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COMPARATIVE EVALUATION OF PILOT BEACH PROFILES AND PROPOSED METHODOLOGY

In cooperation with

WHO

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1. INTRODUCTION AND OBJECTIVES

The issue of updating the Coastal Bathing Waters Criteria and Standards has been a concern for the MED POL Programme for a very long time. Within the framework of the MED POL Programme III in 2003, provisional criteria and standards were proposed, taking into consideration the WHO Guidelines on Safe Recreational Water Environments and the respective European Commission proposals. To prepare the ground for updating the Mediterranean regulations on Coastal Bathing Waters a number of preliminary actions have been developed, including the compilation of beach profiles. Beach profiles consist of describing the physical profile of the beach bathing area, the environmental threats and several other factors. Six Mediterranean countries (Albania, Cyprus, Greece, Malta, Serbia & Montenegro and Tunisia) have conducted pilot studies, taking beach profiles at five or six of their beaches during the summer of 2005. This was aimed at identifying problems and eventual difficulties and suggesting ways and means to resolve them. In addition, it aims to provide a draft methodology that can be useful for all Mediterranean countries. The specific objectives of this report are:

1) To analyse the individual studies performed by Albania, Cyprus, Greece, Malta, Serbia & Montenegro and Tunisia in order to establish the degree of comparability among the countries and to recognise problems encountered.

2) To make conclusions and to put together a draft methodology that may provide guidelines for the Mediterranean countries.

Objective 1 is included under parts 2 and 3 of this report, while objective 2 is addressed in part 4. In addition, we consider it important to include (part 5) some of the most relevant aspects of the new European Bathing Water Directive (2006/7/EC) that has recently been published and came into force on 24th March 2006.

1.1 List of documents reviewed

On the 23rd November 2005 a CD was received that contained the information of the different trials performed at the six Mediterranean countries. The following documents were received from each country:

<u>ALBANIA</u>

Files 1-5. General Information, included individual documents (each between 6 and 7 pages) with a profile from the following beaches:

DURRESI-KAVAJA
SARANDA
SHENGJINI
VELIPOJA
VLORA

File 6. Suggestions: includes main problems on the retrospective evaluation of data.
File 7. **Maps:** includes 2 or 3 maps of each of the previously mentioned beaches, and 3 general maps of Albania to situate the beaches.
File 8. Photos: includes pictures showing problems such as outlets or sewage discharges and dirt at the beaches
File 9. Contains one Excel file for each beach including results of faecal coliforms and intestinal enterococci.
File 10. Excel file with results of physicochemical analysis of the Durresi and Vlora beaches, the first with 14 sampling sites and the second with six, analysed on six occasions.

File 11. There is another file of the DURRESI-KAVAJA BEACHES that includes repeated information from the beach profile:
General information
Description of the physical, chemical and hydrological characteristics of the bathing waters
Sanitary inspection
Analysis of historical data for water quality trends

CYPRUS

File 1. Cyprus Project Beach profiles is a 52 page document that brings together all the information, including results, pictures and maps, from 5 beaches:

NISSI
FINIKOUDES
AKTI OLYMPION
MUNICIPAL
CAMPING SITE

Apparently all the beaches selected are of good or very good water quality.
File 2. Methodology, a 5-page document indicating how the information was obtained, and making some suggestions.

GREECE

File 1. A 22-page document including all data of the study profiles from 5 beaches:

KIANI AKTI
KRIONERI
MITIKAS
MONOLITHI
VALTOS

File 2. A 2-page document describing methodology and suggestions.
File 3. Includes all retrospective microbiological results from 2000 to 2004 from the six beaches.

MALTA

File 1. Beach profile – a final 8-page document describing methodology and suggestions.
Files 2-7. Beach profiles of each of 6 beaches evaluated (each individual document has between 8 and 13 pages):

GHAJN TUFFIEHA BAY
HONDOQ IR-RUMMIEN BAY
MELLIEHA BAY
QAWRA, SALINA BAY
ST. GEORGE'S BAY
XLENDI BAY

SERBIA & MONTENEGRO

File 1. Excel file containing microbiological results and physicochemical results. Under the term AM it is not clear to me what parameters are evaluated.
Files 2-7. Individual profiles for the 6 beaches evaluated (each individual document has between 7 and 10 pages):

CRVENA PLAŽA
HOTEL PLAŽA
MOGREN
TROPICANA
VILA GALEB
ŽUKOTRLICA

File 8. Describes methodology and gives a general overview in a 2-page document.

TUNISIA

File 1. A 17-page document situating the selected beaches and making comments on the approach.
File 2. A 108-page document describing the profiles of the 5 selected beaches:

PLAGE RAOUED
OUED MOUSSA
EL MENCHIA
SALAKTA
HACHANI

2. GENERAL COMMENTS ON THE COMPARATIVE EVALUATION OF THE REPORTS

In general, all countries accurately performed the bathing water profile, and report only few difficulties, which are underlined along with some comments for improvement. Each country used a different format for including the data, so there is a clear **need for standardising the format of the documents for each bathing water area for all the countries.**

In general, **all the countries identified potential sources of pollution** that may affect each bathing area. However, **there is a need for further interpretation of these potential sources in relation to the microbiological results obtained on a day-to-day basis** during the summer season 2005. This is in fact lacking in most of the reports.

The final classification of the sanitary inspection has to be further supported by explanations because data that appear as a result of the sanitary inspection does not adequately justify the classification given on many occasions. Since **the classification given under the terms of sanitary inspection has a high degree of subjectivity** it has to be clearly expressed what the specific criteria were that lead to the decision to classify the bathing area under a specific category. This is **essential to make this potential subjectivity as uniform as possible.**

The exercise of performing a bathing water profile **aims to evaluate retrospective data for analysing water tendencies,** so it should allow us to recognise improvements or deterioration of water quality over those years and to identify evident behaviour that may not be easily recognised when data are evaluated with the single current bathing campaign. **In general, most of the reports**, except the one from Malta, **lack any analysis of this tendency**. This should be a target for further studies. This type of analysis should also serve to recognise if a specific year, with exceptional abnormal circumstances, has or not to be included in the evaluation. Malta performed this evaluation and was able to observe specific behaviour in certain years, although it was indicated that further investigation was needed in order to explain this behaviour. An additional aim of the study was the recognition of bathing areas or sampling points that may pose a health treat because they are impacted continuously or sporadically by faecal pollution. Then **management actions** can be introduced that will lower or reduce this risk. **The extent to which these actions had been taken and the difficulties encountered are not clearly explained in the reports. The management measures taken during short-term pollution incidents and the identity and contact details of bodies responsible for taking such action are only mentioned in few reports** (Tunisia and Malta). Although some reports include a list of management measures for long-term pollution events (need for improving sewage infrastructures), it is not clear when they are going to be taken or if they are only recognised as a need.

In general we can say that the risk of short-term pollution events other than rain events were not identified in the reports. Even when rain events were mentioned, neither the anticipated nature nor the frequency and duration were commented on, and no quantification was made on their impact on the water quality. Similarly, with any remaining cause of pollution.

