Presented below are water quality standards that are in effect for Clean Water Act purposes.

EPA is posting these standards as a convenience to users and has made a reasonable effort to assure their accuracy. Additionally, EPA has made a reasonable effort to identify parts of the standards that are not approved, disapproved, or are otherwise not in effect for Clean Water Act purposes.

TITLE 35: ENVIRONMENTAL PROTECTION

SUBTITLE C: WATER POLLUTION

CHAPTER II: ENVIRONMENTAL PROTECTION AGENCY

PART 378
EFFLUENT DISINFECTION EXEMPTIONS

SUBPART A: INTRODUCTION

SUBPART B: PROTECTED WATER STATUS AND EXEMPTION REQUIREMENTS

SUBPART C: FECAL COLIFORM DIE-OFF MODEL

AUTHORITY: Implementing and authorized by Sections 4, 11 and 39 of the Environmental Protection Act (Ill. Rev. Stat. 1987, ch. 111 1/2, pars. 1004, 1011, and 1039).

SOURCE: Adopted at 13 Ill. Reg. 1190, effective January 17, 1989.

SUBPART A: INTRODUCTION

<BSection 378.101 Purpose, Scope and Applicability>>

a) The purpose of this Part is to establish requirements for determining which National Pollutant Discharge Elimination System (NPDES) permit dischargers may cease effluent disinfection on a seasonal or year-round basis pursuant to standards established by the Pollution Control Board (Board) at 35 Ill. Adm. Code 302.202, 302.209, 302.306 and 304.121.

b) This Part shall apply to National Pollutant Discharge Elimination System permit dischargers which must comply with the fecal coliform effluent standard of 35 Ill. Adm. Code 304.121. This Part does not apply to discharges governed by 35 Ill. Adm. Code 306.305 or to discharges with fecal coliform limitations imposed by any federal regulations pursuant to 35 Ill. Adm. Code 309.141.

c) The standards established by the Pollution Control Board allow that waters unsuitable for primary contact activities, unlikely to allow incidental contact due to remoteness from any parks or residential areas, and unutilized for public and food processing water supply are exempt from fecal coliform water quality standards. National Pollutant Discharge Elimination System permit dischargers which affect these waters may be eligible for an exemption from 35 Ill. Adm. Code 304.121.

d) National Pollutant Discharge Elimination System permit discharges which may prevent protected waters from complying with fecal coliform water quality standards must continue to comply with the fecal coliform effluent standard of 35 Ill. Adm. Code 304.121. In order to be protected, waters must presently support or have physical characteristics to support primary contact activities, flow through or adjacent to parks or residential areas, or be utilized for public and food processing water supply.

e) Exemption determinations will include consideration of potential impacts on interstate waters.

<BSection 378.102 Definitions>>

All terms shall have the meanings set forth in the Environmental Protection Act except, for purposes of this Part, the following definitions apply:

"Act" means the Environmental Protection Act (Ill. Rev. Stat. 1987, ch. 111 1/2, pars. 1001 et seq., as amended).

"Agency" means Illinois Environmental Protection Agency.

"Board" means Illinois Pollution Control Board.

"NPDES permit" means a permit issued under the National Pollutant Discharge Elimination System under Section 39 of the Act and Section 402 of the Clean Water Act, (33 U.S.C.A. Section 1251 et seq.).

"Primary contact" means any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing.
"Residential areas" means any collection of dwellings, such as cities, towns, and subdivisions.

"Year-round" refers to the full twelve months of the year.

<BSection 378.103 Application Requirements>>

The Agency will consider an exemption from the fecal coliform effluent limitations of 35 Ill. Adm. Code 304.121(a) only when the holder of an NPDES permit submits to the Agency a Disinfection Exemption Request. The request, at a minimum, shall demonstrate and document the following:

a) The character of the receiving waters pursuant to 35 Ill. Adm. Code 302.202, 302.209, and 302.306 in accordance with Section 378.204.
b) The discharge will not cause downstream waters to exceed applicable fecal coliform standards pursuant to 35 Ill. Adm. Code 302.209 and 302.306.

