ILLINOIS POLLUTION CONTROL BOARD
August 21, 1980

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY,	)	
Petitioner,	)	
v.	)	PCB 78-271
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

MR. THOMAS L. COCHRAN, SORLING, NORTHRUP, HANNA, CULLEN & COCHRAN, APPEARED ON BEHALF OF PETITIONER.

MR. REID NEUMAN, ASSISTANT ATTORNEY GENERAL, APPEARED ON BEHALF OF RESPONDENT.

OPINION AND ORDER OF THE BOARD (by I. Goodman):

This matter is before the Board upon a petition filed March 3, 1976 and deemed appropriate for hearing pursuant to Rule 203(i)(10) of Chapter 3: Water Pollution Regulations. Rule 203(i)(10) provides for Board determination of specific thermal water quality standards applicable to artificial cooling lakes upon satisfactory demonstrations[1] that the lakes will be environmentally acceptable. Hearings were held in this matter on December 1, 1976, January 17, 1977, February 22, 1977, October 16, 1977, and July 17, 1979.

The subject of this petition is Newton Lake, an artificial cooling lake for Central Illinois Public Service Company's (CIPS) Newton power station which is currently under construction in Jasper County. The lake was formed by the construction of an earthen dam across Weather Creek, which is 1,300 feet downstream from the confluence of Laws Creek and Sandy Creek (R.12).

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[1] The procedure under Rule 203(i)(10) had been simplified by an amendment to subsection (cc) subsequent to the filing of the petition in this case. (See R77-7, adopted on June 28, 1977.) In light of the amendment the Board substituted this new adjudicatory proceeding for Petitioner's prior regulatory proceeding, R76-6, although information from the economic impact study and economic impact hearing was considered by the Board along with the other evidence in the record. (Reference to the record refers to the record in R76-6).

The lake is required to assimilate the waste heat rejected from two, 617-MW steam turbine-driven generators, which amounts to 3.36 x 10^9 Btu/hr. (R.14). Cooling water withdrawn from the intake arm of Laws Creek is applied to the condensers by up to four circulating water pumps. The water is heated approximately 22°F at 100% load and discharged at the Sandy Creek arm through an open flume 7,500 feet in length (R.12, Thermal Demonstration, pp.1-3). The lake then operates as a cooling loop, with water circulating in a counter-clockwise direction during a cycle length of 11 days (R.13, Thermal Demonstration, pp.1-3). (This process is illustrated in Figure 1-3.) The total surface area of the lake is 1,755 acres (R.12), of which 1,408 are utilized in the cooling loop (R.95).

In its petition, CIPS requests that the Board set thermal water quality standards for Newton Lake which would allow a monthly average temperature of 102°F at the outside edge of the mixing zone and a maximum overall temperature of 111°F (R.13).

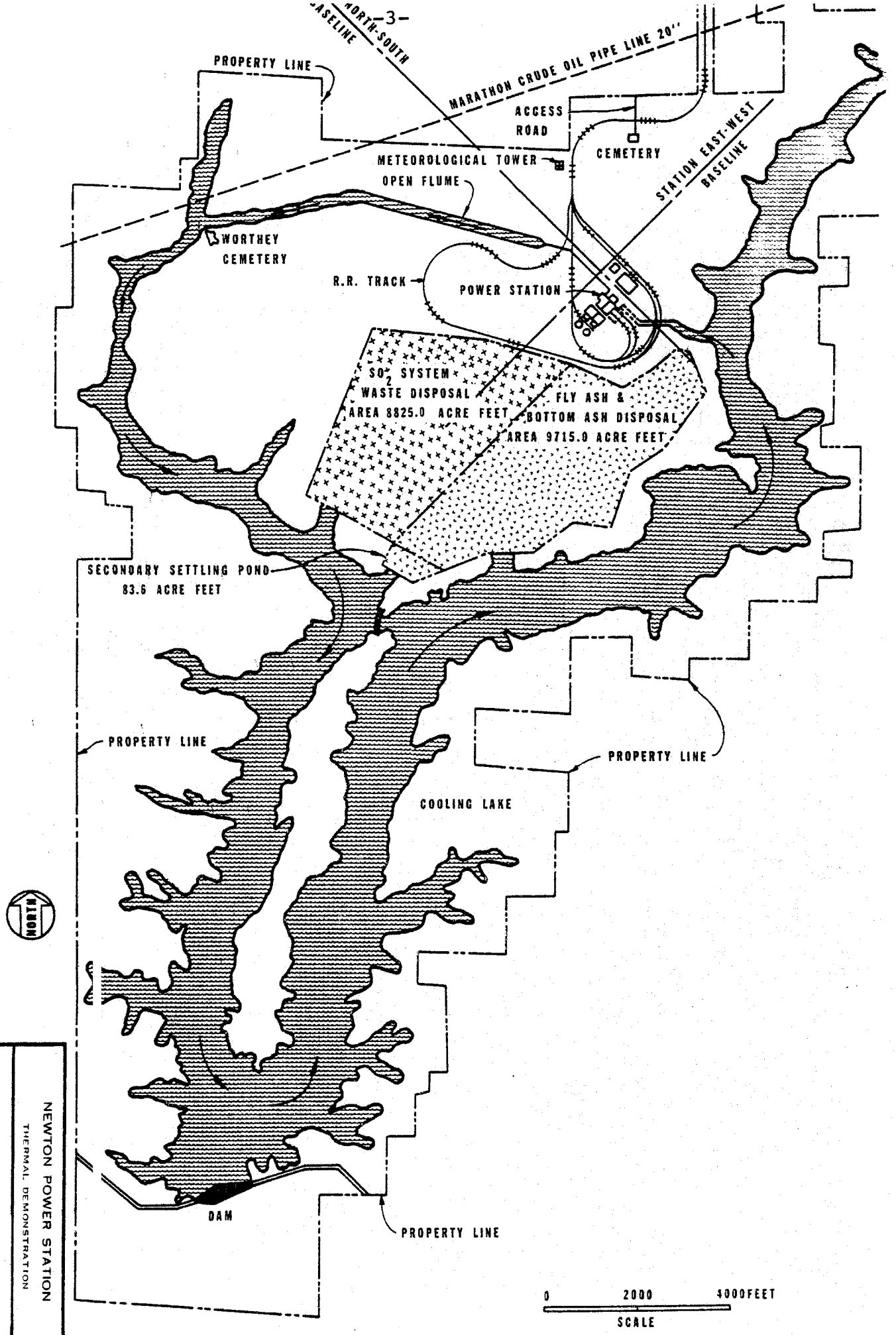
An economic impact study prepared for the Illinois Institute of Natural Resources by William J. Stanley & Associates, Inc. and a Thermal Demonstration prepared by the engineering firm of Sargent and Lundy are part of this record. Much of the Thermal Demonstration is speculative in nature because filling Newton Lake did not begin until the Summer of 1975 (Thermal Demonstration, p.1-2). The effect on Newton Lake of the thermal discharge was predicted in the demonstration by means of a computer simulation model "LAKET" (R.14). Data derived from other reservoirs, particularly Lake Sangchris, were used in conjunction with this model to predict the ecological effects in the lake (R.31).

