ILLINOIS POLLUTION CONTROL BOARD
November 18, 1983

In the matter of:	)	
	)	
JOHN DEERE THERMAL DISCHARGE (EAST MOLINE)	)	R81-26
	)	

FINAL ORDER. ADOPTED RULE

FINAL OPINION OF THE BOARD (by D. Anderson):

On October 19, 1981 John Deere Foundry, Deere & Company (Deere), a Delaware corporation, filed a petition to amend the water quality standards to set a site-specific temperature rule for its discharges to Sugar Creek, a direct tributary of the Mississippi River in Rock Island County. The proposal was amended to conform to codification requirements on November 13, 1981. A second amended proposal was filed on July 23, 1982, adding site-specific proposals for total dissolved solids (TDS) and iron (total).

The Board conducted a merit hearing on August 24, 1982 at Rock Island and the proposal was again amended on that same day (R. 125). An economic impact study (EcIS) was prepared by the Department of Energy and Natural Resources (DENR) (Ex. 21 and 22). An economic impact hearing was conducted February 28, 1983, again at Rock Island.

The Hearing Officer set a comment period following the final hearing (R. 160). On March 10, 1983 Deere filed a comment which suggested alternative language. On March 21, 1983 the Illinois Environmental Protection Agency (Agency) suggested alternative language amending the effluent standards of 35 Ill. Adm. Code 304, rather than the water quality standards of 35 Ill. Adm. Code 302 and 303. On April 8, 1983 Deere indicated that it had no objection to the Agency's suggested language.

On May 5, 1983 the Board entered a proposed rule, first notice Order which proposed to adopt 35 Ill. Adm. Code 304.205. The text of the proposal appeared at 7 Ill. Reg. 6697, May 27, 1983. The Board received comments only from the Administrative Code Unit concerning codification requirements.

On July 26, 1983 the Board entered a second notice Order. The Joint Committee on Administrative Rules (JCAR) considered the rules at its September 22, 1983 meeting. No objection issued.

On October 6, 1983 the Board adopted the May 5 proposal without change. Section 304.205 was filed and became effective on October 14, 1983. It appeared at 7 Ill. Reg. 14515, October 28, 1983.

In a related matter, on October 5, 1982 the Board granted Deere a variance from the water quality standards for TDS, iron and temperature pending the outcome of this rulemaking (PCB 81-163, 49 PCB 21).

The facility in question is a nodular iron foundry, with a potential output of 150,000 tons per year. It employs about 1,000 persons and is located northwest of Silvis, on a 145-acre tract bordered by the former Rock Island Railroad and State Highway 84. It is about 1.25 miles southeast of the Mississippi River (R. 8, 19, 36, 41).

The foundry draws process and noncontact cooling water from two private wells into the Jordan aquifer. It draws up to 1500 gallons per minute from the wells, and up to 100 gallons per minute process water from the City (R. 9). It discharges, pursuant to NPDES permit IL 0002992, via three outfalls to two unnamed tributaries of Sugar Creek, a direct tributary of the Mississippi River. The discharge is about 1.9 million gallons per day (MGD) dry weather flow (R. 9, Ex. 22).

The plant has three discharges, as follows (R. 18, Ex. 2):

001 Stormwater and cooling water from air conditioner (R. 9, 13, 23, 58).

002 Discharge from API oil skimmer, which receives process water, primarily from floor drains, cooling water, cooling tower blowdown and emergency induction furnace cooling water (R. 9, 13, 18, 20, 32, 58, 109, 112, 115).

003 Discharge from clarifier which also receives cooling water (R. 9, 22, 32, 58, 109, 112, 115).

003 is passed through a lagoon before final discharge. Deere has committed itself to transfer of the thermal component of 002 to 003 before December of 1984 (R. 109, 112, 115).

