

## 4.3 Bathing Water Monitoring by Environmental Protection

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### Executive Summary

- Environmental Protection carry out the monitoring of Island bathing waters according to a protocol of EU best practice (EU Bathing Water Directive 76/160/EEC).
- Compliance of the Island's bathing water quality is measured against European standards.
- Weekly results are made available to the public through the States of Jersey website and forwarded to Health Protection.
- In 2009, all 16 bathing waters passed the EU 'Imperative Standard' (100%) and 88% passed the stringent EU 'Guide Standard'.
- Each season's data is independently assessed by CREH; world renowned specialists.
- EP has monitored bathing water annually since 1991 and together with the Centre for Research into Environment and Health (CREH), University of Wales has been instrumental in the development of the first health related standards in the world which have since been used by the World Health Organisation and the EU.
- Preparatory work is being undertaken to implement the revised Bathing Water Directive (Directive 2006/7/EC of the European Parliament) partly based on research carried out in Jersey.
- Work on the new directive involves extensive profiling of the Island's catchments (including mapping of all sources of pollution inc. livestock, septic tanks etc.)

### 1. Overview of monitoring programme

The monitoring of bathing water quality was first carried out between July and September 1991 at eight sites around the Island. In 1992, the number of samples collected expanded to twenty and the number of sites increased to 11 by 1993. Currently, 16 bathing water sites are monitored around the island.

Until 2003, the monitoring was carried out jointly between Environmental Protection (then part of the Public Services Department) and Health Protection. The analysis of samples was undertaken jointly between the Public Services Department Laboratory and the Hospital Pathology Laboratory. Since the 2004 bathing water season, Environmental Protection has carried out all bathing water sampling and The States of Jersey Official Analyst Laboratory has undertaken all analysis.

Preparatory work is currently being undertaken by Environmental Protection to implement the revised Bathing Water Directive (Directive 2006/7/EC of the European Parliament) partly based on research carried out in Jersey.

## **2. Legislation**

Article 7 of The Water Pollution (Jersey) Law 2000 states the requirement to monitor the Island's controlled waters (territorial sea, coastal waters, inland waters and groundwaters). Bathing waters being coastal waters is therefore part of controlled waters.

There is no Jersey legislation that sets out standards for bathing water quality. Although not legally binding in Jersey a best practice approach is followed. The relevant legislation is the Bathing Water Quality Directive 76/160/EEC and Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006.

## **3. Stakeholders**

Environmental Protection forwards the weekly bathing water results, by email, to Health Protection, the main internal stakeholder.

Other internal stakeholders are Tourism and Transport and Technical Services. Tourism are consulted every year prior to the bathing water season to confirm the bathing water beaches to be sampled and the length of the bathing water season over which sampling will be undertaken.

Results are forwarded to the Marine Conservation Society for inclusion in their good beach guide.

External stakeholders include surfers, divers, shellfish farmers and the general public.

#### **4. Potential pollution sources and pathways**

Potential pollution sources include: leaking septic tanks and tight tanks or soakaways not working effectively, sewerage infrastructure during heavy rainfall events, slurry application to land (especially during rain), livestock faeces from animals grazing in fields, wild birds and emptying of boat grey water tanks close to shore.

Pollution pathways include: run-off from land entering surface water streams at discharge points onto the beach, run-off from land entering surface water outfalls and outlets and direct inputs into the sea.

As part of the Revised Bathing Water Directive (Directive 2006/7/EC of the European Parliament, Environmental Protection is undertaking extensive preparatory work. This includes identification and mapping of each potential source of pollution, including all livestock, septic tanks etc within the catchments.

#### **5. Monitoring**

Environmental Protection collect water samples at 16 bathing water sites around the Island during a twenty week monitoring season. This generally commences on the third week of May and ends on the last week of September each year.

The current sampling sites are: Archirondel, Beauport, Bonne Nuit, Bouley Bay, Green Island, Greve de Lecq, Grouville, Havre des Pas, La Haule, Le Braye, Plemont, Portelet, Rozel, St Brelade's Bay, Victoria Pool and the Watersplash.

A bathing water protocol (see appendix 1) has been developed by Environmental Protection to ensure that sampling is undertaken in a recognised consistent manner.

The driver of the bathing water vehicle records field observations on a bathing water field sheet (see appendix 2) (a second person, a driver, is required as part of the health and safety). A separate recording sheet is completed for the samples submitted to the analyst to record the times of sample collection (see appendix 3).

