THE QUICK AND THE DEAD: FISH ENTRAINMENT, ENTRAPMENT, AND THE IMPLEMENTATION AND APPLICATION OF SECTION 316(b) OF THE CLEAN WATER ACT

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INTRODUCTION

Throughout the nation's waters lie marauding opportunists with an irrepressible taste for aquatic life. They kill aquatic organisms with felicity and without discrimination. These monoliths of doom are not mythic creatures from beyond, nor do they represent more tolerated industrial or fishing interests. The single largest predators of our Nation's waters are cooling water intake structures (CWISs) operated by the electric utility industry.

A pernicious by-product of electricity production is the annual destruction of trillions of valuable aquatic organisms. Facilities that produce power (powerplants) produce excess heat, and need to withdraw "cooling water" from nearby waterways to use as thermal transfer vehicles to whisk away unneeded heat. Unfortunately, the donors of the cooling water (source waterbodies) also serve crucial biological purposes as habitat, nursery, and guardian over a fragile amalgam of aquatic life, including fish, fish fry, fish eggs, crustaceans, marine mammals and plankter. After exploiting the cooling water, powerplants abandon it—albeit abused and scarcely resembling its former vigorous and life-supporting state—by discharging it back into the Nation's waters.[1]

Congress largely ignored the aquatic omnicide caused by withdrawal of cooling water until 1972. Following more than five years of

1. SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, BACKGROUND PAPER NUMBER 2: COOLING WATER USE FOR SELECTED U.S. INDUSTRIES AND SUMMARY OF SELECTED EPA REGIONAL AND STATE SECTION 316(b) ACTIVITIES 2-3 (Dec. 13, 1993) (Preliminary Draft) [hereinafter BACKGROUND PAPER NO. 2].

investigation, Congress specifically addressed the impacts of cooling water use by adding Section 316 to the Clean Water Act (CWA).[2] To be sure, by requiring that the "location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact,"[3] Congress has imbued Section 316(b) with more operative terms than any twenty-word phrase in all environmental law. Unfortunately, however, the United States Environmental Protection Agency (EPA) has retreated from its responsibility to promulgate regulations which would give Section 316(b) effect. Thus, agencies trying to execute the provision's mandates are left decidedly in the lurch.

In the absence of regulations, correspondingly few states—those who shoulder a lion's share of responsibility for implementing the CWA—have required utilities to ensure that their existing cooling water intake structures reflect advances in technological measures designed to minimize adverse environmental impact such as closed-cycle cooling systems, flow management techniques, improved screening systems, behavioral devices, and the like. For the most part, EPA and many states, feeling bound by economic constraints, have been loathe to require any technology if its costs are found to be "wholly disproportionate" to the environmental benefits conferred by the technology.

Feeling hamstrung by Section 316(b)'s seemingly inscrutable demands, EPA and some states have allowed utilities to pursue non-technological means of complying with Section 316(b) that are designed to offset adverse impacts. Such "mitigation projects" putatively replace damaged and destroyed fish and aquatic organisms, and provide better habitats, migration and spawning venues, and food sources for surviving organisms. These projects include wetlands enhancement and restoration, removal of fish impediments, installation of fish hatcheries, and fish restocking programs.

This Article has three principal purposes. The first purpose is to explain the genesis of Section 316(b) by examining the adverse impacts caused by cooling water intake structures. The second purpose is to provide a detailed description as to how Congress, EPA, the courts, state agencies, and litigants have interpreted Section 316(b). The third purpose is to provide guidance and recommendations for more effective implementation of the Section. Ultimately, this article concludes that many agencies implementing Section 316(b) have misapplied cost

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2. The Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1988) (commonly referred to as the "Clean Water Act" or "CWA").

3. *Id.* § 1326(b).

considerations, misapprehended mitigation projects, and mishandled the operative language of Section 316(b).

Part I begins by discussing the adverse environmental impacts cooling water intake structures inflict upon source waterbodies. Part II views how Section 316(b) has evolved along with EPA's attempts to promulgate implementing regulations, and addresses the statutory framework of Section 316(b) and how it interrelates with the rest of the Section. Part III explains how courts, agencies, and disputants have interpreted the operative terms of Section 316(b), with special emphasis heaped on the more recent and most important activities and concludes that some early EPA decisions offer the best guidance for informed implementation of the Section. Part IV examines the relevant factors in determining whether a facility is complying with the requirements of Section 316(b), that is, whether the design, location, construction, and capacity of a cooling water intake structure reflects best technology available for minimizing adverse environmental impact. Part V discusses the role of costs in construing Section 316(b), and opines that both environmental costs and marginal costs to ratepayers deserve greater attention. Part VI examines the use of mitigation projects and maintains that Section 316(b) does not currently allow them to be used as substitutes for the technological prescriptions of the provision. Part VII addresses proposed legislative reform of Section 316(b) recently passed by the United States House of Representatives and finds that its enactment would further dilute the Section. Part VIII offers recommendations for better implementation of Section 316(b).

I. BACKGROUND: ADVERSE ENVIRONMENTAL EFFECTS OF COOLING WATER INTAKE STRUCTURES (CWISs)

Steam electric powerplants generate electricity by creating heat which, in turn, converts pure water into high pressure steam.[4] The high pressure steam then races through giant turbines, causing them to rotate at a high rate.[5] The rotating turbines turn electric generators, creating electricity.[6] After the high pressure steam has passed through the rotating turbines, it is typically run through small-diameter tubing surrounded by non-contact cooling water.[7] The non-contact cooling water in the condenser tubes

4. *See* JOHN CLARK & WILLARD BROWNELL, ELECTRIC POWER PLANTS IN THE COASTAL ZONE: ENVIRONMENTAL ISSUES III-1 (1973) (American Littoral Society Special Publication No. 7); BACKGROUND PAPER NO. 2, *supra* note 1, at 3.

5. *Id.*

6. *Id.*

7. *Id.* at III-7. *See generally* BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3.

cools and condenses the steam in the condenser tubes back into water.[8] In essence, the non-contact cooling water is used to convert the high pressure steam back into water for recirculation.[9] Once back in its liquid state, the water is returned to the beginning of the process where it is revaporized into steam to start the process anew.[10] Cooling water is obtained from a source waterbody located outside of the plant.[11] For example, cooling water may be obtained from rivers[12] or oceans.[13]

Powerplants generally use either once-through or recirculating closed-cycle cooling systems.[14] A once-through cooling system withdraws water from the source waterbody, runs it through the condenser system, and then discharges without recirculation.[15] As the water circulates through the condenser system it is heated, and thus returns to the environment in a heated state.[16] Once-through cooling systems require a continual supply of cooling water and are more common than closed-cycle systems.[17]

In contrast to once-through cooling systems, closed-cycle cooling systems recirculate and reuse cooling water.[18] As with once-through cooling, cooling water in closed-cycle systems is passed through the condenser system where it is heated in the process of converting steam back to water.[19] After passing through the condenser system, however, the cooling water is transported to cooling towers[20] or to some other process to be cooled.[21] Once cooled, the water is returned to the condenser system

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8. CLARK & BROWNELL, *supra* note 4, at III-7.

9. *Id.* at III-1; BACKGROUND PAPER NO. 2 at 11.

10. *Id.*; BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3.

11. *Id.*

12. *Id.*; *See, e.g., In re* Carolina Power & Light Co., Region IV, EPA 3, 9 (Nov. 7, 1977) (Initial Decision re: Permit No. NC007064) [hereinafter *Brunswick I*].

13. *See, e.g., In re* Public Serv. Co. of N.H., No. 76-7, 1978 NPDES LEXIS 15 (EPA Aug. 4, 1978) [hereinafter *Seabrook IV*].

14. BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3; CLARK & BROWNELL, *supra* note 4, at III-3 to III-5.

15. BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3; CLARK & BROWNELL, *supra* note 4, at III-1.

16. *See generally* BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3; CLARK & BROWNELL, *supra* note 4, at III-3.

17. Systems which use once-through cooling represent 59% of the total number of units and withdraw 71% of the total cooling water intake flow. Closed-cycle cooling systems represent 36% of the total number of units and withdraw 23% of the total cooling water intake flow. BACKGROUND PAPER NO. 2, *supra* note 1, at 2-4.

18. *Id. See* CLARK & BROWNELL, *supra* note 4, at III-5.

19. CLARK & BROWNELL, *supra* note 4, at III-5.

20. *Id.*

21. *Id.* at III-3, III-4, III-5.

and used again in the cooling process.[22] Although the cooling water used in a closed-cycle system is constantly being reused and recycled, some of the water is lost through evaporation and other processes.[23] Therefore closed-cycle systems must recoup such losses by making additional withdrawals of cooling water from the source waterbody.[24] The amount of make-up cooling water withdrawn from the source waterbody in a closed-cycle system is only 2% to 4% of the quantity of water used by a comparable once-through system.[25] Accordingly, the adverse environmental impact on aquatic ecosystems is far less from closed-cycle than from once-through systems.[26]

In total, powerplants and industrial facilities in the United States withdraw about 70 trillion gallons of water from United States rivers and streams each year for cooling purposes.[27] Powerplants withdraw about 80% of that amount—roughly 60 trillion gallons of cooling water per year—or about 15% of total flow of waters in United States rivers and streams.[28] Powerplant demand for cooling water reaches 254,500 million gallons per day (MGD) (254 billion gallons per day (BGD))[29] from various source waterbodies including freshwater rivers, streams and lakes, coastal ocean waters, brackish estuaries, and groundwater.[30] Moreover, the steam electric generating industry's insatiable thirst for cooling water continues as demand for electricity climbs.[31] The relatively unfettered use of cooling

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22. BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3; CLARK & BROWNELL, *supra* note 4, at III-1, III-5 (fig. III-6).

23. BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3; CLARK & BROWNELL, *supra* note 4, at III-3.

24. CLARK & BROWNELL, *supra* note 4, at III-3.

25. EPA, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION, BACKGROUND PAPER NO. 3: COOLING WATER INTAKE TECHNOLOGIES 2 (Dec. 13, 1993) (Preliminary Draft) [hereinafter BACKGROUND PAPER NO. 3]; CLARK & BROWNELL, *supra* note 4, at III-3.

26. Incidentally, while once-through and closed-cycle cooling systems are the primary methods for obtaining cooling water for the condenser system, use of one does not necessarily preclude use of the other. Some electric generating facilities employ "the concepts of the once-through and closed-cycle cooling systems at the same time." BACKGROUND PAPER NO. 2, *supra* note 1, at 2-4. Such a system entails alternating between the two types of cooling systems, which is usually accomplished on a seasonal basis. *Id.*

27. 38 Fed. Reg. 34,410 (1973) (to be codified at 40 C.F.R. pts. 401, 402) (proposed Dec. 13, 1973).

28. *Id.*

29. BACKGROUND PAPER NO. 2, *supra* note 1, at 2-3, 2-11.

30. *Id.* at 2-11.

31. Over the last five decades the number of steam electric powerplants and electric generating units in the United States has been increasing significantly. For instance, in 1941 there were only 31 operational generating units in the United States and its territories having a combined intake flow of 2,700 million gallons per day (MGD). *Id.* at 2-5 (Table 2-3). By 1993, 976 steam electric powerplants and 2,693 generating units were in existence in the United States and its territories. *Id.*

water by the utility industry, however, comes at a significant cost to the environment.

CWISs remove trillions of aquatic organisms annually, including plankton, eggs, larvae, fish, and any other animals or organisms that live in the water.[32] The unfortunate predicament of being sucked into a CWIS is usually accompanied by a death sentence. For instance, as is discussed later in this paper, it is estimated that one powerplant alone in New Jersey accounts for productivity losses from the Delaware Estuary of nearly one billion fish annually and is responsible for more annual loss of some fish populations than all commercial and recreational fishing pursuits in the estuary combined.[33] Collectively, the power industry constitutes the country's single largest consumer of aquatic life.

Adult fish and larger organisms drawn into the powerplant by the CWISs are entrapped ("impinged") against "intake screens."[34] Intake screens are designed to filter out debris that would interfere with the operation of, or cause damage to, condenser systems.[35] Impinged organisms usually die or suffer injury as a result of starvation, exhaustion, descaling by screen wash sprays, or "asphyxiation when forced against a screen by velocity forces which prevent proper gill movement . . . for prolonged periods of time."[36] If an organism or fish impinged against an intake screen is lucky enough to be removed from the screen while it is alive, it still has a diminished chance of survival. These fish may suffocate in the fish return system, be terminally injured, or otherwise be more susceptible to predation.[37]

Aquatic organisms not removed from the cooling water by the intake screens are "entrained," meaning they are carried through the powerplant's

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at 2-2. Of these 2,693 generating units in existence in 1993, 2,073 were in commercial operation. An additional eight generating units are under construction and a small number are in the planning stages. *Id.* at 2-3.

32. EFFLUENTS GUIDELINES DIVISION, OFFICE OF WATER AND HAZARDOUS MATERIALS, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, DEVELOPMENT DOCUMENT FOR BEST TECHNOLOGY AVAILABLE FOR THE LOCATION, DESIGN, CONSTRUCTION AND CAPACITY OF COOLING WATER INTAKE STRUCTURES FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT 5-9 (1976) [hereinafter 1976 DEVELOPMENT DOCUMENT].

33. *See* discussion *infra* Part III.D.6.

34. Impingement is the physical blocking of larger organisms by a barrier, generally some type of screen system in the cooling water intake. *Id.* at 6. *See also* BACKGROUND PAPER NO. 3, *supra* note 25, at 2.

35. PERMITS DIVISION, OFFICE OF WASTE ENFORCEMENT, EPA, GUIDANCE FOR EVALUATING THE ADVERSE IMPACT OF COOLING WATER INTAKE STRUCTURES ON THE AQUATIC ENVIRONMENT: SECTION 316(b) P.L. 92-500 (Draft) (1977) [hereinafter 1977 ADVERSE IMPACT GUIDELINES].

36. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 6.

37. *See* 1977 ADVERSE IMPACT GUIDELINES, *supra* note 35, at 1.

condenser system.[38] The organisms which become entrained are "relatively small benthic, planktonic and nektonic forms."[39] Entrained aquatic organisms are subject to their own perils and are usually euthanized as a result of: physical impact in the pump and condenser tubing; pressure changes which result in embolisms, or rupturing of fish ballast air bladders caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers; thermal shock, as cooling water is heated in the cooling process; and by chemical toxemia induced by antifouling agents such as chlorine.[40] As EPA has noted "[f]or some species of fish, the intake represents a double jeopardy situation where the same population will be subject to increased mortality through entrainment of eggs and larvae" as well as through impingement if they ever live to be juveniles and adults.[41]

In addition to the impacts caused to organisms drawn into the cooling system, aquatic organisms may also be harmed as the result of damage to their aquatic habitat caused by a powerplant's discharge of heated water.[42] The thermal discharges consist of water which is released back to the source waterbody after it has proceeded through the powerplant's condenser system.[43] Clearly, the cooling process adversely impacts aquatic ecosystems.[44] For example, as EPA has noted, cooling water systems

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38. Entrainment is the incorporation of organisms into the cooling water flow. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 6. *See also* BACKGROUND PAPER NO. 3, *supra* note 25, at 2.

39. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 6.

40. *Id.* at 6, 8.

41. 1977 ADVERSE IMPACT GUIDELINES, *supra* note 35, at 1.

42. *See* Karl R. Rabago, *What Comes Out Must Go In: Cooling Water Intakes And The Clean Water Act*, 16 HARV. ENVTL. L. REV. 429, 432 (1992).

43. *Id.* Congress understood by as early as 1968 that thermal dischargers are "a very important lethal, directive, and controlling factor in the aquatic habitat. It is lethal in that certain high or low levels can directly cause mortalities, directive in that it influences daily and seasonal behavior and controlling in that it affects biochemical reaction rates and consequently influences metabolic rates." *See Thermal Pollution-1968: Hearings Before the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works*, 90th Cong., 2d Sess. 136 (1968) [hereinafter *Thermal Pollution Hearings*] the subject of which was "The Extent to Which Environmental Factors are Considered in Selecting Power Plant Sites, with Particular Emphasis on the Ecological Effects of the Discharge of Waste Heat into Rivers, Lakes, Estuaries and Coastal Waters." These hearings also disclosed that the withdrawal of cooling water may disrupt natural temperature regimes and distribution patterns of the source waterbody; freshwater or saltwater inflows in estuaries may be diminished by powerplant withdrawals of cooling water; "salinity distributions within estuarine areas may be altered"; "clean water areas may be contaminated by introduction or redistribution of polluted water withdrawn from another area"; "[i]ntake or discharge structures, including dikes or dredged channels, may prevent a normal circulation of water or bar migration of organisms"; and "[d]ischarge plumes may interfere with sediment transport." *Id.*

44. *See* 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 6.