Despite the fact that all the reports include wind direction, few of them correlate them with the potential sources of pollution. In addition, since prevailing wind directions and/or currents are not always marked on the map, it is difficult to see if a source of pollution may affect the sampling sites.

The analysis of historical data over the past 5 years changes from country to country. Albania used data from the last 3 or 4 years, Cyprus used data from the last 5 years, both including recent data from 2005. Greece includes data from 2000 to 2004, Malta 2 to 3 years up to 2004. Serbia-Montenegro includes data from 1997 up to 2004 and finally Tunisia from 2001 up to 2005. Also the parameters considered faecal coliforms, *E. coli* or faecal streptococci change from report to report.

Most of the countries with the exception of Cyprus and Malta did not specify what method they used to performed the percentile calculation, but a reanalysis of their raw data lead us to deduce that they had used statistics from the Excel program, which does not require you to transform values of 0. However, **Cyprus and Malta used the formula of the probability density function to calculate the percentile** provided in the new EU Directive (2066/7/EC) and by WHO. Although it is commonly not known, there are several methods for calculating the percentile, as explained in the WHO guidelines, and each of them give different results. So **it is important that in the future this is taken into account, so that all countries use the same approach.** Considering that several countries will have to follow the new EU Directive, the formulas and the method included there to calculate the Percentile should be the most convenient.

The percentile value is derived as follows as transcribed from the new Directive 2006/7/EC:

Log_{10} 95%ile = (Arithmetic mean $\log_{10}$ bacteria concentration) + (1,65 x standard deviation of $\log_{10}$ bacteria concentration)

Log_{10} 90%ile = (Arithmetic mean $\log_{10}$ bacteria concentration) + (1,282 x standard deviation of $\log_{10}$ bacteria concentration)

- Take the $\log_{10}$ value of all bacteria enumerations in the data sequence to be evaluated. (If zero value is obtained, take the $\log_{10}$ value of the minimum detection limit of the analytical method used instead.)

This is normally 1 (if 100 ml are filtered), 2 (if 50 ml), 4 (if 20 ml) when using membrane filtration, or other values with other methods.

- Calculate the arithmetic mean of the log 10 values (μ).
- Calculate the standard deviation of the log10 values (σ).
The upper 95-percentile point of the data probability density function is derived from the following equation: ***upper 95-percentile = antilog (μ + 1,65 σ).***
The upper 90-percentil point of the data probability density function is derived from the following equation: ***upper 90-percentile = antilog (μ + 1,282 σ).***

2.1 Worked examples of Percentile calculation

Dates	log_{10}
10	**1,0000**
15	**1,1761**
16	**1,2041**
680	**2,8325**
15	**1,1761**
32	**1,5051**
10	**1,0000**
15	**1,1761**
16	**1,2041**
80	**1,9031**
15	**1,1761**
32	**1,5051**
20	**1,3010**
20	**1,3010**
10	**1,0000**
1	**0,0000**
3	**0,4771**
82	**1,9138**
140	**2,1461**
504	**2,7024**
260	**2,4150**
1008	**3,0035**
882	**2,9455**
1008	**3,0035**
132	**2,1206**
126	**2,1004**
160	**2,2041**
40	**1,6021**
40	**1,6021**
26	**1,4150**
20	**1,3010**
40	**1,6021**
180	**2,2553**
115	**2,0607**
115	**2,0607**
100	**2,0000**
150	**2,1761**
155	**2,1903**
1820	**3,2601**

Example of Percentile with no 0 data

Data from Durressi (Albania), sampling point 1:

log_{10} arithmetic mean = μ = **1,7697**

log_{10} standard deviation = σ = **0,7274**

(μ + 1,65σ) = **2,9698**

p95 = antilog (μ + 1,65σ) = 933

p90 = antilog (μ + 1,282σ) = 504

Dates	Zero changed by detection limit	log_{10}
0	**1**	**0,0000**
0	**1**	**0,0000**
8	**8**	**0,9031**
9	**9**	**0,9542**
160	**160**	**2,2041**
122	**122**	**2,0864**
5	**5**	**0,6990**
0	**1**	**0,0000**
0	**1**	**0,0000**
4	**4**	**0,6021**
3	**3**	**0,4771**
3	**3**	**0,4771**
0	**1**	**0,0000**
22	**22**	**1,3424**
28	**28**	**1,4472**
1	**1**	**0,0000**
0	**1**	**0,0000**
0	**1**	**0,0000**
10	**10**	**1,0000**
81	**81**	**1,9085**
14	**14**	**1,1461**
117	**117**	**2,0682**
170	**170**	**2,2304**
27	**27**	**1,4314**
1	**1**	**0,0000**
1	**1**	**0,0000**
0	**1**	**0,0000**
1	**1**	**0,0000**
2	**2**	**0,3010**
13	**13**	**1,1139**
2	**2**	**0,3010**
0	**1**	**0,0000**
4	**4**	**0,6021**
0	**1**	**0,0000**
2	**2**	**0,3010**
64	**64**	**1,8062**
50	**50**	**1,6990**
0	**1**	**0,0000**
14	**14**	**1,1461**

Example of Percentile calculation with transformation of 0 values

Data from Tropicana bathing area (Serbia Montenegro):

log_{10} arithmetic mean = μ = **0,7243**

log_{10} standard deviation = σ = **0,7656**

(μ + 1,65σ) = **1,9876**

p95 = antilog (μ + 1,65σ) = 97

p90 = antilog (μ + 1,282σ) = 51

3. COMPARATIVE EVALUATION OF THE REPORTS

3.1 ALBANIA

The approach taken in fulfilling the documents is more difficult to follow than for the other countries where they integrated the map, photos, microbiological results and general data for each bathing area in a single document. In addition, not all potential sources of pollution are marked on the maps (i.e. rainwater drainage) and those marked as source of pollution, should be specifically labelled, e.g. direct discharge from collector, riverine, etc. so that it will be easier to link them with sources mentioned in the sanitary inspection.

The sampling points should be numbered on the maps and wind direction marked. The photos do not identify the potential pollution source shown on the maps. Raw microbiological data is not dated, so it is difficult to see or evaluate the impact of an increasing population and activities in the summer on bathing water quality. This analysis will probably be helpful considering that their monitoring programme includes one sample per season during the non-bathing time.

The retrospective evaluation of the percentile was made with Excel for each individual sampling point at each bathing area, and not globally considering all raw microbiological data of all sites together. This individual classification obtained for the sampling sites is qualitatively averaged to give the overall classification. No exceptional circumstances are mentioned in any of the bathing areas, maybe due to some areas being consistently poor.

Since Albania differ somehow from the other countries in the length of their bathing areas and number of sampling points, we have made a summary of each bathing area with specific comments that may help to improve their approach in the future:

● Durresi-Kavaja (These two beaches are combined in a single report.)