The States of Jersey Official Analyst Laboratory carries out the analysis of the water samples for concentrations of presumptive total coliforms, presumptive faecal coliforms and presumptive faecal streptococci. These three microbiological parameters are used to report compliance of standards throughout Europe according to the 1976 Directive.

As part of the new 2006 Directive, compliance will be measured against the microbiological parameters *Escherichia coli* and enterococci during the 2012 bathing water season. Confirmatory testing will be required rather than presumptive counting. As a step towards this change, during the 2010 bathing water season all presumptive faecal streptococci samples will be confirmed for enterococci. Samples collected at Bonne Nuit and Rozel that fail the Guide Standard for presumptive faecal coliforms under the 1976 Directive will undergo confirmatory testing for *Escherichia coli*.

The different parameters and standards for each Directive and for The World Health Organisation are shown in Appendix 4.

## **6. Analysis and reporting of data**

Each week's results are uploaded onto the States of Jersey website, during the bathing water season.

At the end of the season, all the results are uploaded into the WQMIS database (a database developed by Environmental Protection to store all water quality data). All bathing water results are forwarded to The Marine Conservation Society for inclusion on the 'Good Beach Guide' website. Annual compliance for the season is reported in the statistical publication 'Jersey in Figures'.

Results are independently audited and an annual report is prepared by The Centre for Research into Environment and Health, University of Wales. A list of reports is included in Appendix 5.

The data series available for each bathing water site is listed in Appendix 6.

## **7. Budget, manpower and resources considerations**

The annual cost for bathing water monitoring is approximately £850. This includes the fuel for the designated sampling vehicle, sampling bottles and safety equipment. The cost for analysing the bathing water samples is covered by the Service Level Agreement (see the Monitoring Overview report, appendix 2).

The cost for preparing a report by CREH to assess bathing water quality for compliance with the current 1976 Directive, the revised 2006 Directive and WHO guidelines, analysis of compliance with rainfall trends and analysis of long-term compliance was £4,262.50 for the 2009 bathing water season.

Staff time for carrying out the monitoring is 20 days during the bathing season. A further 30 days per year are spent in relation to bathing water work. Activities include: inputting field and analysis data and checking data, creating weekly PDF files for uploading to the website, checking rainfall results for any high bacteria results, preparing sampling equipment, organising the bathing water report and reviewing drafts, preparing a press release, undertaking interviews and liaising with the Official Analyst and Health Protection.

In addition, the requirement to prepare bathing water profiles under the 2006 Directive has involved several weeks work, which is still ongoing.

## **8. Constraints**

The bathing water sampling requires two people for health and safety reasons.

Depending on whether the sampling is carried out at high tide it is not always possible to reach streams or outfalls to collect additional water samples that may be impacting bathing water quality.

The timing of the sampling is restricted to Monday, Tuesday and Wednesday, as the analysis takes three days to complete. Samples must also be received by The States of Jersey Official Analyst Laboratory by 14:00 pm on these days as samples need to be pre-incubated at a specific temperature for four hours prior to further incubation at warmer temperatures.

The States of Jersey Official Analyst Laboratory has insufficient staffing resources to carry out confirmatory testing for all total coliform and faecal coliform samples. Confirmatory testing is carried out for all samples in England and Wales, and results are reported as confirmed. The 2010 season is the first season that confirmatory testing of enterococci will be carried out. Until all of the samples are confirmed, Jerseys' results which are reported as presumptive figures to The Marine Conservation Society gives an impression that the water quality is worse than it is as not all presumptive counts necessarily confirm following the additional testing.

The States of Jersey Official Analyst Laboratory is unable to accept any other samples for microbiological analysis during the bathing water monitoring days, due to insufficient resources. This greatly restricts the collection of samples from streams and outfalls on the same day as collecting bathing water samples, especially when other sampling (for example outfalls) needs to be tied in with rainfall events.

## **9. Addressing of constraints by Environmental Protection**

Given more resources, samples could be collected at the weekends and on statutory holidays twice per season for each site to follow. This would then follow the Environment Agency best practice. However, this would require that both Environmental Protection staff and The States of Jersey Official Analyst Laboratory staff to work on these days as sample analysis must commence within six hours of collection.