SUBPART B: PROTECTED WATER STATUS AND EXEMPTION REQUIREMENTS

<BSection 378.201 Year-Round Protected Waters>>

Waters utilized for public and food processing water supply must comply with the 2000 per 100 ml fecal coliform standard of 35 Ill. Adm. Code

302.306 at any intake point on a year-round basis.

<BSection 378.202 Seasonally Protected Waters>>

Waters within the following categories must comply with the 200 per 100 ml fecal coliform standard of 35 Ill. Adm. Code 302.209(a) during the months of May through October:

a) All large streams and rivers which support primary contact activities;
b) All lakes and ponds which support primary contact activity;
c) Pooled areas of small streams where depth and access allow for primary contact activities; or
d) Streams which flow through or adjacent to parks or residential areas and are likely to create a risk of incidental or accidental contact.

<BSection 378.203 Unprotected Waters>>

Unprotected waters are not required to comply with the fecal coliform standards of 35 Ill. Adm. Code 302.209 and 302.306. Characteristics of unprotected waters include but are not limited to the following, and waters must possess one or more of these characteristics to be classified as unprotected waters:

a) Waters with average depths of two feet or less and no pronounced deep pools during the summer season;
b) Waters containing physical obstacles sufficient to prevent access or primary contact activities; or
c) Waters with adjacent land uses sufficient to discourage primary contact activities.

<BSection 378.204 Assessment of Waters for Protected Status>>

a) The permittee shall conduct surveys necessary to determine whether affected waters currently support or have the potential to support primary contact activities. The permittee shall determine and document the following:
    1) Whether the water body segments have potential for primary contact use. For example, such segments must have water depths that would ordinarily permit swimming during the months of May through October;
    2) Whether the water body segments are free of obstacles to primary contact activities, such as unsuitable access to the streambank or existence of logs, log jams or other debris

which render the water body hazardous or unattractive to swimmers;

3) Where the adjacent land use to water body segments would discourage primary contact activities; or

4) Whether the water bodies are being used for primary contact activities. The permittee shall make inquiries of local residents, land owners, or local law enforcement officials. The permittee shall also make a list of all downstream access areas and contact custodians to determine the uses and water-based activities of the water body segment in question.

b) The permittee shall conduct surveys necessary to determine whether any affected waters which flow through or adjacent to parks or residential areas have the potential to attract the public and create a risk of incidental or accidental contact. Such water bodies are protected by the seasonal fecal coliform standard of 35 Ill. Adm. Code 302.209(a) unless the permittee can demonstrate that access is limited by such impediments as fences or steep banks.

c) The Agency shall review the information provided by the permittee and determine whether it is accurate and complete in accordance with the requirements of this Section.

SUBPART C: FECAL COLIFORM DIE-OFF MODEL

<BSection 378.301 Die-off Equation>>

a) The permittee shall model the die-off of fecal coliform from its discharge using the first-order die-off equation provided in Appendix A of this Part. Appendix B of this Part provides step-by-step guidance for the application of this equation. Appendices C through E of this Part provide further assistance in the application of the equation.

b) The die-off equation predicts levels of fecal coliform at points downstream from the fecal coliform source. The equation includes variables to reflect upstream levels of fecal coliform, changes in dilution and travel time, and other stream-specific parameters.

c) In modeling the effects of its discharge, the permittee shall collect additional stream-specific information as necessary to demonstrate compliance with fecal coliform water quality standards. The amount of field data necessary to utilize the equation as specified in Appendix B of this Part will depend on the proximity of the source to protected waters and the nature of the receiving waters. Additional field data collected will produce more accurate prediction of downstream levels of fecal coliform.

