

Water Quality Standard Guidance 3 Final	Sampling Methods for Documentation of a Public Health Nuisance Under OAC Rule 3745-1-04 (F) & (G)	
	Statutory reference: ORC Section 6117.34 Rule reference: OAC rule 3745-1-04 (F) & (G)	Ohio EPA, Division of Surface Water Revision 0, August 20, 1998
This internal guidance does not affect the requirements found in the referenced rule or statute.		

Introduction

Ohio law (section 6117.34 of the Ohio Revised Code) provides a mechanism for local jurisdictions to initiate complaints of unsanitary conditions and for the Director of Ohio EPA to issue orders to correct the problems. Bacterial counts are a primary means used to document unsanitary conditions in lakes, rivers and streams. Bacteriological standards are the safe levels of bacteria (fecal coliform and *E. coli*) associated with the recreational use designations (bathing waters, primary contact recreation and secondary contact recreation) of lakes, rivers and streams. The bacteriological standards are in Chapter 3745-1 of the Ohio Administrative Code (OAC). After a court case established that the bacteriological criteria associated with recreational uses do not apply to small streams or water bodies that are unlisted in the water quality standard rules the Agency adopted changes in OAC rule 3745-1-04. Using these standards and the sampling protocols in this guidance Ohio EPA and local health departments can investigate incidents of raw or poorly treated sewage in small streams, roadside ditches or similar water bodies that meet the definition of surface waters of the state [OAC rule 3745-1-02(B)(77)] and take appropriate actions to alleviate public health nuisances.

The following text (Section 1.0 through 1.6) was prepared by a team of Ohio EPA staff and will be added to the next revision of the Ohio EPA sampling methods manual.¹

Section 1.0 General Bacteria Sample Collection Procedures

Water samples for bacteria analysis are to be collected directly into a sterilized, glass or plastic bottle. Rubber gloves should be used for protection against skin contact with potentially contaminated water. Samples may be collected by hand according to the following procedure: The collection container is submerged carefully into the water to avoid contact with soil and surface debris. This is accomplished by holding the container near the base with one hand and removing the cap with the other hand. The container is quickly pushed into the water with the mouth of the collection container down. The mouth of the bottle is then tilted upward into the current and is allowed to fill. If there is no current, move the container through the water in a continuous and unbroken movement. If residual chlorine is suspected sterile containers from the manufacturer containing sodium thiosulfate should be used. The amount of sodium

¹ Cited in OAC rule 3745-1-03 as "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices" October 1988, or any subsequent revision; current citation of document is Ohio EPA, Division of Environmental Services. "Field Practices, Sampling Analysis and Biomonitoring" 1995.

thiosulfate used is 0.1 gm. of the crystal powder. If samples must be collected from a bridge, the sterilized bottle (without cap) may be secured to a string and lowered into the water. A weight may be needed to submerge the bottle. Bottles must be filled to between 2/3 and 3/4 full.

Special sampling considerations if intending to document a public health nuisance associated with raw or poorly treated sewage pursuant to OAC rule 3745-1-04(F) & (G). Samples must be conducted by, or under the supervision of, Ohio EPA or a sanitarian registered under Chapter 4736 of the Ohio Revised Code:

1.1 Sample Location

The bacteria sample shall be collected in “surface waters of the state” as defined in OAC rule 3745-1-02(B)(77), *and* where odor, plus color and/or other visual manifestations of raw or poorly treated sewage occur, as defined in Section 1.5. Bacteria samples also may be collected at a control location outside the influence of the sewage discharge to determine background levels of bacteria in the surface water being tested.

1.2 Sampling Time and Frequency

Bacteria samples may be collected year-round, but only when the surface water is at a flow that is representative of dry weather, “*baseflow*”, conditions as defined in Section 1.4. A minimum of two bacteria samples must be collected over a time period not to exceed thirty days. Bacteria samples may be collected at any time of the day at least two hours apart.

It is recommended, but not required, that at least two bacteria samples be collected on the same day within the thirty day period, because it is difficult to predict when *baseflow* conditions will change rapidly due to runoff from rainfall and/or snowmelt.

1.3 Preservation and Chain of Custody

The sample shall be cooled to 4 degrees Celsius and delivered to the laboratory for analysis within 6 hours. According to *Standard Methods*, 19th Ed. (1995), the time from sample collection to the time the laboratory begins analysis of the sample is 8 hours. Make arrangements with your laboratory if transport time will exceed 6 hours to ensure that the 8 hour ultimate holding time is not exceeded. A Chain of Custody form must be used for the transfer of samples to the testing laboratory in order to get samples into evidence in a legal proceeding.