"may interfere with the maintenance or establishment of optimum yields [of] sport or commercial fish and shellfish, decrease populations of endangered organisms, and seriously disrupt sensitive ecosystems."[45]

One of the most bedeviling machinations of this enterprise is its incomparable impact on fishing interests. This is particularly troubling in light of the general collapse of various fisheries nationwide. Indeed, domestic fish populations have declined dramatically over the last twenty-five years.[46] Losses have been particularly alarming along the Atlantic Coast.[47] Atlantic fisheries have experienced drops of about 25% in fish catches over the last twenty years.[48] The Northwest, Northeast, West Central, East Central, Southwest, and Southeast Atlantic fisheries have recently experienced reductions of 42%, 16%, 36%, 20%, 11%, and 53% respectively, amounting to a net reduction of some 5 million tons annually.[49] Total net reductions in most commercial and recreational fish types in Atlantic fisheries over the last few decades are about 58%, or about 29.71 million tons per year.[50]

Even still, some fish types are more profoundly burdened than others. The Atlantic States Marine Fisheries Commission has estimated that combined recreational and commercial fish landings of previously hearty and economically important weakfish (also known as sea trout) have declined from about 80 million pounds in 1980[51] to just under 11.4 million pounds in 1990.[52] This represents an overall decline in weakfish populations for Atlantic fisheries of almost 75 % since 1980.[53] Moreover, catches of four popular commercial fish (Atlantic cod, Cape hake, haddock, and silver hake) have dropped from 5 million tons in 1970 to 2.6

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45. *Id.*

46. For recent commentary regarding the alarming loss of the nation's fisheries, see generally Peter Weber, *Net Loss: Fish, Jobs, and the Marine Environment*, 120 WORLDWATCH PAPER (1994); Peter Weber, *Abandoned Seas: Reversing the Decline of the Oceans*, 116 WORLDWATCH PAPER (1993); Dick Russell, *Fishing Down the Food Chain*, 17 THE AMICUS J. 16 (1995).

47. *See generally* MID-ATLANTIC FISHERY MANAGEMENT COUNCIL, FISHERIES MANAGEMENT REPORT NO. 20 OF THE ATLANTIC STATES MARINE FISHERIES COMM'N: WEAKFISH FISHERY MANAGEMENT PLAN AMENDMENT #1 (1992) [hereinafter FISHERIES MANAGEMENT REPORT NO. 20]; ATLANTIC STATES MARINE FISHERIES COMM'N, SPECIAL REPORT NO. 33, 1994 ANNUAL REVIEW OF INTERSTATE FISHERY MANAGEMENT PLANS.

48. Peter Weber, *Net Loss: Fish, Jobs, and the Marine Environment*, *supra* note 46, at 14.

49. *Id.*

50. *Id.* at 15.

51. DOUGLAS G. VAUGHAN ET AL., SPECIAL REPORT NO. 21 OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION, AN ASSESSMENT OF THE STATUS OF THE ATLANTIC WEAKFISH STOCK, 1982-1983 11 (1991).

52. FISHERIES MANAGEMENT REPORT NO. 20, *supra* note 47, at 8-9.

53. *Id.* at 8.

million tons in 1989.[54] More current findings suggest that reduction of these species is much greater.[55]

No doubt these declines are largely owed to overfishing,[56] yet the impacts of CWISs have not made agencies implementing Section 316(b) any more solicitous. To the contrary, the dramatic decline of certain fish populations has led to incongruous and puzzling results. For example, the New Jersey Department of Environmental Protection still allows one of the Nation's largest utility users of cooling water to operate largely unabated, thereby causing the loss of an estimated 11 million pounds of weakfish annually.[57] The inherent inequity of this situation for dispossessed commercial and recreational fishing interests is not difficult to grasp. Virtually every state along the Atlantic Coast imposes permit and licensing, gear restriction, and minimum size limits on commercial fishers, and size limitations on recreational fishers.[58] However, although states continue to point their crosshairs at commercial/recreational fishers, the states, in conjunction with EPA, allow cooling water withdrawal by utilities to exact a devastating toll on affected fisheries with little or no regulatory consequence.

Section 316(b) provides the tools for leveling the playing field. It requires that those who are permitted to discharge cooling water ensure that "the location, design, construction and capacity of cooling water intake structures reflect the best technology available (BTA) for minimizing adverse environmental impact."[59] How Section 316(b) should be interpreted, however, has become a matter of growing tension between affected utilities, state and federal environmental agencies, those who use the source waterbodies for fishing, recreational, drinking, and other purposes, and now, in prodigal fashion, Congress. Part II explores how Congress and agencies have attempted to regulate the adverse environmental impacts associated with cooling water intake structures.

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54. Weber, *Abandoned Seas: Reversing the Decline of the Oceans*, *supra* note 46, at 32.

55. Interview with Ian Fletcher, Ph.D., Great Salt Bay Experimental Station (Sept. 25, 1995).

56. *Id.*

57. *See* discussion of Salem, *infra* at Part III.D.6.

58. VAUGHAN, *supra* note 51, at Table 1.

59. CWA § 316(b); 33 U.S.C. § 1326(b) (1988). Section 316(b) provides in full:

> Any standard established pursuant to Section 301 of this title or Section 306 of this title and applicable to a point source shall require that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

Id.

II. THE STATUTORY AND REGULATORY CONTEXT OF SECTION 316(b)

The statutory framework surrounding Section 316(b) is not a model of clarity. Determining just how and why Section 316(b) applies to particular point sources involves an expedition of sorts into other aspects of the Clean Water Act. It also requires further examination of Section 316(b)'s immediate statutory orbit, i.e., Sections 316(a) and 316(c). It is also useful to understand how and why EPA's attempts to promulgate regulations implementing the provision have followed such a tortured course. The first two sections of this part examine the statutory and regulatory context of Section 316(b). The third section of this part explores the special kinship between Section 316(b) and the rest of Section 316.

A. Statutory Context of Section 316(b)

On October 18, 1972, Congress enacted the Clean Water Act.[60] Section 301 of the CWA ordered EPA to establish effluent limitations for existing point sources by July 1, 1977.[61] Section 301 also states the general rule of the Clean Water Act that, absent a permit, "the discharge of any pollutant by any person shall be unlawful."[62] Section 306 requires the Administrator of EPA to establish standards of performance[63] for new sources by February 18, 1974,[64] that is, sources whose construction commences after publication of proposed regulations prescribing a standard of performance applicable to such sources.[65] Section 316(b) requires that any such standard established pursuant either to Section 301 or Section 306 shall "require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact."[66] Furthermore, Sections 301 and 402 prohibit the operation of a point source in violation of

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60. Federal Water Pollution Prevention and Control Act, P.L. 92-500; 33 U.S.C. §§ 1251-1387 (1988). For a comprehensive discussion of Section 316's legislative history, see generally Rabago, *supra* note 41.

61. 33 U.S.C. § 1311(b)(1)(A) (1988).

62. 33 U.S.C. § 1311(a).

63. "Standards of performance" is defined as "a standard for the control of the discharge of pollutants which reflect the greatest degree of effluent reduction which the Administrator determines to be achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives . . . ." 33 U.S.C. § 1316(a)(1).

64. CWA § 306(b)(1)(B), 33 U.S.C. § 1316(b)(1)(B).

65. CWA § 306(a)(2), 33 U.S.C. § 1316(a)(2).

66. 33 U.S.C. § 1326(b).

implementing regulations.[67] Thus, the requirements of Section 316(b) must be fulfilled by facilities which have both a discharge of a pollutant from a point source (e.g., heat)[68] and a CWIS.[69]

Additionally, it appears as though Section 316(b) applies equally to both new and existing facilities. Section 316(b) states that its BTA requirements must be fulfilled when there is "any standard" established pursuant to either Section 301 or Section 306. Section 301 requires EPA to develop effluent limitations which govern existing sources.[70] Therefore, Section 316(b) applies to existing sources for which there are effluent limitations. Section 306 requires EPA to promulgate standards of performance for new sources[71] and specifically requires that such standards be set for steam electric powerplants.[72] Thus, Section 316(b) applies to new steam electric powerplants as well. Courts have agreed with this interpretation. For example, in *In re Central Hudson Gas and Electric Corp.* ("*Decision of the General Counsel No. 63*"),[73] EPA General Counsel determined that all powerplants, whether new or existing, which have both cooling water intake structures and point sources of discharge, are subject to the provisions and requirements of Section 316(b).[74]

Moreover, the CWA requires EPA or states issuing NPDES permits to insure that compliance with Section 316(b) falls within the ambit of the Section 402 permitting process. To be sure, in *United States Steel Corporation v. Train*, the Seventh Circuit held that the appropriate permitting agency is "implicitly require[d] . . . to insure compliance with Section 316(b) as one of the [NPDES] permit conditions"[75] and that the

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67. *See* 33 U.S.C. §§ 1342, 1311, and 1412.

68. CWA § 306(b), 33 U.S.C. § 1316(b).

69. *See* United States Steel Corp. v. Train, 556 F.2d 822, 850 (7th Cir. 1977).

70. CWA § 301(b), 33 U.S.C. § 1311(b).

71. CWA § 306(1)(B).

72. CWA § 306(1)(A).

73. *In re* Central Hudson Gas and Elec. Corp., 2 U.S. ENVTL. PROTECTION AGENCY GEN. COUNSEL OPINIONS 371, 379-80 (Env't L. Publishing Service) (1977) [hereinafter *Decision of the Gen. Counsel No. 63*]. EPA General Counsel explicitly ruled that the term "standard" as it is used in Section 316(b) applies not only to standards of performance required by Section 306, but also to the effluent limitations required to be promulgated pursuant to Section 301. *Id.* at 380. In addition, the EPA General Counsel noted that there is no legislative history, nor is there any language within the Clean Water Act itself, which would indicate that Congress intended the application of Section 316(b) to be limited in its application to new electric powerplants. *Id.* As a result, the General Counsel determined that all powerplants, both new and existing, which have cooling water intake structures and point sources of discharge are subject to the provisions and requirements of Section 316(b). *Id.*

74. *Id.*

75. *United States Steel Corp.*, 556 F.2d at 850.

requirements of Section 316 "are to be implemented through standards established pursuant to Sections 301 and 306."[76]

Further, courts have found that permit issuing agencies clearly have authority to apply Section 316(b). For instance, in *Virginia Electric and Power Company v. Costle*,[77] the Fourth Circuit Court of Appeals affirmed a district court's dismissal of Virginia Electric and Power Company's petition for review of Section 316(b) conditions for want of subject matter jurisdiction.[78] The Fourth Circuit turned to legislative history and tenets of statutory interpretation to lend support to its ruling that EPA may impose 316(b) conditions as part of NPDES permits.[79] The Court construed Section 316(b) conditions to be within the meaning of the term "other limitation[s]" as provided by Section 509(b)(1)(E) of the CWA, and therefore subject to review only in the Court of Appeals.[80]

B. EPA Attempts to Promulgate Section 316(b) Regulations

In July 1973, nine months after Congress passed the CWA into law, EPA published a development document[81] addressing the requirements of Section 316(b). Since the steam electric power industry utilizes the greatest volume of cooling water, EPA prepared the development document specifically with powerplants in mind.

On August 22, 1973, EPA published a notice of rulemaking to establish effluent limitations for existing sources (including powerplants) and standards of performance for new sources (also including powerplants) pursuant to Sections 301, 306, and 316(b) of the CWA.[82]

On December 13, 1973, EPA issued proposed regulations intended to implement Section 316(b) entitled "Cooling Water Intake Structures: Proposal Regarding Minimizing Adverse Environmental Impact" ("1973 Proposed Regulations").[83] The 1973 Proposed Regulations were to be

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76. *Id.*

77. Virginia Elec. & Power Co. v. Costle, 566 F.2d 446 (4th Cir. 1977).

78. *Id.* at 447.

79. *Id.* at 449.

80. *Id.* at 450-51 (referring to 33 U.S.C. § 1369(b)(1)(e)).

81. EPA, DEVELOPMENT DOCUMENT FOR PROPOSED BEST TECHNOLOGY AVAILABLE FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACTS OF COOLING WATER INTAKE STRUCTURES (1973) [hereinafter 1973 DEVELOPMENT DOCUMENT].

82. 38 Fed. Reg. 22,606 (1973) (to be codified at 40 C.F.R. pts. 401, 426) (proposed Aug. 22, 1973); 38 Fed. Reg. 34,410 (1973) (proposed Dec. 13, 1973).

83. 38 Fed. Reg. 34,410 (1973) (to be codified at 40 C.F.R. pts. 401, 402) (proposed Dec. 13, 1973).

incorporated at 40 C.F.R. Parts 401 and 402.[84] EPA stated that new Part 402 was intended "to provide a framework for the case-by-case determination of the best technology available for minimizing adverse environmental impact resulting from the location, design, construction, and operation of cooling water intake structures."[85] EPA also proffered that the regulations were to be applied on a "case-by-case basis" and were "intended to serve as an outline of the factors to be considered, and the data required, in order to arrive at an environmentally sound decision concerning cooling water intake structure, location, design, construction, and operation."[86] Moreover, EPA noted any applicable BTA would be dependent upon multiple factors, not the least of which involved the control of the number and types of organisms which interacted "externally" (referring to impingement) and "internally" (referring to entrainment) with a relevant CWIS.[87] In addition, even though the 1973 Proposed Regulations were not intended to be outcome determinative, EPA remarked that a "certain degree of national uniformity can be prescribed relative to the factors that must be considered."[88] EPA, however, rejected the use of a performance standard as a means of complying with Section 316(b). "While environmentally related performance would provide a

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84. *Id.*

85. *Id.*

86. *Id.*

87. *Id.* The 1973 Proposed Regulations provided:

> (Part A) *Applicable Technology*. The range of technologies corresponding to the control of the number and types of organisms which interact externally with the intake is comprised of two factors—the choice of the location of the intake relative to the location of the organisms, and the full array of process modifications, including the use of recirculating cooling water systems employing offstream means to transport process heat directly to the atmosphere and to minimize or in some cases eliminate the use of cooling water. The technology for controlling the number and types of organisms which interact internally with the cooling system is comprised of one factor in addition to location and flow volume as cited above for intake interactions, i.e., the degree to which the configuration and operation of the intake means prevents the entry of these organisms into the cooling system. The technology for preventing the entry of these organisms while minimizing damage due to external interactions with the organisms is diverse, including a multiplicity of physical and behavior barriers and covering various fish bypass and removal systems. Devices which cause damage due to internal interactions with process cooling systems relate to the design and operation of these systems with respect to mechanical, thermal, and chemical characteristics. For example, the presence of a cooling tower in a nonrecirculating cooling system could affect the amount of organism damage due to the pumping, temperature changes, and possible chemical additives employed with the tower.

Id.

88. *Id.* at 34,411.

measure of the effect desired, it must be related to control technology in order to be assured that adverse environmental impacts are minimized in any particular case."[89]

The 1973 Proposed Regulations also briefly addressed factors germane to assessing adverse environmental impacts, including cooling water intake volume, abundance of affected organisms, species type of affected organisms, system configuration, thermal characteristics, and chemical additives.[90] Regarding industry-wide cost considerations, EPA noted that "in general the costs [of BTA] . . . will have a small economic impact on steam electric power plants."[91] The 1973 Proposed Regulations also defined the terms "cooling water intake structure,"[92] "existing cooling water intake structure,"[93] and "new cooling water intake structure."[94]

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89. *Id.*

90. *Id.* at 34,410. The 1973 Proposed Regulations provided:

> Adverse environmental impacts that could occur from cooling water intakes relate to the net damage or destruction of benthos, plankton and necton organisms by external interaction with the intake structure and by internal interaction with the industrial cooling system. Important aspects of the intake which relate to adverse environmental impacts are the intake volume, the number and types of organisms which interact externally with the intake or which interact internally with the industrial cooling system, the configuration and operational characteristics of the intake and plant cooling system, the thermal characteristics of the cooling system, and the chemicals added to the cooling system for biological control.

Id.

91. *Id.* at 34,410-11. The subsection in question provided:

> (b) *Costs.* The Development Document contains information concerning the performance and costs of various technologies for minimizing adverse environmental damage from cooling water intake structures for steam electric powerplants. The analysis indicates that in general the costs associated with the choice of intake location or application of various intake devices to minimize damage due to internal interactions will have a small economic impact on steam electric powerplants.

Id.

92. *Id.* at 34,412. The 1973 Proposed Regulations provided:

> The term "cooling water intake structure" shall mean the total structure used to direct water from a waterbody into the point source subject to the provisions of this part whenever the intended use of a major fraction of the water so directed is to absorb waste heat rejected from the process or processes employed or from auxiliary operations on the premises, including air conditioning.

Id.

93. *Id.* The 1973 Proposed Regulations provided:

> The term "existing cooling water intake structure" shall mean any cooling water intake structure, the construction of which was commenced before the date of publication of these proposed regulations.

Id.

On January 22, 1974, EPA issued final regulations establishing effluent limitations for existing sources and standards of performance for new sources.[95]

On April 16, 1976, EPA published the long-awaited final rulemaking governing Section 316(b) for incorporation at 40 C.F.R. Part 402, entitled "Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact" ("1976 Regulations").[96] The 1976 Regulations essentially left intact the 1973 Proposed Regulations, with picayune elucidations. EPA first made clear that the 1976 Regulations applied to CWISs for any point source for which EPA had established effluent limitations, including new or existing powerplants and industrial facilities.[97] The 1976 Regulations then turned to costs and choice of BTA. EPA responded to utility remonstrations that BTA should be determined on the basis of a detailed cost-benefit analysis.[98] The agency rejected this notion, finding instead that "[n]o comparison of monetary costs with the social benefits at minimizing adverse impacts, much less a formal, quantified 'cost/benefit' assessment is required."[99] Nevertheless, EPA noted that application of BTA "should not impose an impracticable and unbearable economic burden on the operation of any plant subject to Section 316(b)."[100] Since BTA is applied on a case-by-case basis, EPA further reflected, "consideration of the economic practicability of installing that technology must necessarily be conducted on a similarly individualized basis."[101] EPA extracted confidence for this interpretation by noting that 316(b)'s legislative history "contemplates the [B]est [T]echnology [A]vailable commercially at an economically practicable cost."[102] Pointedly, however, EPA theorized that the prospect of converting an

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94. *Id.* The 1973 Proposed Regulations provided:

> The term "new cooling water intake structure" shall mean any cooling water intake structure, the construction of which has been commenced on or after the date of publication of these proposed regulations.