Samples could be collected on Thursdays and Fridays but this would mean that The States of Jersey Official Analyst Laboratory staff would be required to work during the weekend to carry out the analysis.

Collecting samples in the afternoon would mean that The States of Jersey Official Analyst Laboratory staff would be required to work late on these days as sample analysis must commence within six hours of collection.

The States of Jersey Official Analyst Laboratory require an extra member of staff to be able to carry out the confirmatory tests for all samples for current standard analysis methodologies.

Environmental Protection currently do not have budget to employ UK specialists to undertake microbial source tracking to determine whether the dominant source of pollution is human or animal.

Electronic bathing water signs to warn the public of instances where water quality may be poor have been trialled in Scotland. Predictions are based on rain gauge data (which may be required for each catchment) and daily water samples to compare predictions with. Additional resources would be required to carry out this work.

Bathing water profiling work is being carried out by one officer who also has a high workload in other areas.

## **Appendix 1. Bathing Water Protocol 2010**

### **Monitoring Season**

The bathing water season is mid-May to the end of September 2010.

### **Monitoring Calendar**

Monitoring shall be carried out on Monday and Tuesday mornings each week unless there is a statutory holiday, in which case, monitoring shall be carried out on Tuesday and Wednesday mornings. East and West runs will be rotated each week so that the east sampling is not always carried out on Monday and west sampling, on Tuesday. The monitoring runs will also be rotated so that monitoring does not always start in the north of the island to the south, but instead some runs will start in the south and extend to the north. Please see the monitoring calendar for the run patterns.

### **Sampling**

#### **Sample method**

Take samples safely at a sea water depth of one metre and collect sample at 30 cm below the surface.

#### **Sample bottles**

Use a 250ml sterile bottle. Check that the bottle seal is intact. If not, discard the bottle.

#### **Bottle labelling**

Each bottle should be labelled using a permanent marker with the site code, date and WRS prior to collecting the samples.

#### **Sample locations**

Map of monitoring points on each beach are detailed for each bathing water profile. Monitoring points are specified for high and low water.

#### **Field sheets**

These are located on the L drive in wrs/monitoring/field sheets/bathing waters/bathing water field sheet 2010. Print sheets each week. The sampling run and date should be written on the field sheet. High tide, wind speed and wind direction details are available in the weather section of 'This is Jersey' website and should be entered on the field sheet prior to sampling.

#### **Avoid contamination**

To prevent contamination, do not touch any internal part of the bottle. Sample with clean hands.

## Sampling by hand

Step	Action
1	Enter the sea at the designated point and wade gently until you reach a place where you can take a sample by hand where the water is approximately 1 metre deep.  Keep in mind your own health and safety at all times.
2	Break the cap seal of the bottle and retain the seal in one hand.
3	Lower the bottle to 30 cm below the water surface. Unscrew the cap and place in one hand, making sure that your hand does not come into contact with the open rim of the bottle or inside of the cap.
4	Push the bottle gently through the water away from you.
5	Fill the bottle up to the shoulder.
6	Remove the bottle from the water.

### Duplicate samples (Quality control)

A duplicate sample will be collected at one site, on each sample run. The duplicate sample site will be rotated through all sites during the bathing water season. Please see duplicate sample schedule.

### Handling samples

Samples will be placed immediately into a clean cool box for transport to the laboratory. The box will (i) contain 1 cm depth of water, (ii) contain a minimum of four pre-frozen cold blocks (additional blocks may be required during hot weather) and (iii) have a tight fitting lid to keep the samples in the dark. Where samples have to be transported some distance to the cool box (e.g. Beauport, Plémont and Portelet) they should be kept in the dark and cool using a small insulated container and cold block (e.g. a beer cooler) during transit. Where possible the cool box should be taken to the shore for the immediate storage of samples. Following the completion of each sampling run the samples will be delivered to the analyst.

### Temperature recorder

The temperature recorder should be placed in the cool box, ideally one hour before sampling at the first site on both sampling days. After sampling is completed on the second day, the temperature recorder should be left at the analyst. The analyst will download the data and send a fax of the recorded temperatures. The temperature range should be between 4°C and 10°C.

### Analyst sheet

Located on the L drive in wrs/monitoring/field sheets/bathing waters/paperworkforSA. Print sheets out each week. The sampling run and date should be written on the analyst sheet. The time of collection of each sample should be recorded on this sheet and the parameters ticked. The analyst writes on the laboratory references for the sampling run and a photocopy is taken.

