UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
GENERAL COUNSEL

MEMORANDUM

SUBJECT: Use of BOD_5 Carbonaceous Test Results to Determine Compliance with NPDES Permits Based on Secondary Treatment Requirements

FROM: James A. Rogers
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TO: John Brian Molloy
Director
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Acting Director
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Question

Your memorandum of February 4, 1980, requests advice respecting the availability of a BOD Carbonaceous test as a measure of compliance with secondary treatment requirements. This information would be used to instruct the regions as to whether permits intended to impose secondary treatment requirements may be issued, or secondary treatment effluents monitored and defended, on the basis of a carbonaceous BOD test.

Background

Under section 301(b)(1)(B) of the Clean Water Act, all publicly owned treatment works must achieve secondary treatment as defined by the Administrator under section 304(d). Section 304(d) requires the Administrator to publish information on the degree of effluent reduction attainable through the application of secondary treatment. Under section 304(g) (now 304(h)), the Administrator was required to promulgate guidelines establishing test procedures for the analysis of pollutants.

Pursuant to those sections, the Administrator promulgated secondary treatment information on August 17, 1973. See 40 CFR Part 133. The regulation defines minimum levels of effluent quality attainable by secondary treatment in terms of various parameters, including "Biochemical Oxygen Demand (five-day)." §133.102(a). The regulations further provide that sampling and test procedures must be in accord with the Administrator's guidelines under section 304(g). §133.104.

The Administrator promulgated initial 304(h) (formerly 304(g)) guidelines on October 16, 1973. See 40 CFR Part 136. Section 136.3 of the guidelines identifies approved test procedures and specifies that discharge parameter values must generally be determined by one of the standard analytical methods cited and described in Table I of the section. Table I as promulgated lists BOD_5 and specifies the Winkler (Azide modification) or electrode method.

The Administrator proposed amendments to the test procedures regulations on December 3, 1979. The amendments, if promulgated, would add an approved test procedure for "BOD_5 Carbonaceous." This potential addition raises the issue of whether this test procedure may be substituted for the previously established (and still effective) BOD_5 test procedures in establishing, monitoring and enforcing biochemical oxygen demand limitations in NPDES permits.

Answer

The BOD_5 carbonaceous test may not be used to establish, monitor or enforce BOD requirements in NPDES permits for publicly owned treatment works under the current secondary treatment regulations.

Discussion

For permits issued pursuant to the revised NPDES regulations, specification of monitoring requirements is determined pursuant to §122.20 of those regulations. (See 44 Fed. Reg. 32910, June 7, 1979.) Section 122.20(c)(4) provides that when a method approved under 40 CFR Part 136 was used in developing the applicable standard or limitation, the permit must specify the same method for monitoring by the permittee.

We presume that the BOD_5 tests published in Part 136 were the tests used in developing the Part 133 limitations. Therefore, the same method must be specified in any new secondary treatment permit. */

Where a permit was issued prior to the applicable date of revised §122.20(c)(4), the permittee's monitoring requirements are of course already established, and §122.20(c)(4) is not controlling. However, here also the proposed BOD_5 carbonaceous test procedure may not be substituted for existing permit requirements for monitoring BOD_5. For those permits, whether the proposed BOD_5 carbonaceous test procedure may be substituted for existing BOD_5 test procedures in connection with the secondary treatment requirements depends upon whether the proposed Part 136 test procedure measures the same parameter as is limited in the permit pursuant to Part 133. Is the Part 133 BOD_5 parameter the same parameter as that which is measured by the proposed Part 136 BOD_5 carbonaceous test procedure?

This is a technical, not a legal, question, but it controls the legal result. Our understanding is that BOD_5 and BOD_5 carbonaceous are distinct parameters. Therefore, the BOD_5 carbonaceous test procedure cannot be used under an existing permit to measure a municipal treatment plant's compliance with the secondary treatment BOD_5 requirement expressed in Part 133.