Id.

95. 39 Fed. Reg. 4,532 (1974).

96. 41 Fed. Reg. 17,387 (1976). Section 316(b) would have found its administrative twin at 40 C.F.R. § 401.14.

97. 40 C.F.R. § 402.10.

98. 41 Fed. Reg. 17,388 (1976).

99. *Id.*

100. *Id.*

101. *Id.*

102. *Id.* EPA's nod to the legislative history was probably a reference to the floor remarks of Rep. Clausen, who construed Section 316(b) to mean the "best available technology available commercially at an economically practicable cost." 118 Cong. Rec. 33,762 (Oct. 4, 1972).

existing plant is not vitiated simply because costs of retrofitting would exceed the costs of installing a technology in the first place.[103] In response to utilities' comments that EPA had neglected to take into account "energy penalties" associated with operation of some closed-cycle cooling systems, EPA retorted that "analysis indicates that even under conservative assumptions of the number of plants affected, the increase in energy (fuel) consumption is less than one half of one percent of total fuel consumption by the power industry."[104] In addition to costs, EPA found the age of a CWIS to be relevant.[105] EPA declined, however, to identify closed-cycle or recirculating cooling systems as BTA *per se* for any affected ecosystem, including estuaries.[106]

The 1976 Regulations stated that in determining what constitutes best technology available as required by 316(b), "information contained in the Development Document shall be considered."[107] "Development Document" referred to EPA's 1976 "Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental

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103. *Id.* EPA remarked:

> The Agency recognizes that the costs of modification of existing structures may exceed that of constructing a new intake structure to comparable standards. The Agency expects that higher costs associated with "retrofitting" existing structures, as well as the relationship of those costs to the remaining expected useful life of the facility, will be taken into account in determining the extent to which the specific technological measures described in Development Document are available at an "economically practicable cost."

Id. at 17,388-89.

104. *Id.* at 17,389.

105. *Id.*

106. *Id.* at 17,388. Regarding the relationship between costs, BTA, and estuaries, EPA said that it did not:

> [B]elieve that closed-cycle cooling systems are universally and necessarily the best technology available despite their undoubted and dramatic reduction rates of water used. While the extent of entrainment and impingement damage is in many cases correlated with the amount of water withdrawn, the Agency believes that the appropriate technology is best determined after a careful evaluation of the specific aspects at each site. Moreover, because of the substantial costs of conversion to closed-cycle cooling systems, its economic practicability will depend upon considerations relating individual industrial plants, which are, again most effectively analyzed on a case by case basis.
>
> While there is substantial evidence for concern about the potential destructive effects of open-cycle cooling systems on powerplants in biologically sensitive areas such as estuaries, the available data corresponding to these certain plants do not support a blanket requirement that all similarly situated plants reduce the capacity of their intake structure so as to require conversion to recirculating cooling systems.

Id.

107. 40 C.F.R. §§ 402.10-402.12.

Impact" ("1976 Development Document"). The 1976 Development Document described and discussed the various requirements of Section 316(b), multitudinous available intake designs (including closed-cycle cooling systems),[108] and the relative level of aquatic harms associated with various technologies.[109]

EPA next addressed how adverse impact should be minimized. By reflecting that "minimizing" means "reducing to the smallest possible amount or degree,"[110] EPA rejected utilities' argument that it should narrow Section 316(b)'s focus on environmental impact solely to those respecting damage to long-term fish populations and aquatic ecosystems, and otherwise ignore the number of fish and other aquatic organisms actually killed or damaged.[111] Similarly, EPA rejected industry's averment that the finding under Section 316(a) that the thermal component of a discharge does not disrupt balanced indigenous aquatic communities makes unnecessary further inquiry into Section 316(b).[112] On point, EPA observed that "the Agency should not be precluded from addressing evident entrainment problems simply because the plant's thermal effluent is not itself environmentally unacceptable. The concerns of the two Sections are different and the legal standards by which compliance with their requirements is to be judged are similarly distinct."[113]

Lastly, the 1976 Regulations defined four new terms not defined by the 1973 Proposed Regulations—"location,"[114] "design,"[115] "construction,"[116] and "capacity"[117]—and withdrew definitions of two

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108. While the 1976 Development Document did not specifically dictate that closed-cycle cooling was BTA as required by Section 316(b), one commentator has opined that when viewed in conjunction with an economic analysis performed by EPA, "EPA's approach seemed to be that reference to [the 1976] Development Document would naturally accomplish the unstated goal of setting closed-cycle cooling as the Best Technology Available . . . . EPA thus prescribed and prepared to defend a method of regulation designed to reach closed-cycle cooling without directly requiring it." Rabago, *supra* note 42 at 460.

109. *See* 1976 DEVELOPMENT DOCUMENT, *supra* note 32.

110. 41 Fed. Reg. 17,388 (1976).

111. *Id.* at 17,389.

112. *Id.*

113. *Id.*

114. The 1976 Regulations define the term "location" to mean "the position or site occupied by the cooling water intake structure." 40 C.F.R. § 402.11(b).

115. The 1976 Regulations define the term "design" to mean "the arrangement of elements that make up the cooling water intake structure." *Id.* § 402.11(c).

116. The 1976 Regulations define the term "construction" as "the process of physically constructing the cooling water intake structure, including site preparation." *Id.* § 402.11(d).

117. The 1976 Regulations define "capacity" as "the maximum withdrawal rate of water through the cooling water intake structure." *Id.* § 402.11(e).

terms provided in the 1973 Proposed Regulations—"new source" and "existing source."

The following year, fifty-eight electric utility companies ("Electric Utilities") challenged the validity of EPA's cooling water intake regulations in *Appalachian Power Co. v. Train*.[118] The Electric Utilities argued that EPA had failed to abide by the Administrative Procedures Act (APA) in its bid to establish regulations.[119] Quite simply, they argued that EPA had not validly issued the 1976 Development Document as part of the regulations because the document was neither published in the Federal Register nor properly incorporated into it by reference.[120] The Fourth Circuit Court of Appeals agreed. "Because EPA failed to comply with the publication requirements of the [APA] as to incorporation by reference, its § 316(b) regulations are presently ineffective to impose obligations upon, or to adversely affect . . . the petitioners."[121] Therefore, without reaching the substantive merits of the underlying regulations, the Fourth Circuit remanded them back to EPA.[122]

Without explanation, EPA withdrew its Section 316(b) regulations in 1979.[123] The Code of Federal Regulations has since hauntingly reserved space for "Criteria Applicable to Cooling Water Intake Structures Under Section 316(b) of the Act."[124] Meanwhile, EPA has done precious little to establish regulations under Section 316(b) of the CWA.[125]

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118. Appalachian Power Co. v. Train, 566 F.2d 451 (4th Cir. 1977).

119. *Id.* at 454.

120. *Id.* at 455.

121. *Id.* at 457.

122. *Id.* at 459.

123. 44 Fed. Reg. 32,956 (1979).

124. 40 C.F.R. § 402 (1979).

125. Interestingly, EPA often still refers to Section 316(b) as if it continues to hold regulatory promise. For instance, EPA's November 1980 Calendar of Federal Regulations announced that it was conducting its five-year review of effluent limitations and performance for the steam electric power generating industry. 45 Fed. Reg. 77,778 (1980). In this notice, under "related regulations and actions," EPA noted that "Section 316(b) of the Clean Water Act authorizes the Agency to require the best technology available in location, design, construction, and capacity of intake structures for cooling water, to minimize adverse environmental impact." *Id.* Furthermore, in its June 1981 Calendar of Federal Regulations regarding its five-year review of effluent limitations and performance standards for the power industry, EPA once again referred to Section 316(b) requirements as "related regulations and actions." 46 Fed. Reg. 34,063 (1981). Without implementing regulations, Section 316(b) determinations continue to be made on a case-by-case basis with little or no guidance from EPA. *See, e.g.*, Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc., 835 F. Supp. 160, 165 (S.D.N.Y. 1993). The 1976 Development Document continues to be consulted as authority for interpreting Section 316(b). For example, in 1980 an EPA memorandum from the Office of Regional Counsel for EPA Region IV characterized the 1976 Development Document as "embodying EPA policy." *See* Brunswick Memorandum, *infra* note 275.

In a last ditch effort to fill the vacuum and to force EPA to establish regulations implementing Section 316(b), the National Alliance of River Sound and Baykeepers ("Keepers") filed suit against EPA on September 13, 1993.[126] In *Cronin v. Browner*, the Keepers contended that EPA's failure to issue valid and enforceable 316(b) regulations made it "virtually impossible" for citizens to enforce BTA requirements, and that the absence of federal standards encouraged industry to ignore Section 316(b) "with impunity."[127] The Keepers sought declaratory and injunctive relief, requesting that the court order EPA to issue Section 316(b) regulations in accordance with a judicially-prescribed schedule and retain jurisdiction until EPA issued said regulations.[128] Shortly thereafter, EPA once again began to acknowledge Section 316(b) as part of its regulatory agenda.[129]

On May 4, 1994, and following the institution of discovery and settlement negotiations between the parties in *Cronin v. Browner*, a coalition of fifty-six utilities and related interests ("Electric Utilities"), most of whom had sued EPA following establishment of the 1976 Regulations in *Appalachian Power Co. v. Train*,[130] filed a motion to intervene pursuant to Rule 24 of the Federal Rules of Civil Procedure.[131]

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126. Amended Complaint for Declaratory and Injunctive Relief, Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995) (No. 93-CV-314(KC)).

127. *Id.* at 16-17.

128. *Id.* at 19. The Keepers also requested that the government pay their litigation costs. *Id.*

129. Relatedly, on April 25, 1994, EPA maintained in its Semi-Annual Regulatory Agenda, "Criteria and Standards Reflecting Best Technology Available (BTA) for Cooling Water Intake Structures Under Section 316(b) of the Clean Water Act," its intent to conduct a three-year "data and analysis collection phase to quantify the adverse impacts from cooling water intake structures . . . ." 59 Fed. Reg. 21,045, 21,078 (1994) (April 1994 EPA Notice). The April 1994 EPA Notice acknowledged that the action was not mandated by a legal deadline, and was "economically significant." *Id.* at 21,078. The April 1994 EPA Notice also stated that "a current lack of national standards . . . allows situations where significant percentages of aquatic communities have been severely impacted" and further that it would "proceed along a standard regulatory path to final regulation signature." *Id.* at 21,078-79.

130. *Appalachian Power Co.*, 566 F.2d at 451. *See* discussion *supra* notes 118-125 and accompanying text.

131. Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995). In addition to the utilities, the Edison Electric Institute, the National Rural Electric Cooperative Association, and the American Public Power Association also joined in the motion to intervene pursuant to FED. R. CIV. P. 24. *Id.* at 1055. The individual utilities and their three associations are all members of the "Utility Water Act Group," a group formed by the electric utility industry for collective participation in rulemakings by EPA under the Clean Water Act. *Id.* The Electric Utilities sought intervention as of right pursuant to FED. R. CIV. P. 24(a)(2), or in the alternative, by permission pursuant to FED. R. CIV. P. 24(b)(2). *Id.* With characteristic hubris, the Electric Utilities also sought "to participate in and be heard in connection with any discussion or adjudication between Plaintiffs and Defendant regarding regulations under Section 316(b) of the CWA . . . ." Memorandum of Points and Authorities in Support of Motion for Leave to Intervene at 4, Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995) (No. 93-CV-314(AGS)).

The Electric Utilities' claims were based on two principal assertions. First, they asserted a right of intervention so as to "protect their direct, substantial, and legally protectable interests in the disposition of Plaintiffs' claims."[132] Second, the Electric Utilities maintained that they did not have notice of the Keepers' action until March 16, 1994, following publication of an article in *Inside EPA's Water Policy Report*.[133] In response, the Keepers argued that the Electric Utilities had failed to meet the requirements for intervention as of right ("timeliness," "interests," "impairment," and "inadequate representation") and by permission ("timeliness," "common question," and "a showing that the intervention would not result in undue delay and prejudice to the parties").[134]

On October 14, 1994, the Electric Utilities filed a supplemental memorandum in which they argued that the court lacked jurisdiction.[135] The Keepers correctly returned volley by maintaining that the court had subject matter jurisdiction, that EPA had failed to perform a nondiscretionary duty to establish Section 316(b) regulations, and that the court should enter a proposed consent decree which EPA and the Keepers had jointly lodged before it.[136] A month later, EPA again acknowledged Section 316(b) in its semi-annual unified agenda.[137]

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132. Memorandum of Points and Authorities in Support of Motion for Leave to Intervene at 4, Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995) (No. 93-CV-314(AGS)).

133. *Id.* at 3. The Electric Utilities made this rather remarkable assertion despite the fact that the Keepers had sent EPA their notice of intent to sue on July 23, 1990, filed their action on September 13, 1993, and engaged in scrupulous discovery and extensive settlement dialogue with EPA over numerous months in a matter which drew national attention. More likely, the Electric Utilities probably elected to pursue the matter only after it became evident that the Keepers were making headway with EPA.

134. Plaintiff's Response to Motion to Intervene at 6-7, Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995) (No. 93-CV-314(AGS)).

135. Supplemental Memorandum in Support of Motion for Leave to Intervene at 1, Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995) (No. 93-CV-314(AGS)).

136. Plaintiffs' Supplemental Memorandum in Opposition to Motion for Leave to Intervene at 2, Cronin v. Browner, 898 F. Supp. 1052 (S.D.N.Y. 1995) (No. 93-CV-314(AGS)).

137. EPA issued its semi-annual Unified Agenda for Proposed Rules on November 14, 1994 (November 1994 EPA Notice). 59 Fed. Reg. 58,232 (1994). In the November 1994 EPA Notice, EPA announced its plan to embark on a three-year investigation into Section 316(b) issues, and ultimately to promulgate Section 316(b) regulations. The November 1994 EPA Notice stated that

> [i]n response to the increasing number of requests from Regions and States for guidance on implementing section 316(b) of the Clean Water Act (the Act), the Office of Water plans to conduct a three-year data collection and analysis phase to quantify the adverse impacts from cooling water intake structures and the efficacy of current and prototype control mechanisms. Upon conclusion of the data collection and analysis, the workgroup will develop options for regulatory development (type of regulation, setting a performance standard or decision criteria) and then proceed along a standard regulatory development path to final regulation signature. This initiative is particularly significant since the current

On July 24, 1995, the court sided with the Keepers, finding that the Electric Utilities had not demonstrated that they had the right of either permissive or mandatory intervention.[138] The court also addressed the propriety of the EPA/Keepers proposed consent decree. The proposed consent decree will require EPA to promulgate Section 316(b) regulations by July 2, 1999.[139] The Electric Utilities argued that this requirement will preclude either EPA or the states from applying BTA requirements on a case-by-case basis.[140] The court disagreed, observing that the "language of the [proposed] Consent Decree could hardly less restrict the content of the proposed regulation. Accordingly, under the decree EPA could, if otherwise appropriate, propose and issue regulations that do not embody a generally applicable rule."[141] The court also noted that the Electric Utilities will still possess a full panoply of rights which they can later assert during the Section 316(b) rulemaking process, including the option of responding to any modifications to the consent decree as an amicus party.[142] In short, the court found that nothing in the proposed consent decree would "impair the Utilities' interest in the least."[143] The Electric Utilities elected not to appeal the decision.

Currently, although the proposed consent decree has been neither executed by the parties nor formally approved judicially, the court has already determined that the decree will further the objectives of the Clean Water Act, Section 316(b), and the public interest and is therefore entitled

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> lack of national standards for intake structures allows situations where significant percentages of aquatic communities have been severely impacted either by entrainment or impingement at the cooling water intake. This regulation is needed to establish the technological control floor for minimizing adverse impacts (as stated in section 316(b) of the Act), to encourage the development of better methods to reduce adverse impacts, and to increase consistency in the application of section 316(b).

Id. at 58,236-37. In the November 1994 EPA Notice, EPA acknowledged that "Hudson Riverkeeper and others have filed suit in the United States District Court for the Southern District of New York to compel EPA to re-promulgate regulations under 316(b). Negotiations are ongoing." *Id.* at 58,236.

138. *Cronin*, 898 F. Supp. at 1057.

139. *Id.* at 1061.

140. *Id.*

141. *Id.* at 1062.

142. *Id.* at 1063. The court also dismissed the Electric Utilities' attack of three procedural provisions of the proposed consent decree requiring EPA to provide the Keepers with written status reports, submit to court conferences, and abide by certain procedures for modifying the decree. *Id.* at 1062.

143. *Id.* at 1062.

to a presumption in favor of approval.[144] At the time of this writing, effectuation of the decree appears to be imminent.[145]

C. *The Relationship Between Section 316(b), Sections 316(a) and 316(c)*

Section 316 also addresses the impact of thermal discharges. Sections 316(a) and (c) allow for a process to afford permit holders a variance from current, and immunity from some forthcoming, thermal effluent standards.[146] How Congress, courts and agencies have construed Section 316(a) is beyond the scope of this paper, except for how it relates to Section 316(b).