At the July 17, 1979 hearing, CIPS presented a "Final Report on Preoperational Monitoring" (Ex.29) and "A Postoperational Survey of Selected Limnological Parameters in Newton Reservoir for the Newton Power Plant" (Ex.30). These exhibits updated some of the information contained in the Thermal Demonstration and included the use of actual instead of predicted measurements of selected parameters.

The required showing of environmental acceptability under Rule 203(i)(10)(cc) includes a demonstration of "provision of conditions capable of supporting shellfish, fish and wildlife, and recreational uses consistent with good management practices ..." (emphasis added). The Board notes that this does not require the actual presence of either recreational activity or a fishery. (See Central Illinois Public Service Company v. EPA, PCB 77-158 (April 27, 1978); see, generally, R75-2 (September 29, 1975).)

The major questions to consider regarding fish population capability are:

1. To what extent will the cooling lake water discharge create thermal stress conditions for fish and/or organisms in their food chain?



NEWTON POWER STATION
THERMAL DEMONSTRATION

FIGURE 1-3
PLOT PLAN OF NEWTON SITE SHOWING LAYOUT OF PLANT FACILITIES AND CIRCULATION PATTERN OF COOLING LAKE

2. Can the populations of such organisms remain viable despite the occurrence of these conditions?

The computer simulation, based on an analysis of meteorological data over the last 20 years, indicates that 75-100% of the effective cooling loop area may exceed 90°F during late July and August (Thermal Demonstration, pp. 5-6; Table 4-3 at pp.4-7). In addition, it shows that under "worst case conditions" the entire effective cooling loop area could reach 95°F or more for 9 consecutive days (R.42), which is likely to cause thermal stress (R.45). Moreover, populations of nonmobile organisms may suffer high mortality rates but would be expected to recover rapidly given naturally high productive rates (R.45). However, fish and other mobile organisms will tend to avoid such potentially lethal temperatures by seeking refuge in the unaffected area of the lake above the intake point or in the deeper, cooler water (R.45).

The success of the deep water as a refuge from thermal stress is critical because its availability would be jeopardized during "worst case" drought periods (R.104). The existence of deep, cool water unaffected by thermal discharge or extreme meteorological conditions depends on the occurrence of thermal stratification, or distinct layers created and maintained by temperature-density relationships, although this is normal for lakes in the summertime (R.150). The evidence indicates that such stratification is likely to occur in Newton Lake (R.379,462,464) and provide a "range of temperatures for aquatic organisms" (R.160). Indeed, the results of the thermal study conducted during the Summer of 1978 with only Unit One fully loaded indicates that the stratification is in fact occurring in the lake, even though the stratification would be less apparent at the test stations under the partial loading. The thermal study data further indicate that the majority of the cooling has been accomplished at the mid-point of the loop, with temperatures at other points tending to stabilize both horizontally and vertically. (Ex. 35-2.)