<BSection 378.302 Cumulative Effects of Multiple Sources>>

a) When modeling fecal coliform die-off, the permittee must account for contributions of additional downstream sources. Requests for exemption will be denied when die-off modeling indicates that the combined effect of multiple sources will lead to fecal coliform water quality violations of 35 Ill. Adm. Code 302.209 or 302.306.

b) In reviewing any request for exemption, the Agency shall re-examine previously modified NPDES permits when modeling indicates that there is a potential for fecal coliform water quality violations of 35 Ill. Adm. Code 302.209 or 302.306 due to the combined effects of:
   1) the source's modified fecal coliform limits;
   2) the permittee's modified fecal coliform limits; and
   3) any new source.

<BSection 378.APPENDIX A First Order Die-off Equation>>

The first order die-off equation provides a method of estimating fecal coliform die-off in a receiving water as a function of time:

N(t) = [N(u)/(1+1/d) + N(o)/(1)] x e (-k t)

Definition and discussion of terms:

N(t) is the predicted concentration of fecal coliform at travel time t downstream; units = #/100 ml.

N(u) is the fecal coliform concentration upstream of the source being modeled; units = #/100 ml.

This term will often be negligible relative to the contribution of the source.

N(o) is the fecal coliform concentration in the effluent of the source;

units = #/100 ml.

d is the ratio of the receiving water discharge directly upstream of the

source to the discharge of the source; no units.

k is the first order die-off rate constant; units = 1/hours. The value of

k can vary as a function of receiving water characteristics, including temperature, exposure to sunlight, and turbidity.

t is the travel time to the point of interest below the source; units

= hours.
e = 2.718
@R+R

<BSection 378.APPENDIX B Application of the Die-off Equation>>

a) Sketch the receiving stream and the progression of higher order streams it flows into, up to and including the major river basin. Major river basins are listed in Appendix C. Also identify on your sketch:
  1) Smaller streams which are tributary to the receiving water below the point of discharge.
  2) All point source dischargers.
  3) All public and food processing water supply intakes.
  4) Water body reaches wherein primary contact activities are feasible or known to be engaged.

b) Sources which discharge directly to receiving waters which are obviously suitable for primary contact use and therefore applying for a seasonal exemption only, do not need to assess downstream primary contact potential or use. Sources which are applying for a year-round exemption must carefully assess such potential or use for the entire affected reach of the undisinfected discharge.

c) Subdivide downstream waters into segments where discharge and stream cross-sectional area are relatively uniform. Segments will typically begin at confluences with other streams. Number the segments and identify each on the above sketch. Where available note stream mile numbers established by U.S. Geological Survey (see Appendix C) for the receiving stream.

d) Establish discharge rates for each segment. If no discharge data is available, the equations developed by the Illinois State Water Survey (Appendix C) may be used. For waters protected to 200 fecal coliform per 100 ml, the median discharge (50% recurrence frequency) shall be utilized. For waters protected to 2000 fecal coliform per 100 ml, calculate discharges for the 10%, 30%, 50%, 70%, and 90% recurrence frequencies.

e) Derive average velocities for all necessary recurrence frequencies in each segment. In the absence of field measurements, velocity is best estimated through the use of the Manning equation (Appendix D). For some situations, equations developed by the Illinois State Water Survey (Appendix C) may suffice; however, these equations tend to over-estimate velocity, so it may be beneficial for a discharger to go to a more detailed analysis.

f) Assess the average concentration of fecal coliform directly upstream of the source (N(u)) and for all significant tributaries listed in Part A. Data from Agency ambient monitoring stations may be useful in some instances.

g) Assess the concentration of fecal coliforms in the effluent prior to disinfection (N(o)). An average over at least 3 months is preferable, but a minimum of 4 samples in 30 days will be acceptable. A conservative value of 400,000 fecal coliform per 100 ml may be utilized when effluent specific data is not available.

h) Determine the appropriate die-off rate constant (k). Available literature values for k range from 0.01/hour to greater than 1.00/hour. In the absence of stream-specific data, the following values may be used: 0.06/hour for the months May thru October, and 0.03/hour for the months November thru April. Stream assessments are preferred and may be necessary to demonstrate compliance. (See Appendix E).

i) Calculate fecal coliform levels at intervals downstream using the design average flow for the source, for all necessary recurrence frequencies and values of k. Incorporate the contributions of additional downstream sources as necessary. Compare the results to the required levels of protection. (These levels are 200/100 ml for primary contact and 2000/100 ml for water supplies).

j) In cases where the predicted level approximates the required level of protection, the Agency will require additional stream-specific information. Such information may include, but is not limited to:

   1) Die-off studies to determine k.
   2) Dye tracer studies to determine V.
   3) Stream surveying to determine Q.