### Imperative standard exceeded

If one of the three microbiological parameters fails to meet the imperative standard, re-sampling is required. All determinands: microbiological, physico-chemical and observational must be re-sampled.



## **Laboratory Analysis**

Laboratory analysis will follow the guidelines in:

The Microbiology of Drinking Water (2009) – Part 4 -Methods for the isolation and enumeration of coliform bacteria and *Escherichia coli* (including *E. coli* 0157:H7) - A report by the Environment Agency.

The Microbiology of Drinking Water (2002) – Part 5 - A method for the isolation and enumeration of enterococci by membrane filtration - A report by the Environment Agency.

Confirmatory testing of *Escherichia coli* shall be carried out for samples collected from Bonne Nuit and Rozel bathing water sites. For those weeks when duplicate sampling and duplicate analysis is due at Bonne Nuit and Rozel, only presumptive analysis shall be carried out.

Confirmatory testing of enterococci shall be carried out for all samples.

## Appendix 2: Bathing Water Field Sheet

### SEAWATER SAMPLING

West Run

Date \_\_\_\_\_

High Tide (GMT) \_\_\_\_\_

Wind Direction and Speed \_\_\_\_\_

BEACH	BONNE NUIT	GREVE DE LECQ
SAMPLE N°	<b>B10</b>	<b>A6</b>
TIME		
WEATHER (Sunny, overcast, rain etc)		
SEA STATE (calm, slight, moderate, rough, very rough)		
DEPTH OF WATER		
DEPTH BELOW		
TERRAIN		
COLOUR (of sample) (Normal enter 0 abnormal enter 1) (algae, turbulence or sediment are natural) (discharge or anthropogenic activity is abnormal)		
MINERAL OILS None enter 0, if visible sign enter 1 (no film visible on the surface of the water and no odour)		
FOAM (no lasting foam on the surface) No foam enter 0, lasting foam enter 1		
ODOUR (no specific odour)		
TRANSPARENCY (of sea) Less than 1m enter <1 Greater than 1m enter >1m		
PHENOLS (tarry odour) No odour, enter 0, odour enter 1		
MACRO ALGAE (SEAWEED) (photo if lots) (enter 0-3 using scale) (floating, stranded, attached to rocks or sediment) Nuisance or potential harm to public health.		
ALGAL BLOOM (take photo) Scum, foam, discolouration (strandline or offshore)		
NUMBER OF BATHERS (0 = none, 1 = 1-10 people, 2 = 11-100 people and 3 = >100 people)		
NUMBER OF BEACH USERS (people using the beach but not in the water) (0 = none, 1 = 1-10 people, 2 = 11-100 people and 3 = >100 people)		
ANIMAL FAECES (dogs/horses/birds) (enter 0-3 using scale)		
SEWAGE RELATED MATERIAL (enter 0-3 using scale) (human faeces, contraceptives, sanitary items, cotton buds, toilet paper)		
SEAGULLS (and any other relevant wildlife)		

**Appendix 3. Bathing Water Analyst Sheet**

**Water Resources Section monitoring**

Type of sample: Bathing water

Monitoring reference: Bathing water West run..... (enter run number 1 - 20)

Date: ...../...../...../ (day / month / year)

SAMPLE REFERENCE	TIME SAMPLE OBTAINED *
A1	
A2	
A3	
A4	
A5	
A6	
A8	
B10	
QA **	

\* please insert cross instead of time if was not be obtained

\*\* please insert Beach reference

<b>Analysis required for each sample</b>
<b>Total coliforms cfu / 100ml</b>
<b>Faecal coliforms cfu / 100ml</b>
<b>Faecal streptococci cfu / 100ml</b>

## Appendix 4. Parameters and standards (CREH, 2009)

Standard	Parameter		
	Coliforms	Faecal coliforms/ <i>Escherichia coli</i>	Faecal streptococci <sup>a</sup>
<b>Directive 76/160/EEC</b>			
Imperative <sup>b</sup>	10,000	2,000	-
Guideline <sup>c</sup>	500	100	100
Standard	Coliforms	Parameter <i>Escherichia coli</i>	Enterococci
<b>Directive 2006/7/EC</b>			
Inland waters:			
Sufficient <sup>d</sup>	-	900	330
Good quality <sup>e</sup>	-	1,000	400
Excellent quality <sup>e</sup>	-	500	200
Coastal waters and transitional waters:			
Sufficient <sup>d</sup>	-	500	185
Good quality <sup>e</sup>	-	500	200
Excellent quality <sup>e</sup>	-	250	100
<b>World Health Organization guidelines 2003<sup>f</sup></b>			
A - no observable adverse effect	-	-	≤40
B - low illness risk	-	-	41-200
C - moderate illness risk	-	-	201-500
D - high illness risk	-	-	>500