Durresi is a 12 Km beach that has 14 sampling points, most of them affected by sources of pollution (individual percentiles of the sites were either very poor or requiring immediate action). However, the specific links of water quality with the potential sources of pollution mentioned is not clearly stated for each specific sampling point. Kavaja is a 7 Km beach with 10 sampling points, from which points 8 to 10 have limited samples, as they were added since 2005. The individual sampling points produced percentiles of poor quality for almost all the sites. A single category of High or Very High was given for Durresi-Kavaja on the basis of the sanitary inspection. A global assessment of the total bathing area was made by averaging qualitatively the microbiological quality derived from percentiles obtained from each site as Poor. Despite that it seems the area is being used regularly for bathing without alerting the population of the risk. The fact that the individual percentiles of each of the sampling sites are more or less equal and fall within the same category is an indication that they could have been combined in a single percentile.

We recognize in the report that this bathing area is a very good example of one impacted by so many different potential sources of pollution and that improvement will require the sources that impact the area to be addressed individually.

● Saranda

This is a 5 Km beach with 4 sampling points in 2003 and 2004 and 5 in 2005. The indicated potential sources of pollution marked on the map are not specifically identified (as for example rain water, drainage canals). The raw water discharge between sampling points 2 and 3 influence the bathing water quality at those sites, so people should be encouraged to bathe at points 1 and 4. The retrospective analysis was made using results from 2001-

2005, and show that all sampling points were of category B for IE and mostly of category A for EC. Therefore, this is another example of a bathing area where all data from the different sampling points could be combined in a single category.

● Shengjini

A 2.5 Km beach with 5 samplings points with 12 results in 2003-2004 and only 5 results in 2005. Despite no specific discharge of sewage being reflected in the sanitary inspection, the area is rated as Low, but microbiological results are almost all Poor, so the potential sources should be further investigated. In general, on the basis of the raw microbiological data provided microbiological water quality was better in 2004 than 2003. No reason is given for that, but it is worthwhile considering whether rainfall varied during the 2003 season or whether there were other circumstances (e.g. a different lab, different methods, etc. that could justify this variation).

● Velipoja

It is a 1.5 Km beach with 4 sampling points in 2003 (10 results) and 2004 (12 results) and 6 points in 2005. No sewage discharges are present at this beach according to of the sanitary inspection. However, microbiological water quality is category B, mainly influenced again by the bad results in 2003.

● Vlora

Vlora is a 10 Km beach with 10 sampling points in 2002, 2003 and 2004 and 12 in 2005. The microbiological water quality of the 2 new sampling points introduced in 2005 seems to be very good, so people should be encouraged to use these bathing sites.

A number of drainage pipes are mentioned and marked on the map, but they do not mention if they were draining or not during the sanitary inspection. Again, at this bathing area it is important to encourage bathing at points not impacted by faecal pollution (i.e. the new sampling points mentioned above).

There is a suggestion in their report that the 5-year retrospective analysis will not accurately portray the current situation. According to them, the results will be more accurate if they only reflect data collected during the last 2 years. However, only the analysis of the individual percentile obtained for each individual year will allow us to see to what extent a specific year has behaved differently from the rest, or to see if individual year percentiles are significantly similar or different. It is clear that if we observe their raw microbiological data, the behaviour of 2003 was clearly worse in relation to other years.

They suggest "*since some of the Albanian beaches are 10 – 15 km long with various monitoring points and due to the fact that most of the pollution comes from point sources there is wide range of results on a given beach making it impossible to categorise the water quality for the whole area*". It is clear that when dealing with such big bathing areas of over 10 Km with several sampling points, like the ones at Durresi, Vlelipoja or Vlora, a sub analysis of the impacted parts is essential for directing appropriate management action. Individual evaluation of each sampling site gave them a good opportunity to study the spatial variation, but the report does not suggest which sampling points could be combined. The important thing is to subcategorise places with similar behaviour aiming to promote places where it is safe to bath as opposed to those which are polluted and which would require investment and long term solutions in order to remedy the problem. Heavily polluted places should be delimited or fenced off and bathing prohibited. This exercise could also have evaluated the viability of the management action proposed by the WHO. The Albanian report recognised the need for immediate action but it was not clearly stated what this action was, or if it was undertaken or if signs were posted informing the public or in fact whether it was just a theoretical exercise.

They also comment "*in order to get a more complete set of data I believe that new laboratories are required along the seashore. These laboratories should be aided and directed by the Institute of Public Health which will be closely involved with organising and monitoring this programme".* New laboratories would increase their capacity to obtain more data to specifically recognise less polluted sites where bathing activities could be promoted.

One of the main problems that they refer to impacting the quality of their bathing areas is the expanding development of condominium and service bars/restaurants, which use improperly built septic tanks, and the general lack of proper development of sewage infrastructures in the bathing areas. Additional recognised problems are insufficient garbage collection, the lack of sewage treatment facilities and the direct discharges of untreated sewage due to the big gap between the facilities needed and the ones the government is able to provide.

3.2 CYPRUS

In general the report is very well structured and includes all required information in a single document for all the bathing areas, even the raw microbiological results. Wind directions are marked on the maps of the bathing areas, although streams mentioned in the text are not marked, but pictures are provided. All beaches selected for the trial had Good or Very Good water quality, but despite that, all potential sources of pollution were well considered and their impact well shown. The reason for the final given classification following the sanitary inspection is well explained. The report indicates that they had no problem on performing the study. They suggest the need for specific training of people performing the sanitary inspection (they suggest a microbiologist) and of having a standardised protocol or a questionnaire to be applied to all bathing areas. They give an example of the standardised questionnaire that they developed in their methodology, which is also included in this report as Annex 1, as a potential common approximation to collect the data.

The individual reports of each bathing areas contain a common explanation of a regional emergency plan that would be implemented in the event of pollution accidents (both for biological and chemical pollution) where public health would be at risk.. This plan states, "*the local authorities have the right to close the beach as long as the clean-up operations last and until the laboratory results show that the pollution no longer exists".*

The main potential sources of pollution at the selected beaches are streams that under heavy rain may carry contaminated water to the bathing area. Recorded data of maximum daily precipitation included in their report for each bathing area, shows that these circumstances are rare during the summer season. The report also indicates that since no data are available on the deterioration in the quality of seawater after heavy rain, it is important that in such case during the bathing season, the monitoring programme is extended and focused on observing how long the fall in quality, if any, lasts so that the public is informed and public health is safeguarded.

It is interesting to mention that they investigated the microbiological quality of a natural stream that terminates in the middle of the beach at a Camping Site bathing area where quality was below the limits of 100 enterococci or 100 faecal coliforms per 100 ml. As they indicated, this is a fresh water stream that originates in the hills but from the microbiological results it is clear that it has a negligible impact on the bathing water quality. In fact this is a good example of what is expected from the performance of the sanitary inspection, i.e. to investigate potential sources of pollution and to define their true impact.

For the analysis of the historical data, they used the last 5 years results of faecal coliforms and faecal streptococci, including recent data from 2005. They commented on the doubts they had for the calculation of the 95 percentile for 0 results and they explained the different approaches they used, such as adding 1 to all data, in which case the percentile according to them was higher. While doing it only to the data with zero values, the result of the 95 percentile was 2-3 units lower than in the first calculation. An even lower result of 95 percentile was obtained when they add 0,5 to the zero values, and this was finally the approach used. As mentioned in the general comment, the EU Directive indicates that if zero values are obtained the $\log_{10}$ value should be calculated from the value of the minimum detection limit of the microbiological method of analysis used. In our laboratory, using membrane filtration, zero values are converted to 1 to make the $\log_{10}$ calculation.

