Summary of EVALUATION OF 316(b) DEMONSTRATION--DETROIT EDISON'S MONROE POWER PLANT

1. In response to a request from the U.S. Fish and Wildlife Service's East Lansing Field Office/Office of Ecological Services (ELFO), the Great Lakes Fishery Laboratory undertook an evaluation of Detroit Edison's 316(b) demonstration for its coal-fired power plant at Monroe, Michigan. The evaluation was to serve (1) as a detailed critique of the Monroe plant 316(b) demonstration, for use by the field staff and other agencies responsible for reviewing that document, and (2) by way of example, as a guide to assist the field staff in their review of 316(b) demonstrations for other Great Lakes region power plants.

2. The 316(b) report states that an estimated 861,000 fish of various species, including 122,000 yellow perch, were impinged on the intake screens of the Monroe plant from June 1975 through May 1976 when the plant was operating at 57% of maximum capacity. These estimates differ substantially from those in the present report, which are based on Detroit Edison data for the same period of time and show a potential impingement of 4.7 million fish, including 626,000 yellow perch.

The higher estimates given in the present report result mainly from two sources. First, on most days when impingement data were collected, fish were counted from only a maximum of half of the plant's 16 intake screens. These count data were not expanded correctly to yield an impingement estimate for the whole plant that represented the number of fish impinged on the other screens from which no count data were collected. Secondly, the 316(b) did not consider as impinged any fish removed from the plant intake by the "fish collectors" (a prototype system for pumping live fish from the screenwells) installed in front of two of the plant's intake screens. In the present report, the fish removed by the collectors were considered to be impinged, because the 316(b) did not present evidence that these fish were returned unharmed to Lake Erie.

3. The 316(b) estimates that 21.4 million fish larvae (including about 5 million yellow perch larvae) and 13.1 million fish eggs were entrained at the

Monroe plant during mid-May 1975 through mid-May 1976. Using Detroit Edison's data, the present report estimates that 20.7 million fish larvae and 27.5 million fish eggs were entrained during that same period. The discrepancy between the two annual fish egg entrainment estimates is apparently due to an error in the 316(b) whereby mean egg density in the cooling water passing through the Monroe plant was calculated by dividing the number of eggs found in samples from stations in the plant intake canal by the combined volume of water passing through the sampling pumps at stations in the intake canal and at stations in the plant discharge canal.

Although the present report verifies the procedures used to calculate the entrainment estimates presented in 316(b) for fish larvae and provides a corrected estimate for egg entrainment at the Monroe plant, the entrainment of eggs and larvae may even have been substantially higher than indicated. This possibility arises because the samples used for estimating the numbers of larvae and eggs entrained were collected only at 1-m and 3-m depths in the 5-7 m deep intake canal and because information not presented in 316(b) indicates most entrainable eggs and larvae would have been more abundant near the bottom of the Monroe plant intake canal than near the surface.

4. The 316(b) presents no estimates of the numbers or biomass of macrozoobenthos or zooplankton entrained annually at the Monroe plant. The present report estimates, on the basis of Detroit Edison data, that 55.6 million macrozoobenthic organisms, most of which (77% by number) were chironomids, were entrained during May 1975 through April 1976. This estimate of the numbers of macrozoobenthos entrained at the Monroe plant may be low because these organisms would normally be found at highest densities on or near the bottom, and because the Detroit Edison samples on which this estimate is based were collected at depths of 1 m and 3 m in the 5-7 m deep intake canal.

An estimate of zooplankton entrainment was developed using cooling water flow data from the 316(b) and published information on the density of zooplankton at the plant intake. According to this estimate about

159,000 kg (175 tons) of zooplankton were probably entrained during 1975-76. The most abundant zooplankton entrained were probably rotifers (77% of the total by number) and cladocerans (74% of the total by weight).

5. The 316(b) presents several estimates of the impact of impingement and entrainment losses of fish at the Monroe plant on the source populations in western Lake Erie. Impingement impact was assessed on the basis of the simple ratio of the number of fish impinged of a given species to the number of individuals of that species in the source population; a similar assessment was presented for the impact of entrainment of larval fish on the source population of larvae. The impact of larval entrainment was also evaluated by projecting the loss of entrained larvae to an equivalent loss of adults. The impact of fish egg entrainment was evaluated by considering the estimated number of entrained eggs as the equivalent number of adult females required to produce the eggs. The adequacy of these 316(b) impact assessments is subject to the concerns expressed above regarding the accuracy of the 316(b) estimates of the numbers of fish and fish eggs entrained and impinged and to other concerns detailed in the main body of the present report.

No estimate of the impact of macrozoobenthos or zooplankton entrainment at the Monroe plant is given in the 316(b) report. The available information suggests that large numbers of organisms that are food for fishes are entrained and that zooplankton may have a high mortality because most are entrained when condenser discharge temperatures have risen to the acutely lethal level.

6. The 316(b) contains no discussion of the impact of the plant on the Raisin River even though the entire flow of the river is diverted through the Monroe plant for cooling water during most of the year. Although resident fish populations in the upper river would probably be little affected by the plant, those fish populations that required access to both the upper river and to Lake Erie would be denied this access by the Monroe plant.

7. The impact of the combined entrainment and impingement losses of yellow perch at the Monroe plant was estimated by means of a model

formulated for the U.S. Environmental Protection Agency by R. L. Patterson. This model projects the annual loss in potential yield of yellow perch to commercial and sport fisheries of western Lake Erie due to impingement and entrainment losses of that species at the Monroe plant. On the basis of the estimated impingement and entrainment losses of yellow perch given in the present report (approximately 626,000 and 5 million fish, respectively) and the assumption of 70% mortality of entrained larvae (as in Patterson's model), the annual loss in potential yield of yellow perch to the fisheries is about 265,000 pounds; if it is assumed, as in the 316(b), that the mortality of entrained larvae is 100%, the loss is approximately 267,000 pounds.