Ambient Water Quality Criteria for Bacteria - 1986
### TABLE 4. CRITERIA FOR INDICATOR FOR BACTERIOLOGICAL DENSITIES

<table>
<thead>
<tr>
<th>Acceptable Swimming</th>
<th>Steady State</th>
<th>Designated</th>
<th>Moderate Full</th>
<th>Lightly Used</th>
<th>Infrequently Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated Gastro-</td>
<td>Geometric Mean</td>
<td>Beach Area</td>
<td>Body Contact</td>
<td>Full Body Contact</td>
<td>Recreation</td>
</tr>
<tr>
<td>enteritis Rate per</td>
<td>Indicator</td>
<td>Density</td>
<td>Full Body Contact</td>
<td>Full Body Contact</td>
<td>Recreation</td>
</tr>
<tr>
<td>1000 swimmers</td>
<td>(upper 75% C.L.)</td>
<td></td>
<td>(upper 82% C.L.)</td>
<td></td>
<td>(upper 95% C.L.)</td>
</tr>
<tr>
<td>Freshwater enterococci</td>
<td>8</td>
<td>33(1')</td>
<td>61</td>
<td>78</td>
<td>107</td>
</tr>
<tr>
<td>E. coli</td>
<td>8</td>
<td>126(2')</td>
<td>235</td>
<td>298</td>
<td>409</td>
</tr>
<tr>
<td>Marine Water enterococci</td>
<td>19</td>
<td>35(3')</td>
<td>104</td>
<td>158</td>
<td>276</td>
</tr>
</tbody>
</table>

**Notes:**

1. Calculated to nearest whole number using equation:
   \[
   \text{mean enterococci density} = \text{antilog}_{10} \left( \frac{\text{illness rate/1000 people}}{9.40} + 6.28 \right)
   \]

2. Calculated to nearest whole number using equation:
   \[
   \text{mean E. coli density} = \text{antilog}_{10} \left( \frac{\text{illness rate/1000 people}}{9.40} + 11.74 \right)
   \]

3. Calculated to nearest whole number using equation:
   \[
   \text{mean enterococci density} = \text{antilog}_{10} \left( \frac{\text{illness rate/1000 people}}{12.17} - 0.20 \right)
   \]

4. Single sample limit = \[
   \text{antilog}_{10} \left( \frac{\text{log}_{10} \text{ indicator + Factor determined from geometric mean density/100 ml}}{\log_{10} \text{ standard deviation}} \right)
   \]

   The appropriate factors for the indicated one sided confidence levels are:
   - 75% C.L. - .675
   - 82% C.L. - .935
   - 90% C.L. - 1.28
   - 95% C.L. - 1.65

5. Based on the observed log standard deviations. During the EPA studies: 0.4 for freshwater E. coli and enterococci; and 0.7 for marine water enterococci. Each jurisdiction should establish its own standard deviation for its conditions which would then vary the single sample limit.
EPA Criteria for Bathing (Full Body Contact) Recreational Waters

Freshwater

Based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period), the geometric mean of the indicated bacterial densities should not exceed one or the other of the following:\(^{(1)}\)

- **E. coli** 126 per 100 ml; or
- **enterococci** 33 per 100 ml;

no sample should exceed a one sided confidence limit (C.L.) calculated using the following as guidance:

<table>
<thead>
<tr>
<th>Use of Beach</th>
<th>C.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>designated bathing beach</td>
<td>75%</td>
</tr>
<tr>
<td>moderate use for bathing</td>
<td>82%</td>
</tr>
<tr>
<td>light use for bathing</td>
<td>90%</td>
</tr>
<tr>
<td>infrequent use for bathing</td>
<td>95%</td>
</tr>
</tbody>
</table>

based on a site-specific log standard deviation, or if site data are insufficient to establish a log standard deviation, then using 0.4 as the log standard deviation for both indicators.

Marine Water

Based on a statistically sufficient number of samples (generally not less than 5 samples equally spaced over a 30-day period), the geometric mean of the enterococci densities should not exceed 35 per 100 ml;

no sample should exceed a one sided confidence limit using the following as guidance:

<table>
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<th>C.L.</th>
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</tr>
<tr>
<td>infrequent use for bathing</td>
<td>95%</td>
</tr>
</tbody>
</table>

based on a site-specific log standard deviation, or if site data are insufficient to establish a log standard deviation, then using 0.7 as the log standard deviation.

Note (1) - Only one indicator should be used. The Regulatory agency should select the appropriate indicator for its conditions.
References