Biochemical oxygen demand (BOD) is explained in the statement of EPA's proposed BOD carbonaceous test procedure, Appendix V to the Preamble to the proposed Part 136 amendments, 44 Fed. Reg. 69464 at 69564 (Dec. 3, 1979), as follows:

> The biochemical oxygen demand (BOD) determination is an empirical test in which standardized laboratory procedures are used to determine the relative oxygen requirements of wastewaters, effluent, and polluted waters. The test measures the

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*/ The secondary treatment regulations were promulgated two months earlier than the Part 136 regulations. (Part 133 was promulgated August 17, 1973; Part 136 was initially promulgated October 16, 1973.) The operative facts, however, are that the test method be used for developing the standard and that the method be approved under Part 136. It is not relevant, for purpose of the §122.20(c)(4) requirements, that the approval in Part 136 occurred after use of the method in developing the limitation.

> oxygen required for the biochemical degradation of organic material (carbonaceous demand) and the oxygen used to oxidize inorganic material such as sulfides and ferrous iron. It also may measure the oxygen used to oxidize reduced forms of nitrogen (nitrogenous demand) unless oxidation of nitrogenous compounds is prevented by an inhibitor.

As the quoted statement indicates, a wastewater's oxygen demand may consist of distinct components, a carbonaceous demand component and a nitrogenous demand component. The carbonaceous BOD test inhibits the nitrogenous component and measures only the remaining, carbonaceous portion of the total BOD of the effluent. Thus, it is clearly a distinct measure of effluent quality. Since Part 133 specifies BOD without qualification, the more limited carbonaceous test cannot, consistently with the regulation, be substituted for the BOD test which may measure both components.

We are aware that insistence on the use of the conventional BOD methodologies has been called "legalistic" and unresponsive to the realities of BOD testing. Proponents of the use of the carbonaceous BOD test point out that when untreated domestic wastewater or industrial wastes are tested, the microorganisms responsible for nitrification grow slowly, so that nitrification usually does not occur until five or more days after the start of a BOD test. "This apparently is one of the major reasons why 5 days was set as the standard incubation time in BOD tests." Young, "Chemical methods for nitrification control," 34 Journal WPCF 637 at 638 (1973); see also Metcalf & Eddy, Inc., Wastewater Engineering, Collection, Treatment & Disposal, McGraw-Hill, Inc., 1972, at 245, stating that it normally takes from 6 to 10 days for the nitrifying bacteria to reach significant numbers and to exert a measurable oxygen demand.

In contrast, in effluent from biological treatment units nitrifying organisms exist in sufficient numbers that nitrification proceeds more rapidly in the BOD test and can account for a major part of the measured 5-day BOD. See Young, supra, at 638. Hence, the argument goes that the traditional five day BOD test measured only the carbonaceous BOD but in the partially nitrified effluent from a modern plant the test also measures nitrogenous BOD, with the result that compliance with the guidelines and permit BOD requirements requires greater BOD removals than intended by the drafters of the original requirement.

We have been shown nothing in the record of the secondary treatment guidelines to indicate that the BOD requirement of the regulations was meant to be limited to the carbonaceous component. The preamble to the proposal of secondary treatment information states that the level of effluent quality is based on a sampling of performance data for well designed and operated secondary treatment works. See 39 Fed. Reg. 10642, 1973. Those samples may also have involved partial nitrification, yet the traditional BOD methods were presumably used to test them. Since the data base for the secondary treatment requirements was developed with the conventional BOD test, a departure from that test to measure BOD compliance would be an unauthorized departure from the BOD requirement itself. That requirement may only be changed by amending the Part 133 regulation which establishes the requirement.

Portions of the preamble to the proposed Part 136 revisions suggest that the carbonaceous BOD test should be employed for permit writing and monitoring. See, e.g., 44 Fed. Reg. 69464 and 69564. If the carbonaceous BOD test procedure is included in final regulations revising Part 136, the preamble to the promulgation should clarify the status of the test procedure.

Nitrification can impact the oxygen resources of a receiving water body. Therefore, it is appropriate to recognize nitrogenous oxygen demand as part of the total oxygen demand of the waste. On their face, the Administrator's secondary treatment regulations recognize the total oxygen demand of municipal treatment plant effluents. Use of the carbonaceous BOD test, which measures a distinct, more limited parameter, in connection with the Part 133 regulations is not authorized.

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