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144. *Id.* at 1064.

145. Interview with Theresa R. Hanczor, Senior Staff Attorney, Hudson Riverkeeper Fund (Aug. 3, 1995).

146. 33 U.S.C. §§ 1326(a), 1326(c) (1988). Sections 316(a) and 316(c) of the CWA provide in full:

> [§ 316](a) Effluent limitations that will assure protection and propagation of balanced, indigenous population of shellfish, fish, and wildlife
>
> With respect to any point source otherwise subject to the provisions of section 1311 of this title or section 1316 of this title, whenever the owner or operator of any such source, after opportunity for public hearing, can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, the State) may impose an effluent limitation under such sections for such plant, with respect to the thermal component of such discharge (taking into account the interaction of such thermal component with other pollutants), that will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water.
>
> * * * *
>
> [§ 316](c) Period of protection from more stringent effluent limitations following discharge point source modification commenced after October 18, 1972
>
> Notwithstanding any other provision of this chapter, any point source of a discharge having a thermal component, the modification of which point source is commenced after October 18, 1972, and which, as modified, meets effluent limitations established under section 1311 of this title or, if more stringent, effluent limitations established under section 1313 of this title and which effluent limitations will assure protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in or on the water into which the discharge is made, shall not be subject to any more stringent effluent limitation with respect to the thermal component of its discharge during a ten year period beginning on the date of completion of such modification or during the period of depreciation or amortization of such facility for the purpose of section 167 or 169 (or both) of title 26, whichever period ends first.

While Sections 316(a) and 316(b) are both applicable to steam electric powerplants which utilize CWISs and discharge heated wastewater, the restrictions imposed by Section 316(b) are imposed independently of those required by Section 316(a). The CWA prohibits the discharge of a pollutant from a point source in the absence of a permit.[147] The CWA defines the term "pollutant" to include "heat."[148] Therefore, a steam electric powerplant which collects cooling water from a source waterbody and then discharges that water at an elevated temperature back into a receiving stream is discharging a pollutant and is required to have a permit pursuant to the CWA. Additionally, because heat is defined as a pollutant, EPA is required to set standards of performance on heat for new sources, including steam electric powerplants,[149] pursuant to Section 306.

Section 316(a), however, modifies the requirements of Sections 301 and 306 for heat.[150] Section 316(a) gives the permit writer the authority to grant a variance from an effluent limitation for heat if the permit applicant can show that the effluent limitations "proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the [protection] and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made."[151] In conjunction, Section 316(c) then provides relief from any more stringent restrictions for a period of ten years.[152]

Section 316(b), on the other hand, places BTA requirements on CWISs by requiring that a powerplant utilize BTA for minimizing the adverse environmental impacts caused by its CWIS.[153] In contrast to Section 316(a), Section 316(b) does not allow a permit holder to vary from its technology-forcing mandates.

Accordingly, powerplants which draw cooling water through a CWIS and later discharge this water at elevated temperatures are subject to the provisions of both Sections 316(a) and 316(b) of the CWA. Although a steam electric powerplant may be subject to both requirements, the impact that a Section 316(a) determination has on a Section 316(b) decision is very different from the converse. Thermal effluent limitations and Section 316(a) address the problems created by the discharge of large volumes of

147. 33 U.S.C. § 1311(a).

148. 33 U.S.C. § 1362(6).

149. 33 U.S.C. § 1316(b)(1).

150. *Decision of the Gen. Counsel No. 63, supra* note 73, at 379, 382.

151. 33 U.S.C. § 1326(a).

152. 33 U.S.C. § 1326(c).

153. 33 U.S.C. § 1326(b).

heated water into the aquatic ecosystem. Section 316(b) addresses the problems caused by the intake of large amounts of water from a source waterbody. Thus, EPA and a cacophony of courts have rightfully found that the two Sections address distinctly different environmental concerns and deserve independent treatment.

Although Sections 316(a) and 316(b) address different environmental issues, a Section 316(a) determination may be influenced by the environmental impacts that form the central focus of Section 316(b), i.e., losses due to impingement and entrainment. Section 316(a) requires establishment of a thermal effluent limitation which will "assure the [protection] and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on [a] body of water."[154] Thus, when reviewing the effects of a thermal discharge in making a Section 316(a) determination, "[t]he effect of the discharge must be determined not by considering its impact on some hypothetical unstressed environment, but by considering its impact on the environment into which the discharge will be made, [as] this environment will necessarily be impacted by the intake,"[155] i.e., by impingement and entrainment losses.

Although 316(a) determinations allow consideration of the impacts addressed by Section 316(b), the opposite is not true.[156] While Section 316(a) focuses on whether a "balanced indigenous population" will be maintained, Section 316(b) requires minimization of "adverse environmental impact[s]."[157] As EPA General Counsel has noted, "[s]imply because cooling water could be discharged at a temperature which does not unduly disrupt the aquatic ecosystem does not mean that the withdrawal of the cooling water therefore will also not have an adverse environmental impact."[158] Thus, even if the impingement and entrainment impacts caused by an intake structure would not interfere with the existence of a "balanced indigenous population," any adverse environmental effects (including the effects of impingement and entrainment) must be minimized.[159] Thus, a Section 316(b) determination is not governed by whether impingement and entrainment interfere with fish *populations*; quite the contrary, the purpose of Section 316(b) is to

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154. 33 U.S.C. § 1326(a).

155. *See, e.g., In re* Public Service Co. of N.H., 10 Env't Rep. Cas. (BNA) 1257, 1261 (EPA June 17, 1977) [hereinafter *Seabrook II*].

156. *See Decision of the Gen. Counsel No. 63, supra* note 73, at 378, 381; *Brunswick I*, Region IV, EPA 3, 27 (Nov. 7, 1977) (Initial Decision re: Permit No. NC007064).

157. *Decision of the Gen. Counsel No. 63, supra* note 73, at 381-82.

158. *Id.*

159. *Id.* at 382.

minimize *any* adverse environmental impact, not just impact interfering with balanced indigenous populations. As a result, "[p]ermit conditions may be imposed under [s]ection 316(b) [to minimize impacts] . . . independent of any proceeding to modify an effluent limitation under [s]ection 316(a)."[160]

Agencies have consistently recognized the regulatory distinction between Section 316(b) and Sections 316(a) and 316(c). For instance, *In re Public Service Company of Indiana, Inc.* ("*Cayuga*") involved two 500-MW units operated by the Public Service Company of Indiana (PSI) employing a once-through cooling system along the Wabash River.[161] In *Cayuga*, in 1979 the Regional Administrator (RA) for Region V issued an Initial Decision (ID) which found that the thermal discharge from the powerplant assured protection and propagation of a balanced and indigenous population of shellfish, fish, and wildlife in accordance with Section 316(a) of the CWA.[162] The staff of the EPA Region V Enforcement Division and the Indiana Stream Pollution Control Board curiously appealed the ID together.

EPA Administrator Costle remanded the ID, finding that the RA had failed to consider certain factors that could have affected his conclusion that the station's operation warranted a Section 316(a) variance.[163] Consequently, even though the petitioners had contested the RA's finding that the CWIS at the Cayuga plant complied with Section 316(b), the Administrator's remand of the Section 316(a) issue made it unnecessary to rule on the merits of Petitioner's Section 316(b) claim.[164] The Administrator noted, however, that the Section 316(a) and Section 316(b) issues were "inextricably intertwined" and that the design, location, construction and capacity of the CWIS were relevant stresses to be considered in a Section 316(a) determination.[165]

The statutory and regulatory context of Section 316(b) in theory is one thing; in practice it is quite another, as will be explored in Part III of this Article.

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160. *Id.* at 378.

161. *In re* Public Service Co. of Ind., Inc., No. NPDES-V-061(AH), NPDES-V-062(AH), 1979 NPDES LEXIS 5, at *1-2 (EPA Nov. 29, 1979) [hereinafter *Cayuga*].

162. *Id.*

163. *Id.*

164. *Id.* at *43-44.

165. *Id.* at *45.

III. Survey of Representative Activities Invoking Section 316(b)

With the statutory and regulatory context of Section 316(b) in mind, the following passages detail representative permits and decisions which have invoked the provision. These activities can be broken down into four basic components: the seminal *Seabrook* and *Brunswick* ("baiting the hook"); the use of biological monitoring and studies to explore the perimeter of the Section ("casting the line"); strict compliance with the Section ("reeling it in"); and the limited use of mitigation projects to effect compliance ("bending the pole"). For the sake of cogency these activities are provided with geographical headstones and are addressed more or less sequentially.

A. Baiting the Hook—The Seminal Seabrook and Brunswick Decisions

Seabrook, *Brunswick*, and their progeny established an influential body of EPA decisions pertaining to interpretation and application of the requirements of Section 316(b). Most importantly, these cases still provide a context for consideration of how costs should affect Section 316(b) determinations and offer a roadmap for visiting the Section's salient terms. In the absence of implementing regulations, and as amplified by the EPA in *Decision of the General Counsel No. 63*, *Seabrook* and *Brunswick* continue to illustrate EPA's best articulated analysis of Section 316(b) determinations on a case-by-case basis. *Seabrook*, *Brunswick*, and *Decision of the General Counsel No. 63* are discussed in detail below.

1. Seabrook

Of the early decisions to construe the requirements of Section 316(b), by far the most controversial and heavily reported involved an immense nuclear-fueled, steam-electric generating station proposed by the Public Service Company of New Hampshire (PSCO) in Seabrook, New Hampshire. The Seabrook line of decisions took a serpentine path from an initial decision by the RA of EPA Region I in 1976, to a repeat performance before the First Circuit Court of Appeals in 1979.[166]

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166. *Seabrook II*, 10 Env't Rep. Cas. (BNA) 1257, 1257 (EPA June 17, 1977); *rev'd and remanded sub nom.*, Seacoast anti-Pollution League v. Costle [Seabrook III], 572 F.2d 872 (1st Cir. 1978), Decision of Administrator Costle issued on remand *sub. nom.*, *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15 (EPA Aug. 4, 1978), *aff'd sub nom.*, Seacoast Anti-Pollution League v. Costle, 597 F.2d 306 (1st Cir. 1979) [hereinafter *Seabrook V*].

Seabrook involved two proposed 1,000 megawatt units near Hampton Harbor estuary, about two miles inland from Hampton and Seabrook beaches.[167] The station's CWIS would have consisted of three structures, each with a diameter of 30 feet, 6 inches, located 7 feet off the bottom of the Atlantic Ocean, with an intake velocity of about 1 foot per second, and an intake flow of about 1.2 billion gallons per day (BGD).[168] PSCO proposed to place the CWIS approximately 3,000 feet east of Hampton Beach (known as the "near site"): EPA subsequently required PSCO to locate the CWIS about 4,000 feet to the northwest (known as the "far site").[169] EPA also required PSCO to install a diffuser system at the CWIS's outfalls, and to apply a special coating to the CWIS to prevent biofouling.[170] Moreover, EPA required PSCO to "backflush" the CWIS as an alternative to chemical means of controlling biofouling.[171]

In *Seabrook I*, the Regional Administrator for Region I in 1976 issued an ID which reversed an earlier EPA Section 316 determination that had approved PSCO's use of once-through cooling at the station.[172] On appeal, in *Seabrook II*, EPA Administrator Costle in 1977 reversed *Seabrook I*.[173] By far the most resonating findings in *Seabrook II* pertained to the role of costs in applying Section 316(b). First, the Administrator noted that although Section 316(b) does not contemplate a formal cost/benefit analysis,[174] both the legislative history of the CWA and the preamble to the 1976 Regulations directed BTA to mean "best technology commercially available at an economically practicable cost."[175] With that reflection, the Administrator then fired a reverberating shot heard 'round the Section

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167. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1258-59. Units 1 and 2 were to begin operation in 1981 and 1983, respectively. *Id.*

168. *Id.* at 1259.

169. *Id.*

170. *Id.* at 1259, 1272.

171. *Id.* at 1260. "Backflushing" consists of reversing the flow of the CWIS at a temperature of 120°F for a period of two hours through the entire length of the intake system. *Id.*

172. *Id.* at 1258.

173. *Id.* at 1257. The Administrator's prolix decision also addressed a myriad of related subjects, including the applicability of the Appalachian Power decision, the "nature of Sections 316(a) and (b)," cost considerations, burdens of proof, and the applicability of CWA § 403 (which prohibits the issuance of NPDES permits in contravention of EPA guidelines). *Id.* at 1260-74.

174. *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15, at 5 (order denying request for modification). Following the Administrator's decision in *Seabrook II*, the EPA Office of General Counsel requested him to modify Seabrook II so as to remove any suggestion that EPA had changed its policy with regard to the need to conduct a cost-benefit analysis in certain non-BTA related circumstances. *Id.* at 8. The Administrator denied the request, noting that Seabrook II did not signal any change in EPA policy. *Id.*

175. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1260, 1261 n.2 (citing CWA Legis. Hist., 93d Cong., 1st Sess. (1972) at 264).

316(b) world. The Administrator declared, "I do not believe that it is reasonable to interpret Section 316(b) as requiring use of technology whose cost is wholly disproportionate to the environmental benefit to be gained."[176] This oft-quoted prose of Administrator Costle has come to be championed as the "wholly disproportionate" test.

With regard to "capacity," the Administrator made two findings in *Seabrook II*. He first determined that although Section 316(b) does not require the use of closed-cycle cooling *per se*, an agency may nonetheless restrict capacity to a point which would logically necessitate its use.[177] Next, he concluded the principal element of "capacity" to be intake volume instead of either the size or the intake velocity of the CWIS.[178]

Turning next to "location," the Administrator stated that the most important factor is the relationship of the CWIS's location to spawning areas, nursery areas, and impingable organisms.[179] The Administrator also addressed location as it pertained to impingement and entrainment. The Administrator determined that because impingement losses of finfish were likely to be "negligible," PSCO did not need expensive and time consuming studies of impingable finfish in the water column affected by the CWIS.[180] Next, the Administrator found that entrainment losses attributable to the CWIS did not warrant altering its approved location for two reasons. First, he noted that PSCO's entrainment model was reliable and had predicted an "insignificant" maximum reduction of adult Mya populations of only 4.6% (due to entrainment of Mya larvae) even though it did not take into account compensatory mechanisms and density-dependent limiting factors. Thus, he concluded that the location of the CWIS reflected BTA.[181] Second, due to post-larval recruitment of fishes from other areas, the Administrator reached the same conclusion with regard to the adverse impacts of entrainment losses on icthyoplankton.[182]

Concerning "design," the Administrator suggested that installation of a velocity cap, use of an antifouling protective coating on the CWIS (to discourage growth of aquatic life that it might attract), and employment of an existing diffuser design constituted BTA and made unnecessary "diversion or other means of avoiding [fish] entrapment."[183] Hence, the

176. *Id.* at 1261.
177. *Id.* at 1262.
178. *Id.* (citation omitted).
179. *Id.* at 1264, 1270.
180. *Id.* at 1270-71.
181. *Id.* at 1271-72.
182. *Id.* at 1272.
183. *Id.* at 1270-72.

Administrator concluded that the design and location of the station's CWIS reflected BTA.[184]

The Administrator's decision, however, involved some unorthodox administrative procedures. First, he convened a panel of experts to assist with his review of the record, yet did not subject them to cross-examination.[185] Next, during his review, the Administrator opened the record exclusively to PSCO to receive various information and documentation.[186] These puzzling moves ultimately served to boomerang the case back the following year.

In *Seabrook III*, the First Circuit Court of Appeals invalidated and remanded *Seabrook II* strictly on procedural grounds.[187] First, with regard to the Administrator's consideration of any information not reflected by the administrative record and not subject to cross-examination (such as that provided by the expert panel), the court presented the Administrator with what he surely must have considered to be a Hobson's choice—either approach the matter anew and disregard any ill-begotten information, or consider it only after making all such information subject to cross-examination as part of the administrative record.[188] The court also concluded that it was improper for the Administrator to have solicited materials from PSCO to supplement those found in the public record.[189] Accordingly, the court vacated and remanded *Seabrook II* to the Administrator with instructions.

The Administrator put the First Circuit's February 15, 1978, instructions into effect with astounding speed.[190] On March 20, 1978, he commenced a "supplemental" proceeding whereby the reassembled technical review panel identified all materials germane to *Seabrook II* and were subjected to cross-examination.[191] He also reopened the public record and had Region I prepare a technical summary and analysis of any newly submitted evidence, the authors of which were also subject to cross-examination.[192]

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184. *Id.* at 1272. Parenthetically, it appears that the sole reason the Administrator chose not to state in his conclusion that the station's capacity reflected BTA was because PSCO did not raise this issue on appeal.

185. *Id.* at 1258.

186. *Seabrook III*, 572 F.2d at 878.

187. *Id.* at 879-82.

188. *Id.* at 882.

189. *Id.* at 878-80 (construing the Administrative Procedure Act, 5 U.S.C. §§ 554, 556-557).

190. *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15.

191. *Id.* at *4.