@R+R

<BSection 378.APPENDIX C Discharge and Travel Time Estimation>>

The Illinois State Water Survey, in a publication entitled, "Hydraulic Geometry of Illinois Streams," (by J.B. Stall and Y.S. Fok, WRC Research Report 15, 1968) provides a method of predicting discharge and average stream velocity in stream basins as a function of drainage area. The equations are listed below. Where an equation is not listed for the basin of interest, the statewide composite equations may be used. Drainage areas can be obtained from the U.S. Geological Survey report entitled "River Mileages and Drainage Areas for Illinois Streams - Volumes 1 and 2," (by R. W. Healy, Water Resources Investigation 79-110 and 79-111, 1979).

Hydraulic Geometry Equations for Illinois River Basins

Description of Units

Q = discharge in cubic feet per second (cfs)
V = average velocity in feet per second (fps)
A(d) = drainage area in square miles
F = frequency in percent of days, as a decimal
1n denotes that all logarithms are natural logarithms to the base
$e = 2.718$

Statewide Composite Equations

$1n\ Q = 1.176 - 5.22\ F + 0.984\ 1n\ A(d)$ (cfs)
$1n\ V = 0.103 - 1.81\ F + 0.158\ 1n\ A(d)$ (fps)

Rock River

$1n\ Q = 0.24 - 3.50\ F + 1.03\ 1n\ A(d)$
$1n\ V = 0.20 - 1.50\ F + 0.13\ 1n\ A(d)$

Galena River
$1n\ Q = 0.13 - 2.27\ F + 0.96\ 1n\ A(d)$
$1n\ V = -0.06 - 0.81\ F + 0.06\ 1n\ A(d)$

Fox River

$1n\ Q = -0.24 - 3.33\ F + 1.13\ 1n\ A(d)$
$1n\ V = 0.11 - 1.39\ F + 0.16\ 1n\ A(d)$

Mackinaw River

$1n\ Q = 1.39 - 7.52\ F + 1.00\ 1n\ A(d)$
$1n\ V = 0.38 - 2.26\ F + 0.09\ 1n\ A(d)$

Henderson Creek

$1n\ Q = 1.44 - 5.00\ F + 0.89\ 1n\ A(d)$
$1n\ V = 0.58 - 1.76\ F + 0.01\ 1n\ A(d)$

Spoon River

$1n\ Q = 0.86 - 4.82\ F + 1.00\ 1n\ A(d)$
$1n\ V = 0.52 - 1.63\ F + 0.08\ 1n\ A(d)$

LaMoine River

$1n\ Q = 1.03 - 5.60\ F + 0.92\ 1n\ A(d)$
$1n\ V =-0.13 - 1.16\ F + 0.11\ 1n\ A(d)$

Sny River

$1n\ Q =-2.27 - 5.87\ F + 1.63\ 1n\ A(d)$
$1n\ V =-1.29 - 1.06\ F + 0.39\ 1n\ A(d)$

Sangamon River

$1n\ Q = 0.65 - 4.93\ F + 1.03\ 1n\ A(d)$
$1n\ V =-1.01 - 0.95\ F + 0.26\ 1n\ A(d)$

Des Plaines River

$1n\ Q = 1.78 - 4.98\ F + 0.90\ 1n\ A(d)$
$1n\ V = 0.26 - 1.31\ F + 0.08\ 1n\ A(d)$