The plant discharges to tributaries of Sugar Creek, which is a direct tributary of the Mississippi River with a 6.1 square mile watershed. The Creek flows in a westerly direction from the plant about one mile before joining the Mississippi. This lower reach is diked and is often more of an arm of the Mississippi than a flowing stream. 001 and 002 flow north through a ditch to an underground culvert along 19th Street into the diked portion; 003 flows through a lagoon to a ditch running east along 8th Avenue before turning north to meet Sugar Creek above the diked portion (Ex. 2).

The drainage has been greatly altered by urbanization and agriculture, as well as flood control (R. 41, 64, 84, 130, Ex. 1, 22). Under low flow conditions the Deere discharge is the entire flow of the tributary ditches, and most of the flow of the main stream (Ex. 1, p. 11, Ex. 22, p. 15).

This site-specific regulation arises out of a fish kill on January 21, 1975, which was initially attributed to thermal shock. Subsequent investigations indicated that the kill was likely due to natural causes (R. 10).

Regulations Involved

The following regulations are involved in this rulemaking:

35 Ill. Adm. Code	Description
302.208	Water quality standard of 1.0 mg/l for iron (total)
302.208	Water quality standard of 1000 mg/l for TDS
302.211(d)	Maximum temperature rise of 5F° above natural temperature
302.211(e)	General use water quality temperature standard of 60° F winter, 90° F summer
303.331	Temperature standards for Mississippi River (North) main stem
304.105	Requirement that effluents not cause violation of water quality standards
304.124	Effluent standard of 2.0 mg/l iron (total)
304.205	John Deere site specific Section

TDS

The primary source of TDS is the background in Deere's well water. This ranges from 1700 to 1900 mg/l (R. 29, 36, 55). TDS is also concentrated in cooling tower blowdown (R. 46). The discharge meets the 500 mg/l water quality standards for chloride and sulfate (R. 67). Deere ultimately concluded that it could guarantee levels below 2200 mg/l TDS (R. 107, 111).

The Board has previously concluded that the treatment technologies available for TDS are expensive, consume a lot of energy and result in concentrated brines still requiring ultimate disposal (R76-21, Opinion of September 24, 1981, 43 PCB 367, 6 Ill. Reg. 563). The effluent standard was repealed, leaving TDS to be regulated only through the water quality standards for TDS, chloride and sulfate.

Iron

Deere's discharge is generally below the 2.0 mg/l effluent standard for total iron, and often below the 1.0 mg/l water quality standard (R. 38, 56, 67, Ex. 5, 22). However, background levels often exceed the water quality standards, with concentrations ranging up to 4 mg/l (Ex. 8, R. 67). Such elevated iron levels are common in northwestern Illinois (Ex. 6, 7). With elevated levels in the receiving stream, there is no possibility of dilution to meet the water quality standards. The proposal to modify the iron standard is a recognition of natural conditions.

Temperature

The original and most important aspect of the proposal involves the thermal component of the discharge. Many processes contribute to elevation of the effluent temperature. Among these are air conditioner cooling, cooling tower blowdown, compressor cooling, transformer cooling and intermittent induction furnace cooling (Ex. 2, R. 20). As noted above, all of the discharges are heated somewhat, but Deere has committed itself to route the thermal discharges to 003, which discharges through a lagoon system.

The discharges do not often cause violation of the general use water quality standards of 60° F in the winter and 90° F in the summer; however, they often raise the temperature more than 5F° above the natural background (Ex. 1 and 2). The rerouting to 003 should lessen the frequency of these violations, but will not eliminate them. The thermal violations are most extreme in the ditches; there is little likelihood of violations in the diked area of Sugar Creek and none in the Mississippi (Ex. 22, p. 21).