192. *Id.*

Thereafter, on August 4, 1978, the Administrator issued a supplemental decision in *Seabrook IV*.[193] On remand, the Seacoast Anti-Pollution League and the Audubon Society of New Hampshire argued that the intake structure should have been located even farther offshore from the far site.[194] The Administrator noted that although change "would further minimize entrainment impacts to surface oriented planktonic organisms," it could result in additional entrainment and impingement losses to finfish and their larvae.[195] Further, although the Administrator had determined that moving the intake structure farther offshore from the far site would further minimize plankton entrainment,[196] he found that the costs of additional tunneling for the intake structure would be in excess of $20 million,[197] which cost he determined to be "wholly disproportionate to any environmental benefit."[198] He also believed that relocation of the CWIS could result in substantial delays.[199] The Administrator required PSCO to use special anti-biofoulant material on the CWIS so as not to attract foraging fish and to place special diffusers on the exit conduit,[200] and he concluded that the "general design and location of Seabrook Station's intake and discharge offshore, and not in an estuary, are also special considerations."[201] Having concluded that the design, location, and capacity of Seabrook's CWIS reflected BTA,[202] the Administrator reinstated his findings from *Seabrook II* which allowed PSCO to construct the plant with a once-through cooling system.[203]

Environmental groups appealed *Seabrook IV* back to the First Circuit in Seacoast Anti-Pollution League v. Costle ("*Seabrook V*").[204] In *Seabrook V*, the Seacoast Anti-Pollution League and Audubon Society of New Hampshire again challenged the propriety of the Administrator's

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193. *Id.* at *1.

194. *Id.* at *69.

195. *Id.*

196. *Seabrook V*, 597 F.2d at 311 (citing *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15, at *49-50).

197. *Id.*

198. *Id.*

199. *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15, at *69. The Administrator found that the relocation of the intake structure in water 75 feet deep, as demanded by the petitioners, would require tunneling through an additional 4,000 feet of granite, a task which appeared to be technologically infeasible and which, in any event, would cost more than $20 million. *Id.* at n.22.

200. *Id.* at *85.

201. *Id.* at *86.

202. *Id.* at *85.

203. *Id.* at *85-86.

204. *Seabrook V*, 597 F.2d at 306.

application of Section 316(b).[205] The petitioners claimed that the Administrator had improperly included the estimated costs of delay and re-engineering in *Seabrook IV*.[206] Noting that costs are clearly an "acceptable consideration," the court in *Seabrook V* held that the Administrator had based his decision on appropriate cost factors.[207] Next, the petitioners alleged that the "Administrator's approval of the one-foot-per-second intake velocity" failed to consider information indicating adverse impacts on juvenile fish.[208] The First Circuit rejected this averment as well, noting that the Administrator had made a special attempt to consider the effects of the CWIS on certain types of juvenile fish and that the approved intake velocity for the facility was "unusually low."[209]

Although its cost analysis was too abstract to be paradigmatic, the considerable attention the Seabrook line of decisions paid solely to technological issues associated with Section 316(b) nonetheless represents a distinctive and important application of the law. As will be shown, however, any doubt remaining about how costs influence Section 316(b) determinations quickly evaporated with the Brunswick line of decisions.

2. Brunswick

Few agencies or courts have approached the level of erudition in a BTA determination as that provided by the Brunswick line of decisions.[210] The Brunswick lineage involves a 1,642 MW double reactor nuclear-fired powerplant, operated by Carolina Power and Light (CP&L), located on the Cape Fear River, approximately 16 miles south of Wilmington, North Carolina.[211] CP&L had filed an application in 1968 before the Atomic Energy Commission (AEC) to construct the plant.[212]

The Brunswick powerplant is located near the commercially important and ecologically sensitive Cape Fear Estuary, from which it withdraws

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205. *Id.* at 307-08. The petitioners also sought review of a procedural aspect of *Seabrook IV*, the Administrator's explanation in the *Seabrook IV* decision, and various issues related to Section 316(a). *Id.* at 307.

206. *Id.* at 311.

207. *Id.*

208. *Id.*

209. *Id.*

210. *Brunswick I*, Region IV, EPA 3 (Nov. 7, 1977) (Initial Decision re: Permit No. NC007064); *In re* Carolina Power & Light Co., Appeal No. 77-19, 1978 NPDES LEXIS 4 (EPA Feb. 20, 1978) [hereinafter *Brunswick II*].

211. *Brunswick I*, at 3, 8-9 (Initial Decision re: NC0007064).

212. *Brunswick II*, Appeal No. 77-19, 1978 NPDES LEXIS 4, at *3.

about 1.8 BGD of cooling water.[213] After using it for cooling water, CP&L discharges the estuarine water into the Atlantic ocean.[214] To recruit water from the estuary, CP&L uses an 18,000 foot (3.4 miles) canal that swathes a course through one of the estuary's storied marshes.[215] The powerplant's "delta T" (the difference between the temperature of the withdrawn water and the water as discharged) is about 20.9°F, with a total travel time of approximately five hours.[216] Each of the CWIS's eight intake bays are equipped with trash bars, vertical traveling screens covered by 3/8-inch wire mesh, and high pressure water jets which force impinged organisms into a floating basket which are then taken to a watercraft and dumped at various locations in the estuary.[217]

In the early 1970s, the AEC issued an "environmental statement" requiring CP&L to retrofit the powerplant with closed-cycle cooling towers.[218] In accordance both with the AEC's finding and an action by an environmental group, CP&L agreed.[219] Correspondingly, in 1974, the AEC granted CP&L an operating license subject to installation of a closed-cycle cooling system.[220] Later in 1974, CP&L applied for an NPDES permit with EPA. The resultant permit issued by EPA also required CP&L to install a closed-cycle cooling system at the Brunswick plant.[221] CP&L appealed this permit condition in 1975.[222] Pending completion of EPA administrative hearings, both EPA and the Nuclear Regulatory Commission (NRC, successor to the AEC) postponed judgment on the issue.[223] Sometime later, however, the NRC authorized CP&L to cease construction of the cooling towers.[224]

EPA's decision to require CP&L to install a closed-cycle system at the plant spawned appeal by the utility. Before Region IV ruled on the appeal, it sought guidance from EPA's Office of General Counsel (OGC) about various issues. In *Decision of the General Counsel No. 41* an EPA "Presiding Officer" certified various Section 316(b) issues in 1976

213. *Brunswick I*, at 5, 12 (Initial Decision re: Permit No. NC0007064).
214. *Id.* at 1.
215. *Id.* at 10-11.
216. *Id.* at 13-14.
217. *Id.* at 11, 15-16.
218. *Brunswick II*, Appeal No. 77-19, 1978 NPDES LEXIS 4, at *3.
219. *Id.* at *3-4.
220. *Brunswick I*, at 17 (Initial Decision re: Permit No. NC0007064).
221. *Id.* at 19.
222. *Id.* at 20.
223. *Id.*
224. *Brunswick II*, Appeal No. 77-19, 1978 NPDES LEXIS 4, at *5.

involving the powerplant for resolution to the EPA OGC.[225] In *Decision of the General Counsel No. 41*, EPA's OGC addressed two principal issues. First, the OGC found that although Section 316(b) authorizes a reduction of intake flow to a point which may necessitate closed-cycle cooling, it "does not authorize [an agency] to impose a specific closed-cycle cooling technology . . . [although] the use of a particular treatment system may be a predictable consequence of the limitation imposed on the discharge of specific pollutants."[226]

Second, the OGC opined that an agency *need not* impose a "performance standard" related to the degree of significance of adverse environmental impact caused by a CWIS.[227] In short, the OGC found that a CWIS must reflect BTA regardless of the level of environmental harm attributable to it. "[CWISs] must reflect the [BTA] for *minimizing* (i.e., 'reducing to the smallest possible amount or degree') adverse environmental impact—*significant or otherwise. All* environmental harm should be avoided."[228]

Thereafter, EPA Region IV issued an Initial Decision in 1977 which would have forced CP&L to retrofit its existing once-through system with closed-cycle cooling.[229] In the Initial Decision, the Regional Administrator upheld the permit and advised CP&L to install a closed-cycle cooling system to meet the requirements of Section 316(b).[230] The RA reached this result following an exhaustive discussion of the statutory framework of Section 316(b).[231]

Exploring the essence of Section 316(b), the RA divided his inquiry into four principal issues so as to breathe life into the statutory language of Section 316(b): (1) whether the powerplant's CWIS resulted in adverse

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225. *In re Brunswick Steam Electric Plant, Decision of the General Counsel on Matters of Law Pursuant to 40 CFR § 125.36(m), No. 41*, 2 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM ADJUDICATORY HEARING PROC., DECISIONS OF THE ADMIN. AND DECISIONS OF THE GEN. COUNSEL 172 (1976) [hereinafter *Decision of the Gen. Counsel No. 41*]. The two other issues addressed were: (1) whether Section 316(b) applies prior to the compliance date for thermal effluent limitations (yes); and (2) whether the permittee is estopped from contesting a requirement that it install closed-cycle cooling towers because it agreed previously to this condition by stipulation (no). *Id.* at 172-73, 184.

226. *Id.* at 176, 181.

227. *Id.* at 182.

228. *Id.* at 183 (citations omitted) (emphasis added).

229. *Brunswick II*, Appeal No. 77-19, 1978 NPDES LEXIS 4, at *1-4. The once-through cooling system cost $42.3 million to install. *Id.* at *5. The cooling towers were projected to cost $106 million. *Id.*

230. *Brunswick I*, (Initial Decision re: Permit No. NC0007064).

231. Among other things, the RA discussed the nature of technological and water quality based regulation under the CWA, the history of Section 316, and differences between Sections 316(a) and 316(b). *Id.* at 22-27.

environmental impact;[232] (2) if so, whether the "location, design, construction and capacity of the [CWIS] reflect[s] [BTA] for minimizing adverse [environmental] impact";[233] (3) whether practicable alternate technologies were available to minimize the adverse environmental effects;[234] and (4) whether the costs of practicable technologies were "wholly disproportionate to the environmental benefit[s]" conferred by such measures.[235] The following subsections examine how the RA addressed each of these issues in *Brunswick I*.

a. Whether the Brunswick Station's CWIS Resulted in Adverse Environmental Impact

In *Brunswick I*, the RA found that the powerplant's CWIS was having an adverse environmental impact. The RA stated that "adverse" meant "unfavorable, harmful, difficult, or detrimental."[236] Conversely, CP&L argued that "adverse" should be "irreversible or irretrievable"; that is, "incapable of being reversed" and "impossible to recoup, repair, or overcome."[237] In essence, CP&L believed that "adverse" should require an agency to demonstrate that a CWIS's damage on a waterbody was or would be permanent.[238] The RA rejected this construction of the term outright, explaining that "an impact need not be irreversible or irretrievable to be adverse."[239] Based on an extensive administrative record, the RA ruled that impingement and entrainment losses from the plant were having an adverse environmental impact.[240]

b. Whether the Location, Design, and Capacity of Brunswick's CWIS Reflected BTA

In *Brunswick I*, the RA found that the location, design and capacity of the powerplant's CWIS did not reflect BTA. He addressed location, design, and capacity as follows.

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232. *Id.* at 28.
233. *Id.* (citation omitted).
234. *Id.* at 71-72.
235. *Id.* at 61 (citation omitted).
236. *Id.* at 28 (citation omitted).
237. *Id.* (citation omitted).
238. *Id.* at 29-30.
239. *Id.* at 31.
240. *Id.* at 33-44.

(i) Whether the Location of Brunswick's CWIS Reflected BTA

Given that the station's CWIS was located in an estuary, criss-crossed valuable marshlands, and discharged entrained estuary-borne organisms into the ocean, the administrative record in the case, the RA maintained, clearly demonstrated that the CWIS was "poorly sited."[241] Consequently, the RA determined that the location of Brunswick's CWIS did not reflect BTA.[242]

(ii) Whether the Design of Brunswick's CWIS Reflected BTA

The RA determined that the design of Brunswick's CWIS did not reflect BTA at several levels. First, he noted that the lengthy intake channel (3.4 miles) proved to be an attractive yet deadly entrance into the system's CWIS.[243] Second, the traveling screens did not operate in a continuous fashion.[244] He found that high-pressure sprayers—which were designed to remove debris, not fish—proved harmful and that the fish return process generally harassed whatever adult and juvenile finfish were removed from the plant's intake screens.[245]

(iii) Whether the Capacity of Brunswick's CWIS Reflected BTA

The RA noted that entrainment damage is primarily a function of water withdrawal volume and organism density.[246] Thus, not surprisingly, the RA found that the tremendous amount of cooling water used by the plant (approximately 2 BGD) resulted in a correlative loss of aquatic organisms.[247]

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241. *Id.* at 3-16, 72.

242. *Id.* at 54.

243. *Id.* at 10-11, 55.

244. *Id.* at 57.

245. *Id.* at 15-16, 37-38.

246. *Id.* at 58.

247. *Id.* at 59. For example, the record in *Brunswick I* demonstrated that the plant's CWIS was responsible for a loss of up to nine million adult shrimp annually. *Id.*

c. Whether Alternative Technologies Were Available

Having determined that the Brunswick station was having an adverse impact and that the design, location, and capacity of this CWIS did not reflect BTA, the RA fixed his sights on determining which technologies would be "best" for the plant.[248] Unfortunately, the RA found that no alternate design was "capable of satisfactorily minimizing [the plant's] adverse effects."[249] With regard to "location," the alternative "best" technology would have been to relocate the intake canal "to a less biologically sensitive area, i.e., the Atlantic Ocean."[250] However, because relocation of the intake canal would engender significant delays and would result in interim environmental damage and other problems, the RA found relocation not to be a feasible alternative.[251]

Therefore, the RA found that the record supported installation of a closed-cycle cooling system at the plant as the only available means of minimizing adverse environmental impacts.[252] Such a system would have reduced entrainment by approximately 96%.[253] As such, the RA concluded "the only currently feasible alternative . . . is to severely restrict the flow of water,"[254] thus welcoming the installation of a closed-cycle cooling system at Brunswick.

d. Whether the Costs of BTA Options for the Brunswick Station are Wholly Disproportionate to Environmental Benefits Conferred

Having determined: (1) that the Brunswick station's CWIS was having an adverse impact; (2) that its design, location and capacity did not reflect BTA; and (3) that there existed technologies for minimizing adverse environmental impact, the RA addressed whether the costs of available BTA options fell within the ambit of the "wholly disproportionate" test articulated by the Administrator in *Seabrook II*.[255] Given that CP&L had only submitted cost information relating to natural draft (hyperbolic) cooling towers, the RA limited his cost evaluation accordingly.[256]

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248. *Id.* at 71-72.

249. *Id.* at 57 (citations omitted).

250. *Id.* at 72. *See also id.* at 45-54 for a discussion of the record in greater detail.

251. *Id.* at 72-73.

252. *Id.* at 60-61.

253. *Id.*

254. *Id.* at 73.

255. Seabrook is discussed *supra* Part III.A.1.

256. *Brunswick I*, at 62 (Initial Decision re: Permit No. NC0007064).

CP&L claimed that installing natural draft cooling towers would result in an average monthly cost of $1.14 per residential customer.[257] The RA believed this amount to be overestimated[258] because, *inter alia*, CP&L had (1) miscalculated the incremental costs needed to complete construction, (2) failed to account for a residential cost multiplier of 1.3, (3) neglected to factor in a growth in population base of over 10%, and (4) inflated the cost of capital.[259]

The RA then recalculated the marginal increase in residential rates, and found them to be from $.77 to $.85 per month, or about $9.24 to $10.20 per annum.[260] Importantly, the RA noted that installation of natural draft cooling towers would have increased residential electric rates by an average of 2.5%.[261] The RA then concluded that this cost was not "wholly disproportionate" to the 96% reduction in environmental impacts attendant to retrofitting the plant with BTA.[262]

The RA concluded that it was unnecessary to defer implementation of BTA until CP&L completed further studies.[263] Based on his determinations, the RA denied CP&L's request to reopen the record, and ordered the company to submit to a compliance schedule to reduce their intake flow by 96% to about 70 MGD.[264]

On appeal in 1978, EPA Administrator Costle remanded the ID on two procedural grounds.[265] First, the Administrator held that the RA had violated federal regulations by failing to address all issues of fact or "discretion" submitted by the parties.[266] Second, because the RA refused to delay his decision pending the completion and submission of future studies by CP&L, the Administrator required the RA on remand to better describe the scientific data contemplated in making this decision.[267]

The Administrator also required the RA on remand to inquire into CP&L's state of mind by considering whether CP&L had "reason to believe cooling towers might be required when it constructed its once-

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257. *Id.* Incidentally, the North Carolina Utility Commission derived a figure of $2.76. *Id.*

258. The RA did accept CP&L's figure of about $106.3 million for capital costs and replacement power, however. *Id.* at 63.

259. *Id.* at 62-66.

260. *Id.* at 66-69.

261. *Id.* at 69.

262. *Id.*

263. *Id.* at 75-86.

264. *Id.* at 91.

265. *Brunswick II*, Appeal No. 77-19, 1978 NPDES LEXIS 4, at *2-3. By the time of the Administrator's decision, the towers were 30% constructed. *Id.* at *5.

266. *Id.* at *7 (construing 40 C.F.R. § 125.36(1)-(2)).

267. *Id.* at *8, *9.

through system, and if so, what alternatives were available to it."[268] This suggested that actual or constructive advance notice of a requirement to retrofit an existing once-through system with a closed-cycle cooling system might estop a permittee from contesting a requirement to retrofit in the future.