We ignore if bathing areas in Cyprus all have a similar quality to the ones selected for the trial. If not, and if they have bathing areas of lower or more varying quality, those are the ideal ones for such exercise where the difficulties of recognising the sources of pollution are bigger.

3.3 GREECE

The report combines in a single document all the data required for each bathing area, though no maps or photos are provided in the report. The potential sources of pollution are all mentioned in the sanitary inspection, but there is no interpretation linked with the results obtained. There is a separate file with all raw microbiological data from 2000-2004 of all indicators including *E. coli* and faecal streptococci, which are used for the retrospective study, and the Excel program is used for the calculation of the percentile. The criteria that govern the sanitary classification are not very clear and no arguments are provided. To illustrate this we have summarised each of the categories attributed to each of the bathing areas selected. No management action is commented on for any of the bathing areas, nor what measures are taken, if any, to prevent the people from bathing areas of poor water quality.

● Kiani Akti

A 2 Km beach with no direct sewage discharges identified, with the exception of storm water, and the overall category given on the sanitary inspection is Very High without further explanation. Despite that, microbiological water quality is of category C but there is no comment on what produces the poor microbiological water quality or why this beach is rated globally as Poor. It seems the area is being use regularly for bathing without alerting the population to the risk. WHO guidelines recommend another inspection of the site in such cases

● Krioneri

A 650 m beach rated Moderate on the basis of the Sanitary Inspection due probably to a port and storm water drain. However, the microbiological water quality had a category A and the overall rate given to that beach was Good.

● Mitikas

A 2 Km beach, rated a as Moderate in the Sanitary Inspection for no apparent reason, with microbiological quality A. Final classification rates this bathing area as Good.

● Monololithi

A 2 Km beach, rated in the Sanitary Inspection as Low and the microbiological results are category A and the overall category is Very Good. The criteria used for the overall category is unclear when considering the approach given for Mitikas or Krioneri bathing areas.

● Valtos

This is a 1.7 Km beach with a stream discharge, rated as High by the Sanitary Inspection. However, the microbiological quality is Good and the final overall category given to this area is Good. Again a revaluation of the Sanitary Inspection should be performed, to evaluate the need for another potential sampling site that could more directly evaluate the potential pollution of the stream discharge.

It is clear from those examples, as we mentioned elsewhere in this report, that there is a need for standardising, or making as objective as possible, the category given in the sanitary inspection.

The only difficulty commented on in the Greece report is the scant or the unavailable reliable data on chemical parameters, cyanobacteria, alguae and phytoplacton, hydrological factors and waste discharges due to the lack of a databases and because responsible authorities had no information on these subjects. They propose to create a database that would include all relevant data. They also propose that in bathing areas with low incidence of indicators or with no frequent pollution incidents, sampling frequency should be reduced to once a month or only once at the beginning of the bathing season and again at the end of it. In addition, they indicate that because these coastal areas are rapidly developing for tourists these kinds of projects should be performed more frequently i.e. every two years. Since Greece belongs to the European Union, it will now have to follow the requirements of the new bathing water Directive, which fixes the minimal sampling requirement and the frequency for reviewing the beach profiles.

3.4 MALTA

This is a very good report that includes all data required in an individual document for each bathing area. They have good maps where each specific source including even the storm water drains is indicated, as well as wind direction. This kind of map should be the model for all the other countries. Despite using a very detailed table to establish the risk associated to the sanitary inspection, they rated all the beaches on the basis of the sanitary inspections as Moderate for no apparent reason. However, all these bathing areas had Excellent water quality on the basis of the microbiological results, and were all finally globally rated as Good. The potential reasons for the specified percentage of data that overpasses the standard of 100 cfu/100ml of *E. coli,* which they specifically calculated in their report, should be specified.

It is very much worth commenting that at the end of the individual report for each beach, they address the main management issues relevant to that bathing area, and they summarise the specific potential risk. It is a pity however, that they do not provide a bit more detail, for instance, when they indicate “risk of accidental sewage overflow from pumping station”. They should aim to define how many of those episodes had happened or may happen during a typical bathing season, and to define better the risk. Similarly, “storm water run off during the last part of the bathing season” does not specify how many times this happened, or how high the risk was in relation to the specific level of microbial pollution i.e., changes from A to B or to C or D, the length of the area impacted, the duration of the event, etc.

For the retrospective microbiological analysis they used faecal coliforms data from 2000 to 2004 that they made equivalent to *E. coli* and FS from 2002-2004, which have been extrapolated to the IE from FS using a conversion factor of 0.9. They mentioned a detection limit of 1, which was probably use to calculating the percentile in the case of 0 values using the formula of the probability density function of the EU Directive, which is included in their methodology. However, we could not check their percentiles because the report does not contain a file with the raw microbiological data.

Interestingly, to analyse potential spatial variation they introduce an individual evaluation of each sampling point at beaches with more than one sampling site. They also analyse the trends in microbial water quality (2000-2004) providing the percentile of *E. coli* both on a year to year basis and globally, which enables them to recognise changes in water quality that they suggest should be investigated further. They recognise this need among the main management issues to be addressed, as well as the problems of storm water run off, but they do not indicate how they plan to address this. Their data suggest that they should interpret what changes have been introduced, if any, since 2002 in the Ghajn-Tuffierha Bay bathing area, because the 95 percentile of *E. coli* from 2001 (257 cfu/100ml) and the previous year, fell to 20 cfu/100ml in 2002 and maintained similar values in the following years (2003 and 2004). If the factors that improved water quality were recognised as permanent, then the retrospective analysis should have been made on the basis of the data from 2002 up to 2004. This changing behaviour in different years was also evident at the Qawra, Salina Bay or St. George's or Xendy bathing areas.

They detail common management actions at the end of each bathing water profile as follows: *"In case of emergency accidents leading to short-term pollution, such as visible sewage overflow in the bay or presence of oil slick, the general public, or the Local Council inform the Health Official at the regional office or inform directly the Environment Health Unit (EHU) of the Department of Public Health. The EHU immediately confirms reports by site inspection and sample collection and analysis if the need arises. Health warnings are subsequently issued through the Department of Information, informing the public that the bathing area has been temporarily closed for bathing. Temporary warning notices are posted on site. Such warnings are also made available online through an automated information system on dedicated telephone lines. In case of season excess of bathing water quality standards as shown by routine monitoring data, the test is repeated and if the excess is confirmed, a health warning is issued and the site is temporarily closed for bathing. Subsequently the site is monitored every day for E. coli, total coliforms, faecal streptococci and Salmonella spp. The site is re-opened for bathing only if results of microbial monitoring are favourable for three consecutive days".* However, it is important to clarify how many times this had to be applied at each bathing area just to have a clear estimation of the risk.