1.4 Documentation of Baseflow or Dry-weather Flow

OAC rule 3745-1-04(G)(1) requires that bacteria samples be collected only when the flow and height of the surface water is not rapidly changing in response to rainfall or snow melt. This dry-weather flow condition is called *baseflow* and is defined as “water that sustains stream flow during rainless periods” (T. Dunne and L.B. Leopold, 1978, *Water in Environmental Planning*, W.H. Freeman and Company). *Baseflow* levels in a stream can change over time due to antecedent rainfall and saturated soil conditions.

Before collecting bacteria samples, document that the surface water being tested is at *baseflow*. For the purposes of OAC rule 3745-1-04(G)(1) a *baseflow* condition will be present *if and only if all three of the following field observations are met*: (1) the channel water stage is less than bankfull, and (2) muddy-brown turbidity from runoff of silt/clay is not present, and (3) there is no visual evidence of runoff from wet pavement or snow melt in the upstream vicinity of where the bacteria sample is collected.

For the purposes of OAC rule 3745-1-04(G)(1) the “stage” of the water is defined as the elevation of the water in the stream channel, and “bankfull flow” occurs when the channel is completely full and the stream stage is level with the floodplain (Dunne and Leopold, 1978). Observations on *baseflow* conditions may be recorded on the Public Health Nuisance Field Form provided in Section 1.6.1.

If available, USGS real-time flow hydrograph data and/or rainfall data from the National Weather Service or other local sources can be used to further document that baseflow conditions were present at the time of the sample. The Ohio River Valley Water Sanitation Commission (ORSANCO) uses a “dry-weather” rainfall criterion of 72 hours antecedent dry period, and a “wet-weather” criteria of 48 hour antecedent dry period plus at least 0.3 inches of precipitation in a six hour period. Measurements on stage height to the nearest (cm) may be taken to document that the flow did not change rapidly between the two required bacteria samples. These additional data are not required in order to document baseflow conditions at the time of sampling.

1.5 Documentation of Odor, Plus Color, and/or Other Visual Manifestations of Raw or Poorly Treated Sewage.

To document a public health nuisance under OAC rule 3745-1-04(F)(1) bacteria samples should be collected only when there is evidence of odor, plus color, and/or other visual manifestations of raw or poorly treated sewage. For purposes of meeting the requirements of this rule, the following explanations of odor, color, and other visual manifestations of raw or poorly treated sewage are provided as guidelines for staff to use in the field.

1.5.1 Odor: According to *Standards Methods*, 19th Ed. (1995) a fully acceptable system for characterizing odor has not been developed despite efforts over more than a century. Jain, et al. (1977, *Environmental Impact Analysis*, Van Nostrand Reinhold Company, pp. 195-200) state that the contaminant odor of *septic sewage* has a commonly accepted odor descriptor type known as “rotten egg”, which results from the high amount of organic matter and sulfide compounds present. In addition, failing sewage systems often have a unique septic odor that combines with the rotten egg smell. Health effects from odors include reducing appetite, producing nausea, causing headaches, and disturbance of sleep, breathing, and olfactory sensation (Jain, et al. 1977).

For each odor contaminant, a concentration can be defined for which there can be no human perception of the odor, generally known as the odor threshold. Odor intensity levels can be measured by the following scale following Jain, et al. (1977):

<u>Levels</u>	<u>Descriptors</u>
0	No odor
1	Odor threshold (very slight)
2	Slight odor
3	Moderate odor
4	Strong odor

An environment with no odor at all is considered to be an ideal air environment. The “odor threshold” represents a tolerable level, and a gradient of impairment of the air environment is found from the sequence of slight to moderate to strong odor levels.

A violation of OAC rule 3745-1-04(F)(1) will exist if *septic sewage* odors are found at levels greater than or equal to a slight odor level (level 2) as perceived by the investigator at the time of sampling. Observations on odor may be recorded on the Public Health Nuisance Field Form provided in Section 1.6.1.

1.5.2 Color: *Standard Methods*, 19th Edition, (1995) uses the term *apparent color* to mean the color of water that includes substances in solution and color due to suspended matter. Raw or poorly treated sewage contains a mixture of carbon based organic matter, sulfide compounds, oils and greases, and other compounds that may create a nuisance in surface waters. The colors imparted by raw or poorly treated sewage may range from white to black with various shades of grey within the spectrum. In addition to the imparted color a characteristic rainbow sheen may or may not be present as a result of oils refracting ambient light.

Brown-orange-yellow colored water would be expected in water that contained silts and/or clays, diatoms, humic and/or tannic acids, and/or elemental iron from acid mine drainage. Observations on the type of *apparent color* present in the surface water at the time of sampling may be recorded on the Public Health Nuisance Field Form provided in Section 1.6.1.