Shortly after *Brunswick II*, CP&L submitted a motion to reopen the record for receipt of additional modeling data along with a proposed "mitigation scheme" involving seasonal flow restrictions, intake screen alterations, and use of a "block net."[269] The RA summarily denied CP&L's motion and mitigation scheme as falling short of Section 316(b).[270] The RA then submitted a supplement to *Brunswick I*, which simply reconfirmed his earlier decision.[271] Consequently, CP&L again appealed to the Administrator for relief.[272] The principal dispute at this time revolved around impingement and entrainment modeling efforts.[273] To help resolve the dispute, the Administrator empaneled a third party modeler, who completed a study in June 1979.[274]

Following extensive hand wringing by a new RA for Region IV,[275] and a recent breakthrough in fine-mesh screen technology for a comparable facility at Big Bend, Florida,[276] EPA and CP&L announced on October 6, 1980 that they had resolved their dispute.[277] CP&L agreed to: (1) install fine mesh screen technology on four of its eight intake pump bays; (2) minimize intake flow during periods of highest biological activity; and (3) construct a permanent one-half inch mesh "block net" screen at the mouth of the intake canal to prevent larger fish and shrimp from entering the CWIS.[278]

EPA estimated that this mitigation project would have capital and annual revenue costs of $15-$20 million and $9 million, respectively,

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268. *Id.* at *9.

269. REGION IV, EPA, BRUNSWICK STEAM ELECTRIC GENERATING PLANT OF CAROLINA POWER & LIGHT COMPANY: HISTORICAL SUMMARY AND REVIEW OF SECTION 316(b) ISSUES 4 (1979) [hereinafter BRUNSWICK HISTORICAL SUMMARY AND REVIEW].

270. *Id.*

271. *Id.* at 3.

272. *Id.* at 4.

273. *Id.*

274. *Id.*

275. *See, e.g.*, Brunswick Memorandum from Howard D. Zeller Deputy Director, Enforcement Division, to Rebecca W. Hanmer, Region Administrator (Mar. 21, 1980) [hereinafter Brunswick Memorandum] (on file with the Widener University School of Law, Environmental Law Clinic).

276. *Id.*

277. Region IV, EPA, Brunswick Press Release 1 (Oct. 6, 1980) [hereinafter Brunswick Press Release].

278. *Id.*

versus $118 million and $40 million for the natural draft cooling towers.[279] Without further discussion of the components of Section 316(b), the RA said that "the new technology will make possible the high degree of protection to the estuary at a reasonable cost."[280]

Brunswick I, although flawed, still serves as the leading illustration of thoughtful enforcement of Section 316(b).

3. Decision of the General Counsel No. 63

The *Seabrook* and *Brunswick* line of cases left some fundamental Section 316(b) questions open, many of which EPA had a chance to revisit in 1977. In *Decision of the General Counsel No. 63*, the EPA Presiding Officer referred eight issues in a 1977 dispute involving a powerplant operated by Central Hudson Gas and Electric to the EPA's Office of the General Counsel (OGC).[281] The OGC ruled: (1) that a cooling tower is not an "intake structure" within the meaning of Section 316(b);[282] (2) that establishment of effluent limitations under CWA Sections 301 and 316(a) by EPA is not a prerequisite to regulation under Section 316(b);[283] (3) that Section 316(b) applies to existing, as well as new, powerplants;[284] (4) that Section 316(b) conditions may not take the form of effluent limitations;[285] (5) that Section 316(b) may restrict intake capacity to a rate less than the flow capacity needed to achieve effluent limitations;[286] and (6) that EPA has the burden of prosecuting a *prima facie* case under Section 316(b).[287] The last of these findings proved to be the most daunting. Requiring EPA to carry the burden of demonstrating infirmities with Section 316(b) instead of requiring utilities to make an affirmative showing of compliance with the provision has little, if any, foundation in the CWA. As it stands, however, *Decision of the General Counsel No. 63* calls for proof of

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279. *Id.*

280. *Id.* at 1-2. Internal EPA memoranda indicate that this decision was fueled by resource and political concerns and not by examination of each component of Section 316(b) as in *Brunswick I*. *See generally* Brunswick Memorandum, *supra* note 275.

281. *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 371. The two other issues addressed by the OGC, but not addressed here, were: (1) whether EPA retained jurisdiction over the matter after delegating authority to administer the NPDES program to New York (no); and (2) whether the effluent limitation for steam electric powerplants remanded in Appalachian Power Co. v. Train, 545 F.2d 1351 (4th Cir. 1976), were inapplicable to the permittee (yes). *Id.*

282. *Id.* at 378.

283. *Id.*

284. *Id.* at 379.

285. *Id.* at 380.

286. *Id.* at 380-81.

287. *Id.* at 383.

adverse environmental impact to a level of certainty that the statute does not contemplate and which can only be accomplished through extensive and expensive biological monitoring and studies.

Consequently, *Seabrook*, *Brunswick*, and *Decision of the General Counsel No. 63* have left in their stead the unfortunate effect of holding agencies wishing to enforce Section 316(b) hostage to utilities who are all too willing to exploit the vicissitudes of the type of scientific endeavors inherently addressed by the provision. In full view of this line of decisions, holding that permitting agencies may not impose substantial technological conversions in the absence of inordinately conclusive biological data, and then only after passing muster under the "wholly disproportionate" cost test, most agencies have sought a path of least resistance when implementing Section 316(b).

B. Casting the Line—Pursuing the Contours of Section 316(b) Through Biological Monitoring and Studies

Agencies have, for the most part, become mired in a "paralysis by analysis" and have yet to require much in the way of technological advances to CWISs nationwide. Instead, they have been forced to pursue the contours of Section 316(b) through biological monitoring and biological studies. Their legal authority to do so did not go unchecked. The regulated community challenged the authority to require biological monitoring and studies in the first place. In a 1977 case of first impression, the Seventh Circuit addressed whether and how an agency could establish monitoring requirements under the auspices of Section 316(b). In *United States Steel v. Train*, U.S. Steel owned and operated a CWIS at the Gary Works integrated steel mill along the southern shore of Lake Michigan.[288] The steel mill withdrew up to 775 MGD of water from Lake Michigan for cooling and processing purposes.[289] Accordingly, EPA required U.S. Steel to conduct an intake monitoring program as a means of evaluating the adverse impact caused by the plant's CWIS.[290]

U.S. Steel maintained that EPA could not require that it conduct such monitoring for two principal reasons. First, it contended that Section 316(b) applies solely to steam electric generating plants, and not to the industrial sector.[291] Second, it argued that EPA could not condition

288. United States Steel v. Train, 556 F.2d. 822, 830 (7th Cir. 1977).

289. *Id.*

290. *Id.* at 849.

291. *Id.*

NPDES permits upon compliance with Section 316(b).[292] The court rejected both of these arguments out of hand, and upheld agency authority to pursue Section 316(b) by virtue of biological monitoring and studies.[293]

The EPA OGC then seized an opportunity to supplement the *Decision of the General Counsel No. 63*'s handling of biological proof issues. In 1982, EPA's OGC, Water and Solid Waste Division, issued a legal opinion on several permit-related issues pertaining to Section 316 of the Clean Water Act ("1982 EPA Legal Opinion").[294] In the 1982 EPA Legal Opinion, the OGC addressed the issue of whether a permit-issuing agency could be barred from requiring a permit-holder to perform additional or updated Section 316(b) biological monitoring or studies.[295]

The OGC concluded that nothing in the law restricted the authority of a permit-issuing agency to require a permit holder to update previously performed biological monitoring and/or studies governed by Section 316(b).[296] As the following discussion of developments in the states of Illinois (Coffeen and Hennepin), Florida (Anclote), California (Diablo Canyon and Pittsburg), and New Jersey (Mercer) illustrates, some states implementing Section 316(b) have done little more than require utilities to conduct periodic biological monitoring and studies. In none of these instances have the agencies ultimately required conversion of once-through cooling to some other technological means of complying with Section 316(b).

1. Coffeen

United States v. Central Illinois Public Service Co. ("*Coffeen*") involved a 1979 consent order between EPA and the Illinois Public Service Company (IPSC). In *Coffeen*, the IPSC agreed to conduct a one-year impingement and entrainment study to determine the environmental impact

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292. *Id.*

293. *Id.* at 849-51. With regard to U.S. Steel's first argument, the court noted that Section 316(b) applied "on its face" to all point source activity requiring a Clean Water Act permit. *Id.* at 849. With regard to the second argument, the court held that the Clean Water Act mandates that an agency ensure compliance with Section 316(b) in a Clean Water Act permit. *Id.* at 850. Incidentally, the court noted that EPA should conduct "a limited cost-benefit analysis once the information on which an evaluation of the various technologies can be made available" is completed. *Id.* The court also found confidence in EPA's monitoring requirement from Section 308 of the Clean Water Act (which gives the Agency wide latitude to require monitoring and reporting) and Section 104 of the Clean Water Act (which requires EPA to study thermal discharges and to evaluate alternative methods of controlling them to implement § 316). *Id.* at 850 n.56.

294. Memorandum from Gail S. Cooper, Attorney, Water & Solid Waste Division, EPA, to Joseph J. Zadrassor, Regional Counsel Region II, EPA (Feb. 24, 1982) (EPA Legal Opinion).

295. *Id.* at 7-8.

296. *Id.* at 8 (citing 33 U.S.C. § 1318 and 40 C.F.R. § 122.7(h)).

of the 954 MW Coffeen Power Station on the Coffeen Reservoir in Illinois.[297] The Coffeen powerplant used a closed-cycle cooling system with a recirculating cooling reservoir—as opposed to recirculating cooling towers—to remove waste heat.[298]

The consent order in *Coffeen* required IPSC to conduct an impingement and entrainment study. The impingement component of the study required IPSC to collect impinged organisms from the powerplant's CWIS traveling screens once or twice per week, depending on the time of year.[299] The entrainment component of the study required IPSC to collect entrained organisms with plankton nets suspended in fifty-five gallon drums twice per week.[300] The *Coffeen* consent order then required IPSC to compare the number and biomass of impinged and entrained organisms to standing crops, fecundities, and natural mortality of organisms in heated and non-heated reference areas of the reservoir in order to determine the overall effect of the intake system on the affected fish community.[301]

The *Coffeen* consent order also required IPSC to perform an intake monitoring program to tabulate and record the weight, length, and species type of all fish impinged by the powerplant's intake system.[302] Further, the order mandated that IPSC submit a report demonstrating compliance with Section 316(b) in accordance with EPA's 1973 Development Document for Best Technology Available for Minimizing Adverse Environmental Impact for Cooling Water Intake Structures ("1973 Development Document").[303]

2. Anclote

United States v. Florida Power Corp. ("*Anclote*")[304] involved a 1979 consent decree between EPA and the Florida Power Corporation (FPC) by which FPC agreed to conduct a Section 316(b) demonstration for its Anclote powerplant located in Tarpon Springs, Pasco County, Florida.[305] FPC's Anclote powerplant uses once-through cooling, and withdraws

297. United States v. Central Ill. Public Serv. Co., No. S-CIV-76-014, 1979 U.S. Dist. LEXIS 145, at *50 (S.D. Ill. Aug. 21, 1979) (consent order) [hereinafter *Coffeen*].

298. *Id.* at *51.

299. *Id.* at *49.

300. *Id.* at *50.

301. *Id.* at *49-50.

302. *Id.* at *87.

303. *Id.*

304. United States v. Florida Power Corp., No. 78-127 CIV-T-K, 1979 U.S. Dist. LEXIS 128, (M.D. Fla. June 5, 1979) [hereinafter *Anclote*].

305. *Id.* at *2, *5.

cooling water from, and discharges wastewater into, the Gulf of Mexico.[306] The consent order in *Anclote* required FPC to submit a Section 316(b) study for approval to EPA in accordance with terms found in its NPDES permit.[307] The Section 316(b) demonstration was designed to monitor and assess adverse environmental impacts.[308]

3. Hennepin

In 1980, the Illinois Pollution Control Board (IPCB) ruled in *Illinois Power Co. v. EPA* ("*Hennepin*")[309] that an agency could set limits for the amount of dead and dying fish found in a fish return system following intake screen "backwashing."[310] The Illinois Power Company (IPC) had argued that Section 316(b) supplied the only basis for regulating the discharge of dead fish.[311] The IPCB disagreed and correctly ruled that agencies could limit the discharge of fish killed or impaired by a CWIS in accordance with state requirements that were more stringent than those imposed by the Clean Water Act.[312] Accordingly, the IPCB held that IPC's submission of an acceptable Section 316(b) demonstration and attendant biological monitoring data did not preclude it from "imposing conditions on the backwash discharge" in the meantime.[313] Upon reconsideration, the IPCB did not disturb this ruling.[314] Encased firmly in a unique state law, *Hennepin* represents only a slight departure from the usual agency propensity to go no further than simply requiring biological monitoring and studies.

4. Diablo Canyon

In 1983, in *In re Joel Jaffer* ("*Diablo Canyon*"), several petitioners contested the issuance of a state administrative order upholding the issuance of an NPDES permit by the California Regional Water Quality Control Board, Central Coast Region ("Regional Board"), to the Pacific Gas and Electric Company (PG&E) for discharge of cooling water from

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306. *Id.* at *2.

307. *Id.* at *5.

308. *Id.* at *4-5.

309. Illinois Power Co. v. EPA, PCB No. 79-243 1980 Ill. ENV LEXIS 174 (Oct. 2, 1980) (as modified 1980 Ill. ENV LEXIS 316) [hereinafter *Hennepin*].

310. *Id.* at *10-12.

311. *Id.* at *11.

312. *Id.* at *10-13 (construing § 301(b)(1)(C) of the CWA, 33 U.S.C. § 1313(b)(1)(C)).

313. *Id.* at *12.

314. Illinois Power Co. v. EPA, PCB No. 79-243, 1980 Ill. ENV LEXIS 316 (Dec. 18, 1980).

the newly constructed two-unit 2,200 MW Diablo Nuclear Powerplant, located on the coast near San Luis Obispo, California.[315] The Diablo Canyon powerplant used once-through cooling and had a design cooling water flow capacity of 2.67 BGD.[316] Petitioner Joel Jaffer contended that PG&E's NPDES permit did not ensure compliance with Section 316(b), and that the state should have required PG&E to complete an updated Section 316(b) demonstration/study before allowing it to initiate commercial operation.[317]

On appeal, the State of California's Water Resources Control Board ("State Board") upheld the order of the Regional Board.[318] As part of its order, the State Board required PG&E to submit to the Regional Board an updated Section 316(b) study regarding the adverse environmental impact of the plant within ninety days of either the effective date of the order, or before commencement of commercial operation.[319] Among other things, the study contained an investigation into zooplankton entrainment, seasonal distribution of plankton and larval fish, delayed mortality of entrained copepods, impingement of fish and macroinvertebrates, and ecological studies of the intake source waterbody.[320] The State Board then modified PG&E's permit to require it to submit a revised Section 316(b) demonstration within thirty-six months after beginning commercial operation.[321] PG&E's revised Section 316(b) demonstration was to evaluate alternate technologies for minimizing adverse environmental impacts.[322]

5. Mercer

In *Public Service Electric & Gas Co. v. New Jersey Department of Environmental Protection* ("*Mercer*"), the utility entered into a settlement agreement with the Department of Environmental Protection (NJDEP) in 1986, whereby it agreed to conduct "[c]ontinued biological monitoring" to comport with Section 316(b) at its Mercer, New Jersey steam-electric

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315. *In re* Joel Jaffer, No. WQ 83-1, 1983 Cal. ENV LEXIS 32 (Mar. 19, 1983) [hereinafter *Diablo Canyon*].

316. *Id.* at *4.

317. *Id.* at *41-42.

318. *Id.* at *43.

319. *Id.* at *123.

320. *Id.* at *43.

321. *Id.* at *42.

322. *Id.* at *122-23.

powerplant.[323] The initial step of PSE&G's Section 316(b) monitoring was a "plan of study" by which it would first evaluate and delineate "all factual circumstances which may have materially changed since [its then-existing permit 316(b)] determination," and then evaluate "significant environmental impacts resulting from operation of the station's [CWIS] and draw conclusions on the identified impacts."[324] After completing an approved plan of study, PSE&G agreed to submit a schedule to implement the study, develop a Section 316(b) compliance report, and submit a final compliance report to NJDEP no later than six months prior to permit expiration.[325]

6. Pittsburg

In *Pittsburg Steam Electric Generating Station* ("*Pittsburg*"), the California Regional Water Quality Control Board, San Francisco Bay Region ("Regional Board"), issued an NPDES permit in 1990 to the Pacific Gas and Electric Company (PG&E) which allowed it to continue to operate seven units at its Pittsburg powerplant near San Francisco, in a once-through cooling mode.[326] PG&E's Pittsburg powerplant Units 1-6 require about 1.04 BGD of cooling water, which they withdraw from a nursery area for striped bass in the Suisan Bay.[327] The Regional Board found that striped bass populations had been in decline since the powerplant began commercial operation.[328] The cause of this decline was in dispute.[329] Apparently, the seasonal effects of the powerplant CWIS were fairly dramatic—about 90% of all fish losses due to entrainment occurred during a floating sixty-day period between May and August.[330] To understand better the extent of loss of striped bass attributable to the powerplant's CWIS, the state required PG&E to implement an entrainment monitoring program.[331]

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323. Public Service Elec. & Gas Co. v. New Jersey Dep't of Envtl. Protection [Mercer], No. EWR 7504-85, 6 (Office Admin. Law Feb. 26, 1986) (settlement agreement) [hereinafter *Mercer*].