This is the only report that comments on the degree of subjectivity, which is inherent when assigning a category on the basis of the sanitary inspection. They propose that in order to limit the degree of subjectivity of such assessment scores and levels of categories of the specifically identified risks would be much more clearly defined. In our opinion, the score system that has also been tested in a European trial proved to be somewhat artificial. The major difficulty they encountered was in compiling the beach profiles with insufficient data on a number of relevant characteristics including:

- Local prevailing wind conditions and sea current regimes;
- Basic water quality parameters, including nutrients, chlorophyll, dissolved oxygen etc.
- Cyanobacterial and phytoplankton communities.

3.5 SERBIA-MONTENEGRO

Although the report of each bathing site is fully illustrated with pictures it does not includes a map that locates the potential pollution sources or the situation of the sampling site. The report although gives ranges of concentrations of faecal streptococci from each site, only use data of FC for the retrospective analyses of the percentile including data from 1997 up 2005. The percentile is calculated using the Excel program.

It is not clear, as commented elsewhere in this report, why the sanitary inspection risk category was given for certain bathing areas. For instance CRVENA-PLAZA was categorised as Very High, while no sources of pollution or outfalls were recognised, while Hotel Plaza was rated as Good with illegal pipe discharges, main drain sewage and hospital sewage discharges mentioned. In addition, in the Tropicana bathing area, they attributed the low salinity values to the river Bojan, while a riverine discharge was considered not present in the profile of sanitary inspection. It is also not clear if the 8 sampling points defined for this beach are combined in a single result or not. This cannot be deduced from the Excel file with raw data, where 8 sets of data appear at most for each year. Again the Zukotrlica-bathing area is categorised from the inspection as Good while illegal pipe drains and a potential influence of a temporary river were mentioned. However, microbiological results indicate a Poor quality. In this combination, the global beach rate is given as Good, without providing arguments. It has to be considered again that, according to the WHO criteria, when a sanitary inspection provides contradictory results to those show by microbiology, a repeat inspection is mandatory in order to find the sources of pollution responsible for the poor microbiological results.

It is clear again that there is a need for standardising criteria for the inspection risk category. As in reports from other countries there is a lack of interpretation of individual results on the day-to-day basis, which could be done with the data obtained in 2005.There is no mention of management actions, any provision for exceptional circumstances, or what measures are taken, if any, to deter people from bathing areas of Poor water quality.
In the general comment there is no mention of any specific difficulties in implementing the study, although it recognises the need for investments in improving the sewerage system.

3.6 TUNISIA

This report underlines the limited amount of resources available to carry out a regular monitoring programme. The Tunisian report does not use the guidelines or tables provided for the study as the other countries do. However, in general they identified the sources of pollution that affect bathing water quality. The report of each individual bathing area includes several photos to illustrate sources of pollution but they are not linked to the maps. Furthermore, the maps do not indicate the sampling sites. Despite that, the sampling points are well described in the text, and eventually linked to sources of pollution. As in other cases, the specific source of pollution, in relation to each specific High microbiological result on a day-to-day basis is missing from the most recent data of 2005. In their report for each specific bathing area they specify management actions as placing a black flag to prohibit bathing, but it does not say how often this had to be done. They also propose for each specific bathing area corrective measures, such as the need for construction of a long sea outfall for improving sewage infrastructures, or draining contaminated stagnant water, or for installing more toilets.

The are some problems with the microbiological results, probably linked to the method of analysis or the dilution used, because data repeat themselves a lot such, as values of 2400 or 1100, 460 or 150 and there are not many variations in numbers. The lower microbiological results are 0 or 100, with no values in between. Surprisingly all results of the of the second sampling in July 2005 at the Raoued beach for all indicators at each of 4 sampling sites are 2400 cfu/100ml which is very strange. This requires finding out what methodology they use, because this is not specified in the report.

It is not clear what method they use to calculate the percentile, nor what they did with the zero values. For each bathing site they performed an individual analysis by year, using data from 2001 up to 2005 of total coliforms (TC) and faecal coliforms (FC) using their national legislation (coincident with EC directive 76/160/EC). An additional classification is included using the percentiles but the global category they indicate "*represents percentiles of TC and of FC"* providing a single value for both parameters. We tried to re-evaluate the percentiles using their raw data with the Excel program and with the EU formula, but the results we obtained were completely different and in general much lower than the ones they provide. Although they have available raw data of faecal streptococci they did not use those values for the retrospective evaluation, so in fact it seems that they used totally different criteria from the other countries. Using their criteria almost all beaches are D rated by the microbiological water quality.

From this report is again clear that there is a need for providing more lucid guidance or instructions on how to calculate the percentiles for the retrospective microbiological evaluation.

4. RECOMMENDATIONS FOR HARMONIZATION AND PROPOSED METHODOLOGY

As commented under point 2, the report highlights a clear need for **standardising the format of the documents for each bathing water for all the countries.** A questionnaire can be provided to collect the data such as the one developed by Cyprus (Annex1) or templates developed to fulfil the requested data, like the ones proposed as examples in Annexes 2-4bis.

It is clear after the evaluation of those reports that the combination of all information required for each bathing area in a single document is the best approach, perhaps using one of the models given by one of the countries i.e. Cyprus or Malta. In our view this decision will have to be also made by the European Commission when it compiles the Bathing water profile of the different European countries, especially if the data collected are to be made available on a common web site as it is currently. A map, such as the one given by Malta, showing sources of pollution and wind direction together with the sampling points, should also be standardised.

The criteria for **the classification given under the terms of sanitary inspection** also require harmonisation because **there is a high degree of subjectivity.** Such risk classification is useful, especially to detect discrepancies between the classification given under the sanitary inspection (Very Low or High or Very High) and the one obtained with the retrospective analysis of microbiological results (Poor or Excellent or Good), which will require further investigation. This investigation will require a repeat inspection at the site to detect the sources of pollution that produce a Poor microbiological quality rating, or where the sanitary inspection rated the beach as High or Very High perhaps inspectors should reconsider if the sampling point is the best one for collecting evidence of the sources of pollution. Contrary to the WHO guidelines the new Bathing water Directive (2006/7/EC) do not require to provide a classification based on the bathing water profiles. The Directive only obliges to obtain data required for the beach profile and an interpretation of the impact of the potential sources of pollution, but does not require to provide any risk category (see part 5 in this report). If the Meeting decides to follow the EC Directive, the problem of trying to avoid the subjectivity mentioned above will be solved by itself. If not, Template 2 (Annex 3) may be useful.

A clear involvement of local authorities is **needed for taking measures to prevent use of bathing in areas of Poor water quality,** such as in the cases of some beaches in Albania, Greece or Serbia-Montenegro, where presently there does not seem to be (or at least it is not specified in their reports) any means of preventing the use of those bathing sites, nor signs indicating: “the water is polluted, bathing is not recommended, or avoid bathing”. More detailed information of action taken during short-term pollution incidents and the identity and contact details of bodies responsible for taking such action is necessary across all countries. We recognise provision for emergency events in 2 reports (Malta and Cyprus), which are probably considered being a specific requirement of the candidate beaches for a ‘Blue Flag’. The implementation of a management strategy, even to anticipate potential risk events of pollution, is another challenge that will have to be faced by many European countries in order to comply with the requirements of the new Directive.