1.5.3. Other Visual Manifestations of Raw or Poorly Treated Sewage: OAC rule 3745-1-04(F)(1) indicates that a public nuisance may exist if visual manifestations of raw or poorly treated sewage other than color are also present in the surface water. OAC rule 3745-1-04 (A), (B), & (E) define other visual types of evidence of sewage as including: sewage sludge particles in the water, sewage sludge deposits in bottom sediments, floating oils and scums, and nuisance growths of aquatic weeds and algae from nutrient enrichment. A nuisance also may be caused by the growth of “sewage fungus”, which is defined as a slimy matrix of bacteria, fungi and protozoa associated with sewage. Bacteria including, among others, the *Sphaerotilus-Leptothrix* group, are associated with the “sewage fungus” matrix. These bacteria can form extensive cotton-wool-like plumes (white, grey, or brown) of filamentous mats in areas of organic pollution and are aesthetically undesirable (Curtis, E.J.C., 1969, *Sewage Fungus: Its Nature and Effects*, in *Water Research*, Vol. 3, pp. 289-311, Pergamon Press).
Observations

on visual manifestations of problems other than color may be recorded on the Public Health Nuisance Field Form provided in Section 1.6.1.

1.6. Public Health Nuisance Field Form. As a standard operating practice, Ohio EPA field personnel should utilize form 1.6.1 when collecting samples pursuant to OAC rule 3745-1-04(F)&(G). Local Health Departments and other sanitarians registered under ORC Chapter 4736 may use the form at their discretion because the form is not required by the rule.

Supplemental information:

Ohio Environmental Protection Agency, Division of Environmental Services. "Field Practices, Sampling Analysis and Biomonitoring" 1995.

Sampling Methods for Documentation of a Public Health Nuisance Under OAC Rule 3745-1-04 (F) & (G) - Comments on Previous Drafts of Sampling Methods Document:
Responses by R.D.Davic

For more information contact:

Ohio EPA, Division of Surface Water
Water Quality Standards group leader (614) 644-3075

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1.6.1 Public Health Nuisance Field Form, OAC rule 3745-1-04(F)&(G)

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 Name of Sample

 Latitude: _____ Longitude:

 County _____ Township

 Agency

I certify that bacteria samples were collected at times when the surface water being tested met the odor, plus color and/or other visual manifestation of raw or poorly treated sewage requirement of OAC rule 1-04(F)&(G).

 Printed Name of Sample Collector _____ Title _____

 Signature of Sample Collector _____ Date _____

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Bacteria Sample # _____
 Location of Sample _____

 Date of Sample _____
 Time of Sample _____ am _____
 pm _____

Bacteria Sample # _____
 Location of Sample _____

 Date of Sample _____
 Time of Sample _____ am _____
 pm _____

Baseflow Documentation:
 Stage less than bank full _____ yes _____ no
 Muddy-brown turbidity absent _____ yes _____ no
 Pavement/ snow melt runoff absent _____ yes _____ no

Baseflow Documentation:
 Stage less than bank full _____ yes _____ no
 Muddy-brown turbidity absent _____ yes _____ no
 Pavement/ snow melt runoff absent _____ yes _____ no

[All three baseflow conditions must be met (yes) before a bacteria sample can be collected]

Odor Documentation:
 _____ No odor, level (0)
 _____ Odor Threshold (very slight), level (1)
 _____ Slight Odor, level (2)
 _____ Moderate Odor, level (3)
 _____ Strong Odor, level (4)

Odor Documentation:
 _____ No odor, level (0)
 _____ Odor Threshold (very slight), level (1)
 _____ Slight Odor, level (2)
 _____ Moderate Odor, level (3)
 _____ Strong Odor, level (4)

[An odor level of 2 or greater must be met before a bacteria sample can be collected]

Visual Documentation: (check all that apply)
Color Documentation:
[non sewage colors] _____ clear, no color
 _____ brown-yellow-orange
 _____ muddy-brown
[sewage colors] _____ whitish
 _____ greyish
 _____ blackish
Other Visual Manifestations:
 _____ oily sheen
 _____ floating scums
 _____ suspended sludge
 _____ sludge deposits
 _____ aquatic plants
 _____ sewage fungus
 _____ algae
 _____ other*

Visual Documentation: (check all that apply)
Color Documentation:
[non sewage colors] _____ clear, no color
 _____ brown-yellow-orange
 _____ muddy-brown
[sewage colors] _____ whitish
 _____ greyish
 _____ blackish
Other Visual Manifestations:
 _____ oily sheen
 _____ floating scums
 _____ suspended sludge
 _____ sludge deposits
 _____ aquatic plants
 _____ sewage fungus
 _____ algae
 _____ other*

[At least one sewage color and/or other visual manifestation of sewage must be met before a bacteria sample can be collected. Check all of the above that are present at the time of sampling.]

***Field Notes:**