324. *Id.*

325. *Id.*

326. California Regional Water Quality Bd. San Francisco Bay Region, State of California, Discharge Permit, Pacific Gas & Elec. Power Co.: Order No. 90-053, NPDES NO. CA0004880 at 6 (Apr. 18, 1990) [hereinafter Pittsburg Discharge Permit].

327. *Id.* at 1. Unit 7 operates with closed-cycle cooling towers. *Id.*

328. *Id.* at 6.

329. *Id.*

330. *Id.*

331. *Id.* at 4.

The entrainment monitoring program in Pittsburg involved two main thrusts. The first part required PG&E to use plankton nets to monitor entrainment abundance, size-specific density, and seasonal distribution of larvae and juvenile striped bass from May through July of each year.[332] The second part required PG&E to implement a "Resources Management Program" requiring it to: maximize use of Unit 7 (which operated with closed-cycle cooling towers); minimize use of Units 1-6 (which did not); overhaul Unit 7 before April 1 of each year; use variable speed pumping to minimize water flows; minimize use of the Pittsburg powerplant during spawning and nursery periods for striped bass; submit an annual evaluation of BTA program performance; reduce striped bass entrainment losses by at least 50% (up to a "goal" of 79%); determine fish kill reduction rates; replace stock yearling striped bass annually according to a prescribed fish replacement schedule (a function of kill reduction percentages);[333] provide estimates of the number of striped bass eggs and larvae entrained and killed; re-evaluate intake screening technology by submitting a work plan; and submit a status report within approximately twenty months from the effective date of the permit.[334]

To address impingement losses detected by monitoring studies previously performed, PG&E used "Ristroph Modified Screens" and variable speed pumping controls.[335] The Ristroph Modified Screens included watertight fish collection buckets along the base of each screen panel, a low-pressure (in place of high-pressure) fish impingement removal system to reduce aquatic stress and abrasion, a fish return system, and heavy-duty bearings and motors to reduce impingement duration.[336] The variable frequency controls installed on the powerplant's circulation water

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332. *Id.* at Attachment 4.

333. The fish replacement schedule is as follows:

Kill Reduction Percentage	Number of Yearling Fish
79.1 - 92.5	100,000
65.1 - 79.0	200,000
55.1 - 65.0	300,000
50.1 - 55.0	400,000
45.1 - 50.0	500,000
40.1 - 45.0	600,000
40.0 or less	700,000

Id. at 15.

334. *Id.* at 13-16. PG&E's permit refers to periods of striped bass susceptibility to entrainment as the "entrainment period." *Id.*

335. *Id.* at Attachment 1.

336. *Id.*

pumps enabled PG&E to reduce cooling water flow and concomitant entrainment losses.[337]

Although in *Hennepin* and *Pittsburg*, the agency did require some curative efforts to offset adverse impacts, in no case thus far have permit conditions requiring biological monitoring or studies ultimately led to the conversion of once-through cooling to some other technological means of complying with Section 316(b).

C. Reeling It In—Strictly Technological Means of Complying with Section 316(b)

Once biological monitoring and biological studies demonstrate the extent of adverse environmental impact, Section 316(b) requires a permit holder to ensure that their CWISs reflect BTA for minimizing the impact. This is certainly easier said than done. Though EPA has found that technological approaches for meeting Section 316(b) evolve over time,[338] seldom has either EPA or any state, and never has a judicial entity, required substantial conversion of an existing CWIS to employ emerging advances in BTA. The reasons are varied. Infrequently, as in *In re Tampa Electric Co.* ("*Big Bend*"), EPA sticks to its guns and requires a utility to retrofit an existing CWIS with an emerging technology. Sometimes, these issues are stillborn as cases are dismissed for any number of reasons.[339] Most of the time, however, actions seeking to enforce Section 316(b) are settled. In fact, no court or administrative tribunal has ever reached the merits of a Section 316(b) case, although this may change with *Hudson Riverkeeper*. *Hudson Riverkeeper* and *Big Bend*, perhaps the only vestiges left of the notion that existing CWISs should be retrofitted to ensure compliance with Section 316(b), are discussed in the following sections.

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337. *Id.*

338. In the 1982 EPA Legal Opinion, *supra* note 294, EPA addressed the issue of whether a Section 316(b) determination became fixed in time, that is, whether a permit-issuing agency's Section 316(b) determination changes with the issuance of renewal permits and/or the discovery of different BTA compliance measures. The OGC opined that permit conditions may be "adjusted" so as to meet ever-evolving applications of Section 316(b). Of course, existing information and past Section 316(b) determinations would still be relevant factors.

339. For example, in Philadelphia Elec. Co. v. Pennsylvania Dep't of Envtl. Resources, No. 88-309-M, 1990 Pa. Env't LEXIS 123, (Aug. 31, 1990) [hereinafter *Point Pleasant*], a coalition of environmental groups argued in 1990 before the Pennsylvania Environmental Hearing Board (PEHB) that the location of a CWIS for the Limerick (Pennsylvania) Nuclear Generating Station along the Schuylkill River did not comply with Section 316(b). The PEHB dismissed the coalition's claims on procedural grounds and never reached the Section 316(b) issue.

1. Hudson Riverkeeper

In only one instance has a federal court provided an inkling as to how Section 316(b) might apply to a particular powerplant. In *Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utilities, Inc.*, ("*Hudson Riverkeeper*") the plaintiffs took advantage of the fortuitous wording of a permit condition as a means of presenting the question of what constitutes BTA under Section 316(b) to a federal court as a matter of first impression.[340] In *Hudson Riverkeeper Fund*, the New York Department of Environmental Conservation (NYDEC) added the following provision (Condition 9) to an NPDES permit held by Orange and Rockland Utilities (O&R) for continued once-through cooling operation of five fossil fueled powerplants located on the west shore of the Hudson River at Tomkins Cove, Rockland County, New York ("Lovett Generating Station"):

> The location, design, construction and capacity of the cooling water intake structure shall reflect the *best technology available* for minimizing adverse environmental impact.[341]

At the time of commencement of the action, Lovett Station's CWIS clearly did not reflect BTA. To be sure, the station's CWIS operated largely in a state of suspended animation unchanged from when it commenced operation in 1949. Its CWIS was designed to prevent river debris from entering the condenser system, but not to prevent aquatic injuries.[342] Indeed, Hudson Riverkeeper's arguments were firmly footed; evidently Lovett Station's CWIS was employing no fish saving technology

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340. Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc., 835 F. Supp. 160 (S.D.N.Y. 1993).

341. *Id.* at 163 (emphasis in original). O&R's permit for the Lovett Station also contains other conditions related to the CWIS not at issue in the case at hand. Among other relevant responsibilities, Orange and Rockland is required to: obtain advance approval conditioned upon a demonstration that any change to the station's CWIS reflects BTA (Condition 10); submit an impingement report (Condition 11); sample the abundance and composition of impinged aquatic organisms (Condition 12); conduct a review of technologies and institute remedial measures should the number of fish impinged by the station exceed 100,000 (Condition 13); modify the screen wash discharge sluices to minimize hazards to viable fish (Condition 13c); and conduct an entrainment monitoring program with sampling (Condition 14). The impact these additional conditions will have on the station's adverse environmental effects, and correspondingly on the Hudson Riverkeeper's lawsuit, remain to be observed. *Id.*

342. Amended Complaint at 6, Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc., 835 F. Supp. 160 (S.D.N.Y. 1993) (No. 93-CV-3116(CLB)). The five intakes at the station were built in 1949, 1950, 1955, 1966, and 1969.

whatsoever at the time the complaint was filed.[343] The configuration of Lovett Station's CWIS consisted merely of trash racks, 3/8 inch vertical traveling screens, water jets (for removal of impinged organisms) and a fish return trough.[344] Hudson Riverkeeper argued that the Lovett Station, with a largely unfettered maximum cooling water intake flow of about 484 MGD, was responsible for losses of a large number of fish and other aquatic life.[345]

Relying on a hearsay statement made by NYDEC, O&R argued that Condition 9 served merely to "make clear that DEC had authority to regulate intake structures."[346] The court rightly rejected this argument as "absurd," and remarked that "[o]nce the permit was issued, it had the force of law, and citizens desiring to sue, including Riverkeeper, could rely on the plain meaning of Condition 9."[347]

Next, the court properly concluded that "[BTA], under the statute, is something which exists and can be ascertained as fact."[348] Accordingly, the court flatly denied O&R's Motion for Summary Judgment, reasoning that the BTA determination for the Lovett Station involved disputed issues of fact, including, *inter alia*, "cost, the age of the facility, the number of fish killed, the additional energy, if any, needed to support improved technology, or other relevant concepts."[349]

Hudson Riverkeeper implored the court to reach the merits, requesting that it "[enjoin] the defendant from operating the Lovett Generating Station in such a manner as will result in further violations," and to order that O&R "utilize technologies and implement operation and maintenance practices and programs that will insure that the location, design, construction, and capacity of the [CWIS] reflect [BTA] for

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343. Plaintiff's Memorandum in Opposition to Defendant's Motion for Summary Judgment at 31-35, Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc., 835 F. Supp. 160 (S.D.N.Y. 1993) (No. 93-CV-3116(CLB)).

344. *Hudson Riverkeeper Fund*, 835 F. Supp. at 162.

345. Amended Complaint at 6, *Hudson Riverkeeper Fund*, (No. 93-CV-3116(CLB)).

346. *Hudson Riverkeeper Fund*, 835 F. Supp. at 166.

347. *Id.* Interestingly, the Court also opined that had NYDEC not parroted the language of Section 316(b) (and its state analog provision) into Orange and Rockland's permit, Hudson Riverkeeper would not have been able to bring the matter before a federal court:

> So long as this concept remained only in the regulations it was not a basis for citizen suit. . . . By inserting a [BTA requirement] as Condition 9 in the permit, the Permit Writer in effect issued an open invitation to a lawsuit, which invitation Riverkeeper accepted. The presence of Condition 9 . . . allows plaintiffs to allege that the permit is being violated because the facility is not employing the Best Technology Available.

Id.

348. *Id.* at 165.

349. *Id.* at 166.

minimizing adverse environmental impact."[350] Hudson Riverkeeper asserted that there exist other "better demonstrated technologies and practices" which O&R could use at the Lovett Station for minimizing both losses due to impingement (including closed-cycle cooling systems, Fletcher-modified Ristroph vertical traveling screens, volume restrictions, and power outages) and entrainment (including volume restrictions and power outages).[351] As partial proof of its claim, Hudson Riverkeeper observed that these better impingement and entrainment reducing technologies were currently being used by other powerplants along the Hudson River.[352] Moreover, Hudson Riverkeeper also submitted the affidavit of arguably the world's foremost BTA expert, who opined that the Lovett Station was not utilizing BTA.[353]

Although the court responded that "[f]acially, it is hard, but not impossible, to justify the issuance of permits to plants existing within view of one another . . . with technologies for fish protection which are so markedly different," it declined Hudson Riverkeeper's invitation to resolve the BTA issue without further proceedings.[354] The court also rejected O&R's argument that Hudson Riverkeeper was strictly bound by the statement it made opposing the permit during public comments.[355] Lastly,

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350. Amended Complaint at 11, *Hudson Riverkeeper Fund*, (No. 93-CV-3116(CLB)).

351. *Id.* at 8-9.

352. *Id.* at 9.

353. *Hudson Riverkeeper Fund*, 835 F. Supp. at 165 (referring to Ian Fletcher, Ph.D.).

354. *Id.* at 166-67.

355. The court ruled that the plaintiffs' legal arguments were not frozen in time. Ironically, during public comment associated with permit renewal, Hudson Riverkeeper objected strenuously to Condition 9, arguing that the condition was too vague to be enforceable, and that the permit failed to account for the "cumulative impacts" of all CWISs found along the Hudson River. *Id.* at 163. The balance of Hudson Riverkeeper's comments that O&R found to be relevant were:

> We believe that [the 100,000 fish] performance standard is too lenient, *unenforceable* and allows two years to pass before any mitigative action is initiated. It is our recommendation that the DEC establish monthly limitation for both impingement and entrainment, that is seasonally and species specific. Once this standard is set, the DEC will then have an immediate *enforceable* limitation that will allow them to assess penalties for permit violations. Eighteen years have passed since the 1972 CWA requires intake structures to reflect the Best Technology Available (BTA) for minimizing adverse environmental impact, *yet there is no standard or criteria governing this requirement in the permit.*

Memorandum of Law in Support of Defendant Orange & Rockland's Motion for Summary Judgment Dismissing the Complaint at 21, Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc., 835 F. Supp. 160 (S.D.N.Y. 1993) (No. 93-CV-3116(CLB)) (alteration in original) (citation omitted). As such, O&R asserted that the court did not have jurisdiction because the plaintiff's action was "actually a collateral attack on the terms of the permit, [and hence] not an enforcement claim." *Hudson Riverkeeper Fund*, 835 F. Supp. at 164. In response, the court concluded that Hudson Riverkeeper was not estopped from enforcing an earlier permit condition, even if the basis of its opposition called into question the enforceability of the condition in question. *Id.* at 165. The court

the court ignored O&R's demand that the court defer to NYDEC's "continuing jurisdiction" over Lovett Station's CWIS.[356]

As of this writing, the case has changed hands in the Federal District Court for the Southern District of New York. The case is still undergoing discovery and settlement negotiations, and awaits further disposition.[357] If the court chooses to entertain the merits of the case and determine what constitutes BTA for Lovett, it would be the only judicial body yet to do so. In the meantime, O&R has field-tested a new entrainment-reducing design called the "Gunder boom."[358] The efficacy of the Gunder boom is questionable.[359]

2. Big Bend

Big Bend involved a 1981 NPDES permit issued by the Acting Director of the Enforcement Division for EPA Region IV ("RA Acting Director") applying Section 316(b) to three existing units and one proposed unit at Tampa Electric Company's (TECO's) Big Bend Station

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also ruled that Hudson Riverkeeper had standing to pursue the matter. *Id.*

356. Memorandum of Law in Support of Defendant Orange & Rockland's Motion for Summary Judgment Dismissing the Complaint at 26, *Hudson Riverkeeper Fund*, (No. 93-CV-3116(CLB)). The court held that due to the inextricable interconnection between Condition 9 and Conditions 10-14, as well as the potential need to solicit agency expertise, NYDEC should be joined in the action as a necessary party. *Hudson Riverkeeper Fund*, 835 F. Supp. at 167. It is unclear whether the court thought NYDEC should be joined as a necessary plaintiff or defendant.

357. Interview with Theresa R. Hanczor, *supra* note 145.

358. The Gunder boom reportedly consists of a porus, synthetic blanket made from a felt-like, non-corrosive, non-biogradable fiber that is not susceptible to damage from ultraviolet rays. EPA, Power Plant Testing Potential Model for CWA 'Best Technology,' INSIDE EPA'S WATER POLICY REP., July 19, 1995, at 3. The technology it employs is similar to the type used to protect aquatic wildlife from the Exxon Valdez Oil Spill. *Id.* The prototype measures 400 by 20 feet, surrounds the perimeter of the station's CWIS, and is reported to be filtering about 95% to 100% of the intake flow and removing fish eggs from the intake flow at a ratio of about 10:1. *Id.* O&R hopes that the $250,000 Gunder boom will reflect the same level of environmental protection as would a $1 billion cooling tower. *Id.* The Hudson Riverkeeper Fund views the Gunder boom as experimental, and simply another in a long line of potential BTA technologies which O&R could use, including, Fletcher-modified Ristroph screens, variable speed intake pumps, and power outages during peak spawning periods. *Id.*

359. Before installing a full-scale Gunder boom at Lovett Station, O&R is attempting to resolve problems associated with the incidental entrainment losses caused by the boom, such as boom shifting due to changing tides, and fabric integrity. Interview with Theresa R. Hanczor, *supra* note 145. Until such time as the device is fully evaluated, its usefulness in stemming the tide of aquatic loss at Lovett Station and elsewhere remains murky. The designer of the Gunder boom is also quoted as claiming that he is discussing the possibility of deploying the boom in front of the Salem Nuclear Generating Station's CWIS. EPA, Power Plant Testing Potential Model for CWA 'Best Technology,' *supra* note 358, at 3.

on the southeastern shore of Hillsborough Bay in the Tampa Bay region.[360] Big Bend Units 1-3 are fossil fuel generated and have a combined rated capacity of 1,336 MW.[361] Historically, the three units had a cooling water intake flow of about 1.5 BGD, with more than half of that amount attributable to a dilution pump system.[362]

Following submission of a Section 316(b) demonstration by TECO in 1979, the EPA Region IV RA determined that "due to unacceptable levels of entrainment of biota," the design, location, construction, and capacity of the once-through cooling water intake system for Units 1-3 does "not reflect best technology available for minimizing adverse environmental impact."[363] Consequently, TECO proposed to terminate its dilution-assisted cooling system and to provide for studies to assess the biological implications of such action.[364] Based on this proposal, the RA Acting Director approved TECO's continuing use of the once-through cooling system for Big Bend Units 1-3. In short, the RA Acting Director found

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360. Region IV, EPA, Tentative Findings & Determinations Under 33 U.S.C. § 1326, *In re* Tampa Elec. Co.: NPDES Permit No. FL0037044 (June 12, 1981) [hereinafter Big Bend Permit No. FL0037044]; Region IV, EPA, Tentative Findings & Determinations Under 33 U.S.C. § 1326, *In re* Tampa Elec. Co.: NPDES Permit No. FL0000817 (June 12, 1981) [hereinafter Big Bend Permit No. FL0000817].