- a This parameter is effectively equivalent to enterococci specified in the Directive 2006/7/EC and WHO guidelines outlined
- b 95% results to be ≤ to the specified values to pass
- c 80% coliform and faecal coliform/*Escherichia coli* results to be ≤ to the specified values to pass  
90% faecal streptococci results to be ≤ to the specified values to pass
- d Distribution of results not to exceed the specified 90%ile\* values. Where the distribution exceeds these values the water quality is deemed "Poor"
- e Distribution of results not to exceed the specified 95%ile† values
- f Specified values are the 95%ile of the distribution of results
- \* 90%ile =  $10^{(\mu + 1.282 \sigma)}$
- † 95%ile =  $10^{(\mu + 1.65 \sigma)}$

Where:

$\mu$  is the mean of  $\log_{10}$  transformed concentrations (cfu/100 ml)

and

$\sigma$  is the standard deviation of  $\log_{10}$  transformed concentrations (cfu/100 ml).

## **Appendix 5: Reports**

- i. Assessment of Bathing Water Quality for the States of Jersey 2009
- ii. Assessment of Bathing Water Quality for the States of Jersey 2008
- iii. Assessment of Bathing Water Quality for the States of Jersey 2007
- iv. Assessment of Bathing Water Quality for the States of Jersey 2006
- v. Assessment of the States of Jersey bathing water quality in relation to the new European Directive (2006/7/EC), 2006
- vi. Assessment of Bathing Water Quality for the States of Jersey 2005
- vii. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 2005 Bathing Season
- viii. Assessment of Bathing Water Quality for the States of Jersey 2004
- ix. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 2004 Bathing Season
- x. Assessment of Bathing Water Quality for the States of Jersey 2003
- xi. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 2003 Bathing Season
- xii. Assessment of Bathing Water Quality for the States of Jersey 2002
- xiii. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 2002 Bathing Season
- xiv. Assessment of Bathing Water Quality for the States of Jersey 2001
- xv. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 2001 Bathing Season
- xvi. Assessment of Bathing Water Quality for the States of Jersey 2000
- xvii. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 2000 Bathing Season
- xviii. Assessment of Bathing Water Quality for the States of Jersey 1999
- xix. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 1999 Bathing Season
- xx. Assessment of Bathing Water Quality for the States of Jersey 1998
- xxi. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 1998 Bathing Season
- xxii. Assessment of Bathing Water Quality for the States of Jersey 1997
- xxiii. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 1997 Bathing Season
- xxiv. Assessment of Bathing Water Quality for the States of Jersey 1996
- xxv. Evaluation of Jersey Bathing Waters in relation to Health Related Standards 1996 Bathing Season
- xxvi. Assessment of Bathing Water Quality for the States of Jersey 1995
- xxvii. Assessment of Bathing Water Quality for the States of Jersey 1994
- xxviii. Assessment of the bacteriological quality of bathing waters and land drainage to the Jersey coastal zone during the 1993 bathing season
- xxix. Recreational water quality for The States of Jersey 1992
- xxx. Marine recreational water quality for The State of Jersey 1991 Scientific Appraisal

## **Appendix 6: Data series**

Limited monitoring began in 1991 at eight sites around the island at: Plemont, Le Braye, Beauport, St Brelade, Portelet, La Haule, Grouville and Archirondel.

Full season data:

Archirondel	1992 to date
Beauport	1992 to date
Bonne Nuit	2005 to date (10 samples collected 2004 season)
Bouley Bay	1995 to date
First Tower	1992 to 2003
Green Island	1993 to date
Greve de Lecq	1992 to date
Grouville	1992 to date
Havre des Pas	1993 to date
La Haule	1992 to date
Le Braye	1992 to date
Plemont	1992 to date
Portelet	1992 to date
Rozel	2005 to date (10 samples collected 2004 season)
St Brelade's Bay	1992 to date
Victoria Pool	1992 to date
Watersplash	1995 to date