There is a need for standardising the method used for calculating the percentile. As commented earlier, the probability density function with the formula to calculate the percentile provided in the new EU Directive (2066/7/EC) could be the common approach. In fact, the formula can be introduced in an **Excel** file, in which the results of the different years can be introduced and provided to all countries (see attached Excel file). Maybe some kind of training with clear instructions could be provided or a short training course recommended. This could also be done via Internet, sending the same set of data to all participants and asking them to obtain the percentile, to identify which ones have discrepant results and to help them to solve their problems.

The influence of the **microbiological methods** on the final results, very clearly identified in the case of Tunisia, **will also require harmonisation**. Although many of the reports mentioned that they used the ISO methods, it is not clear if in fact, they followed them strictly or not. Not every laboratory has the ISO norm available, because it normally has to be purchased from ISO. One solution could be to provide them with a summary of the ISO method for Membrane Filtration, such as the one shown in Annex 5, and to ask them to compare it with the methodology they use, indicating the differences if any.

ANNEX 1

QUESTIONNAIRE USED FOR THE COMPILATION OF THE BEACH PROFILE DATA IN THE REPUBLIC OF CYPRUS

Name of the beach……………………………………………………………

		YES	NO	COMMENTS
1	Is there a sewage collection system?			
2	Are there any sewage discharges in the coastal waters?			
3	Are there any toilets and sanitary facilities available to the public?			
4	Are the toilets connected to the sewage collection system?			
5	Is the beach clean?			
6	Are there any litterbins and how often are they emptied?			
7	Are driving, dumping and camping allowed on the beach?			
8	Are there any rivers, streams or drainage pipes entering the sea via the beach?			
9	Are domestic animals allowed on the beach?			
10	Are there any animal farms near the beach?			
11	Are there large quantities of macro algae (seaweeds) on the beach?			
12	Has a eutrophic growth of macro algae ever been reported for this coastal area?			
13	Has a eutrophic growth of cyanobacteria ever been reported for this coastal area?			
14	Other			

ANNEX 2
PROPOSED TEMPLATE TO COLLECT DATA FOR THE BEACH PROFILE

Template 1. GENERAL BATHING WATER PROFILE

General Information
Name of beach and bathing area:…………………......…………………………………..
Location:.....................................Location on the map (grid reference):...…………..
Length.........m wide.. ....m depth... ....m gradient..........cm
Type of bathing area: river River flow (mean Q_{95}/Q_5):.........
open confined natural artificial lake estuarine marine
Type of bathing area: sand rocky pebble grass other…......................
Public facilities: No. of: Toilets......... Showers......... Litter bins............
Is there in place any information system indicating water quality? Yes No
Are methods in place to warn the people of danger? No
Yes: Flags megaphones Digital panels other…...........................
Accessibility: Road Path No access. Is there an adequate parking area? Yes No
Beach usage: swimming sailing motor sports other….....................……
Number of bathers at peak usage (e.g. Sunday)…......................……................
Are dogs or other animals present at the beach? Yes Type...... Number**......** No
Water colour: Transparent No transparent brown green reddish
Are there any algae present? Yes Type.................... Amount........... No
Does the beach look clean? Yes No Specify type of dirt................
Characteristics of surrounding area: (more than one category can be used)
urban residential industrial agricultural dunes
river mouth hills & mountains grassland other.....................
(Other freshwater or sewage sources to be specified in template 4)
Average water temperature:………..
Prevailing wind (N/S/E/W):..................………………………………………....................
Prevailing current (N/S/E/W):……………………………….......................................
Tidal amplitude:……………..……………………………………………..........................
Distance between mean high and low water:……………………………........................

Beach manager or contact in case of pollution incident:

Phone:........................ Fax........................ e-mail…………………………….
Address:..
Organisation:..

Management team at the bathing area
-...
-...
-...
-...

ANNEX 3
TEMPLATE 2 Faecal Contamination Risk Assessment

Please include map indication all sources identified and the location of the sampling points
The receptors for the risk assessment are the human bathers user group
Instructions for each column are provided below the table

<table>
<tr><th>Potential Source</th><th>Location</th><th>Description of Source</th><th>Pathway and Necessary Conditions</th><th>Risk Rating</th></tr>
<tr><td>Wastewater Discharges
wastewater treatment works
combined sewer overflow
storm water overflow
emergency overflow
unsewered discharge
industrial discharge
other discharge…(specify)</td><td>see below</td><td>Wastewater discharges will identify frequency of occurrence (continuous, intermittent), level of treatment provided, volume discharged, microbiological load, frequency of spill and duration, etc.</td><td>see below</td><td>see below</td></tr>
<tr><td>River or Stream Discharge

Groundwater Discharge
Diffuse contamination from associated catchments
Agriculture</td><td></td><td>Detail of catchment drained, including land use, urbanisation, agriculture, seasonality, diffuse sources inputs.
Land uses in catchment (dairy cattle, sheep, pigs, forestry etc.),</td><td></td><td></td></tr>
<tr><td>Other Local Developments or Inputs
ships and/or boats
ports and/or marinas
leisure development (eg caravan parks, restaurants etc.)
others… (specify)</td><td></td><td>Number of boats, associated activities and sewerage provision, unsewered caravan parks, restaurants, etc.</td><td></td><td></td></tr>
<tr><td>Animals: dogs, birds, donkeys, cows, etc.)</td><td></td><td>Number of animals, times of occurrence, likely volumes of sources etc.</td><td></td><td></td></tr>
<tr><td>Historic contamination of sediments</td><td></td><td>e.g. re-suspension of faecally contaminated sediments</td><td></td><td></td></tr>
<tr><td>Other sources…(specify)</td><td></td><td></td><td>Overall Risk Rating:</td><td>see below</td></tr>
</table>

ANNEX 3 bis 1 Instructions

Potential Sources	Potential sources of faecal contamination should include any possible sources that could contribute to the faecal contamination budget of the bathing water. A number of types of source are highlighted in the table, which are given as a guide, but the list should not be seen as exhaustive. There will be occasions and locations where other sources of faecal input may be significant. Information should be provided on each of the potential sources. Information would most usefully be appended to the submission. Information may include, for example: wastewater discharge characteristics (population equivalent, volume, discharge point, microbiological quality etc); CSO spill frequency; bird/mammal occurrence etc. All point sources have to be indicated on the map of the bathing area (see also Box 1 - Compulsory Brief Profile).
Location	The location and grid reference of each source should be included.
Pathway and Necessary Conditions	The Pathway and Necessary Conditions column is provided to allow definition of the types of conditions (for identified sources) that could lead to faecal contamination on the receptor bathing water. It is likely that any major sources of potential contamination and the conditions that lead to contamination will be known by the beach manager. For example, these could include a wastewater discharge in the holiday season (highly concentrated) on cloudy days with an onshore wind; or a CSO discharging during a period of particularly heavy rainfall. The column for Pathway and Necessary Conditions column has limited room fro text. It is expected that the information needed to assess the risks associated with many of these potential sources will have to be provided as an attachment. The risk assessment should reference previous studies and reports as appropriate. Information should include, for example, for wastewater treatment works the level of treatment, discharge volumes, plume dispersion characteristics, transit route to bathing water areas and so on. For CSOs, the rainfall required to induce overflow and the spill frequency, the duration of spills, the volume and zone of impact. Sufficient information should be included in the template and associated material to allow the reader of the trial report to fully understand the potential risks and the confidence with which the beach manager can predict likely contamination events.