Kankakee River

$1n\ Q = 1.41 - 5.12\ F + 0.96\ 1n\ A(d)$
$1n\ V =-0.38 - 1.19\ F + 0.17\ 1n\ A(d)$

Vermilion River (Illinois River Basin)

$1n\ Q = 0.97 - 6.28\ F + 1.01\ 1n\ A(d)$
$1n\ V =-0.20 - 2.19\ F + 0.17\ 1n\ A(d)$

Kaskaskia River
$1n\ Q = 0.95 - 5.88\ F + 1.02\ 1n\ A(d)$
$1n\ V =-0.26 - 1.28\ F + 0.14\ 1n\ A(d)$

Vermilion River (Wabash River Basin)

$1n\ Q = 1.11 - 4.96\ F + 0.98\ 1n\ A(d)$
$1n\ V =-0.81 - 2.20\ F + 0.29\ 1n\ A(d)$

Embarras River

$1n\ Q = 0.04 - 5.61\ F + 1.17\ 1n\ A(d)$

1n V =-0.92 - 1.62 F + 0.26 1n A(d)

Little Wabash River

1n Q = 1.91 - 7.90 F + 0.96 1n A(d)
1n V =-1.38 - 1.18 F + 0.30 1n A(d)

Big Muddy River

1n Q = 1.26 - 8.50 F + 1.09 1n A(d)
1n V =-0.75 - 1.47 F + 0.18 1n A(d)

Big Bay Creek

1n Q = 1.48 - 7.90 F + 1.05 1n A(d)
1n V =-0.53 - 0.41 F + 0.14 1n A(d)
@R+R

<BSection 378.APPENDIX D Manning Equation>>

V = <P1.49>> R(2/3)(h) S(1/2)
n

Q = <P1.49>> AR(2/3)(h)S(1/2)
n

where: Q is the discharge in cfs.
V is the average velocity in fps.
A is the cross-sectional area of the stream in square feet.
R(h) is the hydraulic radius of the stream in feet, as determined by the cross-sectional area (A) divided by the wetted perimeter.
S is the slope of the stream in decimal form.
n is the Manning coefficient.
@R+R

<BSection 378.APPENDIX E Field Assessment of Die-off Rate Constant>>

Assessing the fecal coliform die-off rate constant (k) below a source is a fairly straight-forward process. It is important, however, that sampling be conducted under appropriate conditions. The following guidelines should be observed in planning and conducting the necessary field work.

a) Assessment of k must be conducted on an undisinfected effluent.

b) Assessment of k for warm months (May thru October) should be conducted when water temperature is at least 20 C. For cold months (November thru April), water temperature should be less than 10 C.

c) Stream discharge and effluent discharge must be relatively steady. Precipitation events within the past 24 hours or during sampling should be avoided. The dilution ratio should be such that initial fecal coliform levels will be well above background levels. Stream velocity should average 0.2 feet per second at the minimum.

d) Fecal coliform levels in the undisinfected effluent, upstream (dilution) waters, and significant downstream tributaries and sources should be assessed for several days prior to conducting the k study. Extreme variability in these levels should be avoided if possible.

e) At least 5 downstream sampling stations must be established. The first station should be the closest point where it is likely that the effluent has completely mixed with the stream. Other sites should be selected with regard to location of downstream tributaries and fecal coliform sources and convenience of access, and should be representative of typical stream reaches. A typical example might include stations at 1, 3, 5, 10, 15 and 25 miles downstream of the source.

f) Stream discharge should be measured at each station. Information necessary to calculate travel time between sites must also be collected (this is typically done via the Manning equation, see Appendix D).

g) Samples should be collected during the daylight hours in one day if at all possible. Agency protocol for fecal coliform sampling requires that samples be iced immediately and transported to a laboratory for analysis within 6 hours.

h) Resources permitting, it is preferred that at least 2 warm weather and 2 cold weather studies be conducted. Values of k should be calculated using the die-off equation for each stream reach. An overall average for each study should also be computed.

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