

ILLINOIS POLLUTION CONTROL BOARD
August 8, 1972

City of LaHarpe)	
)	
v.)	PCB 72-168
)	
Environmental Protection Agency)	
City of Carbondale)	
)	
v.)	PCB 72-203
)	
Environmental Protection Agency)	
City of Marion)	
)	
v.)	PCB 72-225
)	
Environmental Protection Agency)	

Opinion and Order of the Board (by Mr. Dumelle)

The three applications embrace a common topic and ask a variance from the water quality standards to permit the use of copper sulfate in their drinking water reservoirs to prevent algae nuisances.

The Agency has recommended a grant subject to certain conditions and we concur for reasons given later.

City of LaHarpe

The City of LaHarpe in Hancock County has a population of 1,240. The petition for variance was received by the Board on April 21, 1972 and a hearing held in LaHarpe on July 14, 1972. The reservoir is 10 acres in area, has an average depth of 15 feet and a capacity of 45 million gallons. The Agency report by Ronald W. Jahns indicates that copper sulfate treatment at this reservoir has been practiced since at least 1949.

The Agency report, which was stipulated to by the City of LaHarpe, cites excessive algae growth two years ago with clogging of the filter bed, improper settling in the clarifier and numerous complaints of taste and odor from users of the City's water. Dosages of 300 to 600 pounds of copper sulfate applied

in the usual way of towing the crystals in a sack behind a motor boat have stopped the problem.

It is further stipulated that no fish kills have been caused by the copper sulfate treatment and that the reservoir is well stocked with fish. The concentrations of copper resulting from the treatment are given as 0.3 mg/l for 300 lbs. of chemical used and 0.6 mg/l for 600 lbs.

City of Carbondale

The City of Carbondale, population 22,816, is in Jackson County. The variance petition was received May 11, 1972. No hearing has been held. The reservoir is 144 acres in area with an original average depth of 9.6 feet. Original capacity was 350 million gallons which the Agency states is now 330 million gallons. The City of Carbondale, in its petition, states that excessive algae growth produce taste and odor problems in the water supply.

Use of copper sulfate in the reservoir, which is used as water supply intermittently when Crab Orchard Lake is low, has been 4,900 lbs. in 1969, 4,700 lbs. in 1970 and 5,100 lbs. in 1971. The statement is made that no fish kills have occurred in these three years.

The Agency recommend applications of 1,700 lbs. per treatment and states that the copper levels will not exceed 0.165 mg/l.

City of Marion

The City of Marion, population 11,724, is in Williamson County. The variance petition was received by the Board on June 2, 1972. A public hearing was held on July 27, 1972 in Marion. The variance is requested for the large reservoir about four miles south of Marion which is stated to have a capacity of 482 million gallons. No area or average depth is given.

Mr. Russell Fisher, chief operator of the Marion water plant testified that copper sulfate had been applied for the past six years to his knowledge to this reservoir. Commissioner Paul Joyner in his petition for the variance discusses an algae bloom condition in April of this year which caused the drinking water to be "unfit to drink" because of taste and odor problems. He also stated that some \$2,500 in activated carbon had to be used to treat the water that month. In his testimony on this point he stated that copper sulfate would have been lower in cost had Carbondale been able to use it. No ill effects on aquatic life because of copper sulfate treatment are known to Mr. Joyner or Mr. Fisher.

The Agency recommends up to 4,000 lbs. of copper sulfate per treatment every six weeks and states that concentrations will not exceed 0.3 mg/l as copper.

Discussion

The Agency recommendations in these three cases are virtually identical. A grant of the variance is recommended and dosage limits are specified. We concur in the grant but do so reluctantly because of what appears to be an incomplete discussion by the Agency or by the various cities of alternative methods of treatment or of possible harm. However, the algae bloom "season" is now almost over and no discernible harm from using copper sulfate appears in these records. Ample time remains before next summer for both the Agency and all Illinois water supply users to prepare fuller discussions on both alternative methods and possible harm from the present practice.

The Agency recommendations state flatly that the "only alternative to use of copper sulfate for algae treatment is chlorine." In the Marion hearing, Mr. Dennis Stover, representing the Agency, affirmed this opinion. Yet a highly respected sanitary engineering text, Water Purification and Wastewater Treatment Vol. 2 by Fair, Geyer and Okun (1968) lists three other methods for algae control. These three methods are (1) spreading of activated carbon on the reservoir surface to shut out sunlight (2) dosing with lime in amounts sufficient to produce caustic alkalinity to deprive the algae of needed carbon dioxide and (3) use of viruses selective to algae, (33-41 to 33-47).