Risk Rating

For each of the identified sources that has a potential contamination pathway, a risk rating will have to be given. The risk ratings are as follows:

High - source that has led to more than one bathing water quality failure or has the potential for chronic bathing water quality failure
Medium - source that has led to one bathing water quality failure and that demonstrates risk of periodic contamination
Low - source with risk of bathing water contamination at rate of less than one contamination incident per year
Negligible - source with negligible risk of bathing water contamination
None - no risk of contamination as no sources in zone of influence
Unknown - source with the potential to lead to bathing water contamination or bathing water with contamination for no known reason

ANNEX 3 Bis 2

The ratings are necessarily descriptive and will rely on the experience and expertise of local beach managers. These risk ratings will be improved through consultation during the trials. The risk rating should ideally reflect the magnitude and significance of potential contamination events (frequency and geographic area) and the sensitivity of the receptor population. The following general rules should be applied:

i) For bathing waters that have previously recorded elevated microorganism levels on any occasion, the rating should be at least low.
ii) If there are potential sources of contamination identified, only bathing waters with no history of faecal contamination can have a negligible rating.
iii) A risk of None can only be ascribed when there are no faecal sources and no history of contamination.
iv) The unknown category is for bathing waters that have a history with some faecal contamination, but for which there is currently no explanation.

Overall Risk Rating

The overall risk rating should reflect the potential for faecal contamination of the bathing water. Usually, bathing waters should be rated according to their highest individual risk rating, given that bathing water quality is usually associated with one or at most two significant sources of faecal contamination. Any variation from this, leading to potential downgrading of the overall risk, would have to be accompanied by documented evidence for a reduced combined rating.

ANNEX 4

Template 3 FOR INSEASON MANAGEMENT ACTIONS

				Microbiology		**Parameters Environmental**									**Beach Manage-ment**
Sample	Date	Time	Time of high tide	EC/100 mL	EI/100 mL	Wind P/A	Wind Intensity S/M	Wind Direction N/S/E/W	Rain (RBS) A/M/H	Rain (RS) A/M/H	Weather S/C	Salinity	Air temp. (ºC)	Sea temp (^{0}C)	when excess of standards see annex 3

Environmental parameters on the sampling day. Wind: Present (P) or Absent (A); Intensity: Strong (S) or Moderate (M); Direction: North (N), South (S), East (E), West (W). Rain the day before sampling (RBS) and rain on the day of sampling (RS): Absent (A), Moderate (M) or Heavy (H). Weather: Sunny (S) or Cloudy (C).

ANNEX 4 bis 1. Worked example

				Microbiology		Environmental Parameters									Beach Management when excess of standards see annex 3
Sample	Date	Time	Time of high tide	EC/100 mL	EI/100 mL	Wind P/A	Wind Intensity S/M	Wind Direction N/S/E/W	Rain (RBS) A/M/H	Rain (RS) A/M/H	Weather S/C	Salinity sea waters	Air temp. (ºC)	Sea temp (^{0}C)	
1	24/05/00	12:06	6:25 a.m.	0	0	P	M	N	A	A	C	32,7	22,4ºC	25,1ºC	
2	29/05/00	12:20	10:15 a.m.	0	0	P	S	E	A	A	S	32,2	26,2ºC	26,7ºC	
3	5/06/00	9:25	4:30 a.m.	0	0	P	S	N-E	A	A	C	32,1	21,6ºC	27,3ºC	
4	7/06/00	8:30	6:25 a.m.	144	0	A	M	W	A	A	C	32,7	24,1ºC	26,2ºC	(1)
5	13/06/00	11:40	11:15 a.m.	0	0	P	M	N	A	A	S	32,3	24,7ºC	26,3ºC	
6	14/06/00	12:50	12:30 a.m.	0	0	P	M	S	A	A	C	32,5	25,0ºC	26,1ºC	
7	19/06/00	11:02	3:35 p.m.	0	0	A	S	N	A	A	S	32,5	24,6ºC	26,8ºC	
8	20/06/00	11:20	16:10 p.m.	0	0	P	S	N-E	A	A	S	32,3	24,4ºC	27,5ºC	
9	26/06/00	8:55	8:55 a.m.	0	0	P	M	S-E	A	A	S	31,6	25,1ºC	27,3ºC	
10	28/06/00	11:27	10:40 a.m.	0	0	P	M	N	A	A	S	31,8	27,5ºC	28,2ºC	
11	3/07/00	12:30	15:45 p.m.	0	15	P	M	N-E	A	A	S	31,7	26,1ºC	27,5ºC	
12	4/07/00	8:45	16:40 p.m.	0	0	P	M	N-E	A	A	C	33	26,4ºC	27,7ºC	
13	5/07/00	8:20	17:35 p.m.	0	0	P	M	N-E	A	A	C	33	21,9ºC	27,9ºC	
14	10/07/00	10:55	9:15 a.m.	15	0	P	M	N-E	A	A	C	33,1	23,5ºC	26,1ºC	
15	11/07/00	10:45	10:00 a.m.	94	0	P	S	N	A	M	C	31,8	25,6ºC	26,6ºC	(1)
16	12/07/00	10:38	10:45 a.m.	0	15	P	M	N	M	A	C	32,3	24,7ºC	26ºC	
17	17/07/00	12:20	14:45 p.m.	0	0	P	M	N-E	A	A	S	32,8	23,4ºC	27,3ºC	
18	18/07/00	12:40	15:30 p.m.	0	0	P	M	N	A	A	S	33	25,5ºC	27,3ºC	
19	24/07/00	10:10	7:35 a.m.	0	0	P	M	N-E	A	A	S	32,7	26,2ºC	26,5ºC	
20	25/07/00	10:00	8:20 a.m.	0	0	P	M	N-E	A	A	S	33,5	25,4ºC	27,8ºC	

Environmental parameters on the sampling day. Wind: Present (P) or Absent (A); Intensity: Strong (S) or Moderate (M); Direction: North (N), South (S), East (E), West (W). Rain the day before sampling (RBS) and rain on the day of sampling (RS): Absent (A), Moderate (M) or Heavy (H). Weather: Sunny (S) or Cloudy (C). (1) Public information and resampling.