Another issue is whether there would be sufficient dissolved oxygen in the deep water refuge areas to allow fish to survive there, albeit temporarily. Despite the increased solubility of oxygen in cooler water, severe oxygen depletion at the bottom of a lake is common during the summer months (R.161-63). This oxygen depletion is caused by bacterial decomposition of organic material at a time when normal thermal stratification prevents replenishment of oxygen to the hypolimnion (R.161-63). Mr. Gary Milburn, expert witness for the Agency, contended that a low level of dissolved oxygen would be hazardous to fish already weakened by thermal stress (R.335). Witness Milburn's contention is based on recommendations of dissolved oxygen levels contained in the "Water Quality Criteria 1972" report of the National Academy of Sciences. Mr. James King, expert witness for CIPS, while admitting that fish might avoid the deep water due to low levels of dissolved oxygen (R.53), contended that the deep water would still be an effective temporary refuge from the thermal stress conditions (R.53). Mr. James Burkett, expert witness for

CIPS, offered the same opinion, based on experience with other reservoirs (R.472).

The Board notes that the deep water refuge area will be required only under extreme and unusual conditions and then only temporarily. The Board is aware of the need to protect our resources against improbable but catastrophic occurrences. (See R.337-38.) However, the potential for depletion of dissolved oxygen at the bottom of Newton Lake does not appear to be a problem of large magnitude. The fact that the lower depths of the lake may be unsuitable for long term fish habitation does not mean that a catastrophe results when fish, driven from the epilimnion by once-in-20-year worst case conditions, seek temporary refuge in the deeper water.

The Summer of 1978 thermal study measured dissolved oxygen concentrations at various depths along the cooling path. The results indicate a severe oxygen depletion in those areas of the lake's cooling loop which sustain severe temperature stratification, which appear to be located within the first third of the cooling loop. Beyond these areas, the dissolved oxygen level recovers down through a depth of approximately 5 meters. (Ex. 35-2.) Evidence presented by CIPS at the final hearing concerning a post-operational study made in October, 1978 after one year of single-unit operation, indicates that fish have survived the power station's thermal input in good condition, and that changes in populations had occurred not only as a result of changing from a stream-type to a lake-type environment, but prior to Unit One's even going on line and discharging.

Combining the predictive nature of the Thermal Demonstration with actual, later temperature measurements and dissolved oxygen level measurements determined with Unit One on line, the Board finds that CIPS has demonstrated, pursuant to Rule 203(i)(10)(cc)(1), that conditions exist which are capable of supporting a fishery.

An additional consideration under Rule 203(i)(10)(cc)(1) is whether conditions exist which are capable of supporting wildlife and recreational uses. The Board finds that these conditions exist. CIPS has leased to the Department of Conservation an area on the west side of Newton Lake for purposes of establishing a fishing and recreational area. (Ex. 31.) Exhibit 33 shows the fish stocking record at the lake, and Exhibit 34 consists of Department of Conservation reports concerning the lake. Finally, an area remote to the recreational area has been dedicated as a prairie chicken preserve, that species being an endangered one.

The issues of technological feasibility and economic reasonableness under Rule 203(i)(10)(cc)(2) were addressed at length in the economic impact study and at the hearing of October 16, 1977. The two major alternatives considered for control of thermal effluent were wet mechanical offstream cooling towers and trim cooling towers (R.492). Both of these options would result in a reduced thermal output but on balance are less environmentally and asthetically acceptable, with respect to other than cooling

problems, and cost more to install and maintain (R.494-97). The alternative chosen by this petition (no cooling towers) was found to be the most reasonable methodology from the standpoint of benefit-cost analysis (R.497; Economic Impact Study, Tables 5.1 and 5.2).

The final requirement under consideration is whether discharges from Newton Lake to other waters will comply with the thermal water quality standards in Rule 203(i)(1-4). Rule 203(i)(10)(aa). Evidence from the hearing record indicates that spillover to Weather Creek from the dam will occur at times (R.36). Although there is no evidence in the record directly concerning present spillovers from the dam to Weather Creek, the data from the Summer, 1978 thermal study indicate that any spillover will meet those criteria. (See Exhibit 35-2.)

The Board finds that CIPS has satisfactorily demonstrated that Newton Lake, with thermal standards of 102°F (monthly average) and 111°F (maximum), will be environmentally acceptable as defined in Rule 203(i)(10)(cc). Therefore, pursuant to Rule 203(i)(10)(ee), the Board promulgates these specific thermal standards applicable to CIPS' thermal discharges to Newton Lake, and authorizes the Agency to issue NPDES permits consistent with this Order pursuant to Rule 914 of Chapter 3.

This Opinion constitutes the findings of fact and conclusions of law of the Board in this matter.

ORDER

It is the Order of the Pollution Control Board that:

1. The thermal discharge to Newton Lake from Central Illinois Power Company's Newton power station shall not result in a temperature, measured at the outside edge of the mixing zone in Newton Lake, which exceeds 102°F as a monthly average and 111°F as a maximum;

2. The Illinois Environmental Protection Agency is hereby authorized to incorporate the thermal discharge limitations in Order 1, above, in any appropriate NPDES discharge permit.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order were adopted on the 21st day of August, 1980 by a vote of 5-0.

Christan L. Moffett, Clerk
Illinois Pollution Control Board