The economic impact study evaluated seven options to avoid thermal violations (R. 19, 27, 32, 53, 55, 60, 128, 131, Ex. 22, p. 56):

1. Deep well injection.

2. Direct discharge of 002 and 003 to the Mississippi via a new pressure sewer.

3. Direct discharge via an existing water main.

4. Total recycle of discharges 002 and 003.

5. Brine chiller with direct discharge of 002 and 003 to Sugar Creek.

6. Direct discharge to Sugar Creek.

7. Reroute 003 to 19th Street culvert.

Deep well injection was rejected as unfeasible because chemicals added to cooling water would bring the wells under the Underground Injection Control permit system (40 CFR 122 and 146; 35 Ill. Adm. Code 704 and 730).

It was uncertain whether options 6 and 7 would guarantee compliance with the standards. It was also uncertain whether option 3 was feasible because the condition of the existing water main was uncertain.

The least expensive option evaluated would cost $1.7 million, to build a new 10-inch sewer some 9,000 feet to the Mississippi. Options 5 and 4 would cost $10.1 and $16.5 million, respectively.

Environmental Impact

Historically Sugar Creek drained a rolling hardwood forest and a swamp. It now drains agricultural land and a city. In both, the drainage has been improved to promote faster drainage. The lower reaches of the stream have been channellized and diked for flood control. Species diversity is limited by habitat availability rather than the chemical and physical properties of the water (R. 64, Ex. 2, 22). If the existing discharge flow were routed from the tributaries, species diversity would be reduced because there would be an inadequate flow of relatively clean water (R. 68, 129). Pools of stagnant water would become a breeding ground for biting insects (R. 139).

With respect to iron, the proposal just recognizes that the natural background exceeds the general use water quality standard.

With respect to TDS, the Agency introduced a study: "Acute Toxicity of Chlorides, Sulfates, and Total Dissolved Solids to Some Fishes in Illinois", by Paula Reed and Ralph Evans of the Illinois State Water Survey (Ex. 14). This study indicates that 96-hour median tolerance limits for TDS are around 11,000 to 17,500 mg/l for Illinois fish exposed to TDS in water with a composition similar to that found in Illinois. The maximum level allowed under the proposal

would be 2200 mg/l discharged under zero flow conditions. This would be 13 to 20% of the 96-hour media tolerance, greater than the 10% required by Section 302.210, but providing an adequate margin of safety for this non-toxic parameter under the conditions of this discharge.

With respect to the thermal discharge, temperatures sometimes exceed the 90° F summer maximum, as well as the 5F° over ambient limitation. It is reasonable to expect high discharge temperatures to coincide with low flow conditions at times when fish are already under stress from high temperatures and low dissolved oxygen. However, if the discharge were moved or eliminated, the reduction in discharge flow would certainly produce lethal conditions during times of low stream flow. The option of chilling the discharge would cost far more than any conceivable benefit to the stream, which is habitat limited anyway. Furthermore, the brine chiller would be difficult to control to avoid bringing the stream to a temperature lower than 5F° under ambient temperatures.

As noted previously, Deere has committed itself to move the thermal component of 002 to 003 and the lagoon so as to damp out swings in temperature, thus avoiding possible problems with thermal shock.

The Board has therefore adopted Section 304.205, granting Deere the site specific regulation requested. The text is that suggested by the Agency on March 21, 1983 with minor changes.

Deere had originally requested a modified water quality standard. The Agency suggested that the Board set an effluent standard of 98° F and exempt Deere from the water quality standards for temperature, TDS and iron (total). The exemption from the TDS standard was to have been conditioned on a discharge TDS level of 2200 mg/l.

As adopted, Section 304.205 instead sets effluent standards for both temperature and TDS, and exempts the discharge from the water quality standards for temperature, TDS and iron, conditioned on compliance with the site-specific effluent limitations. This makes the TDS standard directly enforceable without proof of a water quality violation. The water quality standards could also be enforced if there were a violation of the site-specific effluent standards.

This Opinion supports the Board's Final Order, Adopted Rule of October 6, 1983.

Board Members B. Forcade and J. Marlin abstained.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion was adopted on the 18th day of November, 1983 by a vote of 5-0.

Christan L. Moffett

Christan L. Moffett, Clerk
Illinois Pollution Control Board