ANNEX 5

	ISO DIS 7899-2 (2000) **Intestinal enterococci (MF)**	**VARIATIONS FROM THE ISO METHOD**
ISOLATION **MEDIA**	m-Enterococcus agar (Slanetz- Bartley) with 1% sterile solution of TTC added to cooled basal medium 44 ± 4 h a 36 ± 2°C typical colonies are light and dark red	m-Enterococcus agar 44 ± 4 h a 36 ± 2°C typical colonies are light and dark red
CONFIRMATION **MEDIA -TESTS**	Transfer the membrane filter to Bile esculin azide agar preheated at 44ºC Petri dishes 44 ± 0.5°C for 1 h dark brown to black colonies surrounded by black halos = **intestinal enterococci**	Transfer the membrane filter to Bile esculin agar preheated at 44ºC Petri dishes 44 ± 0.5°C for 1 h dark brown to black colonies surrounded by black halos = **intestinal enterococci**

An example of variations used by other laboratories is marked in red. Please use this model and note any differences from the ISO in the method used in your laboratory, if any.

ANNEX 5 bis 1	**ISO DIS 9308-1 (2000)** **Coliforms and *E. coli* (MF)**	**VARIATIONS IN RELATION WITH THEISO METHOD**
ISOLATION MEDIA	**Standard test** Lactose TTC agar with Tergitol 7 21 ± 3 h at 36 ± 2ºC[2] typical colonies turn the medium to yellow **Rapid test** Tryptone soya agar 4 - 5 h at 36 ± 2ºC[2]	
CONFIRMATORY MEDIA - TESTS	**Standard test** Verify all or a representative number of typical colonies (at least 10) 1) Non selective agar (i.e. Tryptone soya agar) 21 ± 3 h at 36 ± 2ºC 2) Oxidase test (-) non-appearance of a dark purple colour within 5-10 sec (-) oxidase = **coliform bacteria** 3) Tryptophane broth 21 ± 3 h at 44 ± 0,5°C Add indol reagent (+) indol production (red ring) (-) oxidase and (+) indol = ***E. coli*** **Rapid tests** Transfer the membrane filter to Tryptone bile agar 19 - 20 h at 44 ± 0,5°C place the membrane filter on a filter paper saturated with indole reagent red colonies = ***E. coli***	

Please use this model and note any differences from the ISO in the method used in your laboratory, if any.

5. COMPLEMENTARY INFORMATION IN RELATION WITH THE EUROPEAN UNION DIRECTIVE

On 15 February 2006, representatives of the Council and the European Parliament in Strasbourg formally adopted the revised Directive. The text can be found on the Council's website. The revised Directive has been published in the Official Journal of the European Union (4th March 2006) and comes into force twenty days after its publication date (i.e., 24th March 2006). Member States then have a period of two years (up to 24th March 2008) in which to introduce any new national laws, regulations or administrative processes needed to comply with the revised Directive. It is indicated in the Directive that in the summer season of 2008, the Directive will have to start to be applied. However, it will take longer to bring the revised Directive into full effect, as its various elements will need to be planned and introduced in order to meet a range of deadlines. By the end of the summer season of 2015 all bathing waters will have to be classified according to the criteria of the new Directive that will be in full operation across the whole of the EU.

The most relevant change introduced in the last version is the new standards and a new category of bathing waters as extracted below.

CLASSIFICATION AND QUALITY STATUS OF BATHING COASTAL WATERS

INDICATORS	Water Quality			Reference method of analysis
	Excellent	**Good**	**Sufficient**	
Intestinal Enterococci (UFC/100ml)	100*	200*	185**	ISO 7899-1 or ISO 7899-2
Escherichia coli (UFC/100ml)	250*	500*	500**	ISO 9308-1 or ISO 9308-3

* 95th percentile, ** 90th percentile.

SAMPLING FREQUENCY AND DATA FOR THE RETROSPECTIVE ANALYSIS

One sample is to be taken shortly before the start of each bathing season. No fewer than 4 samples are to be taken and analysed per bathing season. However, only 3 samples need be taken and analysed per bathing season if a bathing season does not exceed 8 weeks or is situated in a region subject to special geographical constraints. Sampling dates must be evenly spread throughout the bathing season, with the interval between sampling dates never exceeding one month.

Sets of bathing water data used to carry out bathing water quality assessments must always comprise at least 16 samples or 12 in the special circumstances referred before or 8 samples in the case of bathing waters with a bathing season not exceeding 8 weeks.

BATHING WATER PROFILES

The bathing water profiles according to the new Directive should consist of:

a. a description of the physical, geographical and hydrological characteristics of the bathing water, and of other surface waters in the catchment area of the bathing water concerned, that could be a source of pollution, which are relevant to the purpose of this Directive and as provided for in Directive 2000/60/EC;

b. an identification and assessment of causes of pollution that might affect bathing waters and impair bathers' health;

c. an assessment of the potential for proliferation of cyanobacteria;

d. an assessment of the potential for proliferation of macro-algae and/or phytoplankton;

e. if the assessment under point (b) shows that there is a risk of short-term pollution, the following information is required:

- the anticipated nature, frequency and duration of expected short-term pollution,

- details of any remaining causes of pollution, including management measures taken and the time schedule for their elimination,

- management measures taken during short-term pollution and the identity and contact details of bodies responsible for taking such action

f. the location of the monitoring point.

REVISION OF THE BATHING WATER PROFILES

In the case of bathing waters classified as “good”, “sufficient” or “poor”, the bathing water profile is to be reviewed regularly to assess whether any of the aspects have changed. If necessary, the classification is to be updated. The frequency and scope of reviews is to be determined on the basis of the nature and severity of the pollution. However, they are to comply at least with the provisions and to take place at least with the frequency specified in the following table:

Bathing Water Classification	“Good”	“Sufficient”	“Poor”
Reviews are to take place at least every	4 years	3 years	2 years

The review is to cover the following aspects:

- A description of the physical, geographical and hydrological characteristics of the bathing water,

- An identification and assessment of causes of pollution that might affect bathing waters and impair bathers’ health,

- An assessment of the potential for proliferation of cyanobacteria, macro-algae and /or phytoplankton.

- In the case of bathing waters previously classified as “Excellent”, the bathing water profiles need be reviewed and, if necessary, updated only if the classification changes to “Good”, “Sufficient” or “Poor”.

- In the event of significant works or significant changes in the infrastructure in or in the vicinity of the bathing water, the bathing profile is to be updated before the start of the next bathing season.

However, notwithstanding the general requirement of above, bathing waters may temporarily be classified as 'poor' and still remain in compliance with this Directive. In such cases, Member States shall ensure that the following conditions are satisfied:

(a) in respect of each bathing water classified as 'poor', the following measures shall be taken with effect from the bathing season that follows its classification:

(i) adequate management measures, including a bathing prohibition or advice against bathing, with a view to preventing bathers' exposure to pollution;

(ii) identification of the causes and reasons for the failure to achieve 'sufficient' quality status;

(iii) adequate measures to prevent, reduce or eliminate the causes of pollution; and

(iv) in accordance with Article 12, alerting the public by a clear and simple warning sign and informing them of the causes of the pollution and measures taken, on the basis of the bathing water profile.

(b) If a bathing water is classified as 'poor' for five consecutive years, a permanent bathing prohibition or permanent advice against bathing shall be introduced. However, a Member State may introduce a permanent bathing prohibition or permanent advice against bathing before the end of the five year period if it considers that the achievement of 'sufficient' quality would be infeasible or disproportionately expensive.