Two other references provide information on possible additional alternatives. A paper by Symons, Weibel and Robeck in Water Quality Behavior in Reservoirs by the U.S. Department of Health, Education and Welfare (1969) mentions the possibility that algal toxins may have inhibited algae blooms on the Ohio River (p. 19). An article by Howard in Reclamation Era (February 1972) (p. 6-7) describes how air injection into Casitas Lake near Ventura, California brought cooler water to the surface and thus inhibited algae growth. The annual costs for copper sulphate and citric acid treatment of the reservoir were \$20,000 and dropped to \$12,000 for air injection (exclusive of capital charges).

It is possible that none of the alternatives listed above are suitable for application in the instant cases. But nothing in the records of these cases showed that they were considered by any of the parties.

The record is not clear on whether these reservoirs are "flow-through" impoundments. If these reservoirs feed streams below them, then the high copper concentrations proposed (0.6 mg/l) may destroy some forms of aquatic life. McKee and Wolfe in their authoritative work, Water Quality Criteria, report "... concentrations (of copper) of 0.015 to 3.0 mg/l have been reported as toxic, particularly in soft water, to many kinds of fish, crustacea, mollusks, insects, phytoplankton, and zooplankton" (p. 171). Clearly a biological survey is indicated in the streams below these reservoirs, if any such streams exist, to determine which may have occurred in the past from the use of copper sulfate.

Lastly no data are presented by any of the parties as to the possibility of limiting these algae blooms by limiting a critical nutrient, such as phosphorus. In adopting the revised Water Quality Standards (R71-14) on March 7, 1972 we set a phosphorus limit for reservoirs and lakes at 0.05 mg/l to prevent just such obnoxious blooms. The Agency should investigate phosphorus concentrations in the instant reservoir waters and take action to reduce controllable upstream phosphorus inputs under its powers to abate water quality standards violations if such are found to exist. The Federal Environmental Protection Agency in its letter of July 10, 1972 (entered into the City of Marion record) makes the point that nutrient removal upstream may well be a superior alternate method of eliminating algae blooms. We ought not to pollute and then be forced to poison to eliminate the effects of the pollution. And the fact that the Agency requests in its recommendations data on copper levels in each reservoir before and after copper sulfate treatment leads us to believe that data of this type are lacking. Perhaps what is needed is a research study by the Institute for Environmental Quality which the Agency might well request.

In recent months we have found that old practices are not necessarily environmentally sound practices. Metallic mercury discharged in effluents is converted in sediments by bacteria to the highly toxic methyl mercury which is then concentrated into fish flesh. Copper sulfate usage may have some environmental consequences which are undesirable and about which we know little on the basis of these records.

Fair, Geyer and Okun sum up the case against chemical treatment succinctly:

There is a growing awareness of the dangers of indiscriminate and largescale use of chemicals for the destruction of specific populations of living things. It is generally true that dislocations of biological equilibria should be avoided where possible. Useful or otherwise wanted members of normal plant and animal communities should not be killed. Relief from nuisance growths or otherwise runaway proliferation of unwanted organisms should not be obtained at that price. Thinking has turned more and more to the promotion of biological self-regulating mechanisms that will right the imbalance and not create a new imbalance -- in abnormal ecological systems. The introduction of specific parasites that keep unwanted components of the plant or animal community in check is one example. Breaking the food chain or otherwise modifying the existing environment to the disadvantage of the organisms to be controlled is another. Biological control, in

comparison with chemical destruction, is more likely to be a reversible or an incomplete reaction. Equilibrium is reestablished of its own accord. Damage does not become irrevocable. An important example is interference with the biological destruction of bottom deposits when lakes and impoundages are treated with copper salts. (p. 33-37)


This opinion constitutes the Board's findings of fact and conclusions of law.

ORDER

Variations are granted to the cities of Marion, Carbondale and LaHarpe to exceed the water quality standard of 0.02 mg/l in their water supply reservoirs by treating with copper sulfate to prevent algae blooms subject to the following conditions:

- 1) Dosage shall be limited as follows:
 - a) For Marion, to one treatment every six weeks until November 30, 1972 not to exceed 4,000 lbs. of copper sulfate per treatment.
 - b) For Carbondale, to one treatment during August 1972 not to exceed 1,700 lbs. of copper sulfate.
 - c) For LaHarpe, to one treatment per month for the months of August through November, 1972 not to exceed 600 lbs. of copper sulfate per treatment.
- 2) Copper concentrations at the raw water intake to the water treatment plant shall never exceed 1.0 mg/l.
- 3) Copper concentration in the reservoir shall be measured immediately before and after each copper sulfate treatment and the results submitted to the Agency on a monthly basis.

I, Christian L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Opinion and Order were adopted by the Board on 5th day of August, 1972 by a vote of 5-0.



Christian L. Moffett, Clerk
Illinois Pollution Control Board