361. Big Bend Permit No. FL0000817, *supra* note 360, at 1.

362. *Id.*

363. *Id.* at 2. The RA determined TECO's entrainment analysis to be infirm:

> [For] the following reasons, the company's analyses fail to demonstrate the adequacy of conventional once-through cooling to minimize entrainment impacts.
>
> - The permittee attempts to evaluate the impact of entrainment in three ways: area of entrainment influence; area of equivalent production; reduction in equivalent adults.
> - Data are not available to make valid estimates of "area of entrainment influence" and "area of equivalent production." Disregarding the validity and usefulness of these estimates, it appears that the data have been analyzed in such a manner that the estimates of impact are orders of magnitude on the low side.
> - The equivalent adults model used by the permittee measures the loss of spawning stock under an assumption of equilibrium. This method does not provide a meaningful measure of impact since it ignores the forage and fishery value of the entrainment losses. Other shortcomings include: model assumptions cannot be met; faulty reasoning was used for selecting stations; and fecundity and survival estimates are not supported by the literature.
> - Survival estimates for pink shrimp in the lower Gulf indicate that a conservative estimate of potential annual losses to the catchable stock may be as high as 2.3 [million] pink shrimp. This compares with the permittee's estimate of 5,275 equivalent adults—a 436-fold difference.
> - Data presented in Table 4.5-8, Appendices 2D through 2N of the demonstration show that all stages of most species are attracted to and are concentrated in the intake.

Big Bend Permit No. FL0037044, *supra* note 360, at 2-3.

364. *Id.* at 2.

that because retirement of the dilution pump system would reduce the capacity of Units 1-3 by about 36%—and thereby reduce entrainment losses by a proportional amount—the once-through cooling system represented BTA.[365] The RA Acting Director also found that the concomitant increase in thermal discharge associated with retirement of the dilution flow system would not cause an unacceptable impact to Hillsborough Bay.[366]

TECO also wished to build a new 1,782 MW Unit 4 at the Big Bend Station.[367] TECO proposed to use once-through cooling for Unit 4.[368] As a means of minimizing the adverse environmental impact associated with new Unit 4, TECO agreed to install fine-mesh screens at the cooling water intake for Units 3 and 4.[369] The RA Acting Director accepted the proposal, and found that retirement of the dilution-assist cooling system for Units 1-3, combined with the design modification to add fine-mesh screens to the CWIS for Units 3 and 4, would "minimize adverse environmental impacts for purposes of Section 316(b) of the Act."[370]

As it stands, *Big Bend* represents the EPA's only successful attempt to force a utility to institute substantial efforts to retrofit an existing CWIS with an emerging BTA. Given that such victories have proven to be so politically and economically intensive to EPA, as we shall see in the next section, it is no wonder why states have as of late allowed utilities to explore non-technological means of complying with Section 316(b), and why EPA has been all too quick to oblige them in their efforts.

D. Bending the Pole—Institution of Non-technological Means of Addressing Adverse Environmental Impact

Owing to the difficulty of demonstrating the level of adverse environmental impact caused by a particular CWIS, and in light of cost considerations, some agencies have elected to allow mitigation instead of minimization. Mitigation projects arguably started with the acceptance of a fish stocking program for the ever-imperiled Hudson River in the 1980 Hudson River Agreement, and most recently appeared as a comprehensive wetlands enhancement and mitigation program in 1994 for the Delaware

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365. *Id.* at 2, 7.

366. *Id.* at 7.

367. *Id.* at 1.

368. *Id.*

369. *Id.* at 5. TECO had first studied a prototype fine-mesh screening system and found that it was a viable technology for reducing entrainment. *Id.*

370. *Id.*

Estuary in Salem County, New Jersey.[371] Caught between the pioneering but bittersweet mitigative components of *Hudson Riverkeeper* and *Salem*, EPA and states alike have recently danced an increasingly up-tempo tango with mitigation projects in the Tennessee Valley (John Sevier), Florida (Crystal River), Maryland (Chalk Point), and California (Earth Island). Although not bearing EPA's express imprimatur, these decisions, and others like them, nonetheless are slowly becoming accepted industry practice for complying with Section 316(b).

1. Hudson River Agreements

The Hudson River has been a relative hotbed of Section 316(b) activity, and, as *Hudson Riverkeeper* indicates,[372] remains so presently. What began in the mid-1970s as a mandate from EPA to retrofit three utilities along the Hudson River with closed-cycle cooling systems culminated in a global settlement agreement among EPA, the State of New York, the affected utilities, and environmental groups (including the Hudson Riverkeeper Fund) in 1980.

By permitting the utilities to offset adverse environmental impacts by instituting a fish stocking program, the settlement arguably helped to usher in the age of mitigation projects. The Agreement's scheme will, in all likelihood, continue as revised into the next century, and will continue to represent a tactical strike against BTA.

The Hudson River Agreements had their genesis in 1975, when EPA issued a series of permits to Consolidated Edison (ConEd), Central Hudson Gas and Electric Corporation ("Central Hudson") and Orange and Rockland Utilities (O&R) (collectively "Hudson Utilities") requiring that they retrofit their existing powerplants using once-through cooling systems along the Hudson River with closed-cycle cooling towers.[373] EPA instituted this requirement to reduce cooling water withdrawal in the Hudson River by about 90%.[374] The Hudson Utilities subsequently requested adjudicatory hearings before EPA, arguing that the costs of retrofitting the existing facilities would be wholly disproportionate to the benefits conferred to the environment.[375] EPA then delegated authority to administer the NPDES program to the New York Department of

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371. *See infra* Part III.D.6.

372. *See supra* note 340 and accompanying text.

373. *See* Consolidated Edison Co. of N.Y., Inc. v. New York State Dep't of Envtl. Conservation, 726 F. Supp. 1404, 1406 (S.D.N.Y. 1989).

374. *Id.*

375. *Id.*

Environmental Conservation (NYDEC), who then intervened.[376] On December 19, 1980, the Hudson Utilities, EPA, NYDEC, the Hudson River Fishermen's Association (the progenitor of the Hudson Riverkeeper Fund), and others reached a settlement ("1980 Hudson River Agreement") which applied to the Bowline,[377] Roseton,[378] Indian Point Two,[379] and Indian Point Three[380] facilities.

As part of the 1980 Hudson River Agreement, the Hudson Utilities agreed to conduct power outages,[381] install dual speed pumps,[382] install a fish hatchery,[383] donate land to the state (land they had reserved for the since-terminated Cornwall Pumped-Storage Project),[384] fund independent research,[385] conduct biological monitoring,[386] pay fees and costs,[387] and

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376. *Id.*

377. Bowline is a fossil-fueled powerplant consisting of two 600 MW units owned and operated by Orange & Rockland and Consolidated Edison (ConEd). Hudson River Settlement Agreement 2 (Dec. 19, 1980) (on file with the Widener University School of Law, Environmental Law Clinic) [hereinafter 1980 Hudson River Settlement Agreement].

378. Roseton is a fossil-fueled powerplant consisting of two 600 MW units owned and operated by Central Hudson, Niagara Mohawk, and ConEd. *Id.* at 2-3.

379. Indian Point Two is a nuclear fired powerplant with a capacity of 850 MW, owned and operated by ConEd. *Id.* at 3.

380. Indian Point Three is a nuclear fired powerplant with a capacity of 965 MW and is owned and operated by the Power Authority of the State of New York (PASNY). *Id.*

381. The Hudson Utilities agreed to outages of 30 unit-days between May 15 and June 30 for the Bowline units, 30 unit-days between May 15 and June 30 for the Roseton units, and 42 unit-days for the Indian Point Unit, and up to a maximum of 434 days over the 10-year term of the agreement. *Id.* at 4-5.

382. The Hudson Utilities agreed to replace the circulating cooling water pumps of Indian Point's Units 2 and 3 with dual speed pumps within a three and one-half year period from the effective date of the agreement. *Id.* at 5-11.

383. The Hudson Utilities agreed to construct, lease, or contract for the operation of a hatchery on or adjacent to the Hudson River with the objective of replacing 600,000 three-inch striped bass fingerlings per year from May 1, 1983, until expiration of the agreement. *Id.* at 11-12.

384. The Hudson Utilities agreed to seek authorization from the Federal Energy Regulatory Commission (FERC) to surrender its license for the Cornwall Pumped-Storage Project, terminate the project, and convey it as public parkland west of and behind the summit of Storm King Mountain to the Palisades Interstate Park. *Id.* at 12-14.

385. The Hudson Utilities agreed to endow an independent research program to advance scientific understanding and management of the Hudson River Fishery in the amount of $12 million. *Id.* at 14.

386. The Hudson Utilities agreed to conduct a biological monitoring program at the cost of at least $2 million per year adjusted annually for inflation. *Id.* at 15. The major components of the biological monitoring program included: impingement and entrainment abundance sampling; impingement and entrainment survival sampling; a net evaluation; an ichthyoplankton survey; a juvenile fish survey; and an adult fish stock assessment program. *Id.* at Attachment V, at 2.

387. The Hudson Utilities agreed to reimburse the Hudson River Fishermen's Association, Scenic Hudson, and the Natural Resources Defense Council for their actual legal costs and attorneys' fees in administrative and court proceedings related to protection of aquatic life on the Hudson River in an aggregate amount of $500,000. *Id.* at 15.

refrain from building any other once-through cooling facilities along the Hudson River.[388] The 1980 Hudson River Agreement also required Indian Point Units 2 and 3 to be modified with angled screens,[389] and contained other miscellaneous provisions.[390]

As part of these 1980 Hudson River Agreements, NYDEC agreed to a ten year moratorium on requiring thermal or other germane modifications to any CWIS.[391] Nonetheless, in 1987 NYDEC attempted to impose two new conditions on ConEd's Indian Point Powerplant's CWIS which led to litigation in 1989 in *Consolidated Edison Co. of New York v. State Deparatment of Environmental Conservation*.[392] The first condition was directed at reducing impingement losses and would have required that the CWIS traveling screen for the Indian Point plant be operated in continuous wash mode and that all impinged fish, including those which may not be viable, be returned to the Hudson River.[393] The second condition pertained to notice of any modifications instituted by the utility, and would have required ConEd to submit to NYDEC a notice at least sixty days in advance of any modification to the design, location, construction, or capacity of the CWIS, along with a demonstration that

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388. The Hudson Utilities agreed not to seek authorization to use once-through cooling in any new steam electric generating facility having a capacity of 50 or more MW along the Hudson River north of the George Washington Bridge. *Id.* at 16.

389. *Id.* at Attachment II.

390. The miscellaneous provisions pertained to: use of circulating water pumps during outages; access to data; recordkeeping on outages; suspension and makeup of outages; cross-plant outage credits; force majeure; outage compliance schedule and remedy for breach; monetary penalty for unexcused insulation delays; submission of annual reports; and various provisions regarding term, effective date, disclaimer of admissions, and venue for enforcement actions. *Id.* at 20-36.

391. Consolidated Edison Co. of N.Y. v. New York State Dep't of Envtl. Conservation, 726 F. Supp. 1404, 1406 (S.D.N.Y. 1989).

392. *Id.*

393. *Id.* at 1406-07. The full extent of the first condition required as follows:

> During all times that a circulating water pump is operating, the intake travelling screens servicing that pump shall be in continuous wash mode. Impinged debris and fish, including those fish that may not be viable, are to be returned to the Hudson River using existing screens and sluiceways. The screen washwater discharge point will be modified as necessary to ensure return to the river rather than on to a bank or ice flow. The design of any grate installed to prevent clogging of the screen wash-water return sluice shall be submitted for Department review 20 days prior to installation. Fixed screens on the intake should be blocked in the up position while travelling screens are operated so that viable fish are returned to the river. During impingement monitoring studies, fixed and travelling screens may be operated in ways consistent with achieving study objectives.

Id.

such change reflected BTA for minimizing adverse environmental impact.[394]

Based partially on the 1980 Hudson River Agreement, ConEd appealed these conditions to the United States District Court for the Southern District of New York.[395] At the core of ConEd's argument was that the 1980 Hudson River Agreement forbade NYDEC from ordering it to modify the Indian Point CWIS until expiration of the agreement in 1991.[396]

After ConEd filed suit, NYDEC quickly announced its decision to rescind the offensive conditions.[397] Accordingly, NYDEC argued that the case was either moot or outside the court's jurisdiction.[398] The court accepted only part of this argument.[399] Consequently, the court granted New York's motion to dismiss.[400]

NYDEC thereafter issued renewal permits to the Hudson Utilities in October 1987, which were due to expire on or about October 1, 1992. However, the 1980 Hudson River Agreement expired on or about May 14, 1991.[401] Given the disconnection between the expiration dates of the renewal permits and the 1980 Hudson River Agreement, NYDEC issued a "letter agreement" on May 15, 1991, unilaterally declaring that the permit provisions pertaining to implementation of the 1980 Hudson River

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394. *Id.* at 1407. The second condition states:

> The permittee shall submit written notification, to include detailed descriptions and appropriate figures, . . . at least sixty days in advance of any change which would result in the alteration of the permitted operation, location, design, construction or capacity of the cooling water intake structures. The permittee shall submit with its written notification, a demonstration that the change reflects the best technology currently available for minimizing adverse environmental impact.

Id.

395. *Consolidated Edison Co. of N.Y.*, 726 F. Supp. at 1404.

396. *Id.* at 1407.

397. *Id.* Counsel for NYDEC informed ConEd that "[a]lthough DEC continues to reserve its rights . . . [it] does not foresee proposing any relevant modification of the permit to take effect before the expiration of the [1980 Hudson River] settlement agreement . . . ." *Id.*

398. *Id.* at 1407-08.

399. First, the court rejected NYDEC's mootness argument, finding that it had not made it "absolutely clear" that the agency would not impose these conditions in the future, and alternatively, that the issue of whether the imposition of these conditions was legal survived expiration of the 1980 Hudson River Agreement. *Id.* at 1408 (citations omitted). With regard to jurisdiction, the court found that it was indeed bereft of jurisdiction because ConEd was exercising a right of action not provided by the citizen's suit provision of the CWA (Section 505, 33 U.S.C. § 1365), and alternatively, that the terms of the 1980 Hudson River Agreement were a matter of state, not federal, law. *Id.* at 1409-10.

400. *Id.* at 1411.

401. *Id.* at 1408.

Agreement were voluntary from thereon. As such, in September 1991, the petitioner-plaintiffs to the 1980 Hudson River Agreement brought an action before the Supreme Court of the State of New York to annul the May 15, 1991 letter agreement and to declare that these terms of the 1987 permits survived expiration of the 1980 Hudson River Agreement.

Following extensive negotiations, the parties agreed to keep the essential terms of the 1980 Hudson River Agreement intact through a series of one-year agreements enforceable in state courts. The first of these agreements took the form of a consent order in March of 1992 ("1992 Hudson River Agreement").[402] The 1992 Hudson River Agreement mirrored the requirements of the 1980 Hudson River Agreement.[403]

The 1992 Hudson River Agreement expired on September 1, 1993. On or about September 1, 1993 the parties agreed to a one-year extension ("1993 Hudson River Agreement").[404] Much akin to both the 1980 and 1992 Hudson River Agreements, the 1993 Hudson River Agreement contained outage requirements,[405] dual/variable speed pump flow rates for Indian Point Units 2 and 3,[406] restricted flow rates for Bowline and Roseton,[407] measures to continue operation of a fish hatchery for striped bass fingerlings,[408] forbearance provisions against construction of the facility at the former Cornwall Pump-Storage Project site,[409] and requirements to institute a biological monitoring program,[410] deploy and maintain a barrier net at the Bowline plant,[411] use circulating water pumps during outages,[412] and other provisions.[413]

The process repeated in 1994 when the parties agreed to a one-year extension to carry over the terms of the 1993 Hudson River Agreement for

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402. *In re* Natural Resources Defense Council, Inc., No. 6570-91 at 2 (N.Y. Sup. Ct. July 1993) (first amended stipulation of settlement and judicial consent order) (1993 Hudson River Agreement).

403. Interview with Theresa R. Hanczor, *supra* note 145.

404. *See generally In re Natural Resources Defense Council*, No. 6570-91 (1993 Hudson River Agreement).

405. *Id.* at 7-9.

406. *Id.* at 9-10.

407. *Id.* at 10.

408. *Id.* at 13.

409. *Id.* at 14.

410. *Id.*

411. *Id.* at 13.

412. *Id.* at 15.

413. These other provisions required ConEd to: provide data access; record outages; suspend makeup of outages; maintain cross-plant credit points; submit an annual report; void the May 1991 letter agreement; establish a Hudson River Settlement Technical Fund; and provide for permit renewals, notice provisions, and payment of litigation costs to Hudson Riverkeeper Fund and the Natural Resources Defense Council. *Id.* at 4, 15-20.

another one year term until September 1, 1995 ("1994 Hudson River Agreement").[414] At the time of this writing, the parties were in the process of negotiating a one-year extension to the agreement.[415]

2. John Sevier

An attempt by EPA to require BTA in the Tennessee Valley proved to be difficult, and once again the agency sanctioned mitigation. *In re Tennessee Valley Authority John Sevier Steam Plant ("John Sevier")*, involved the issuance of an NPDES Permit in 1976 by EPA Region IV to the Tennessee Valley Authority (TVA) for the operation of a once-through cooling system for their coal-fired steam electric powerplant along the Holston River, in Rogersville, Tennessee.[416] Pursuant to TVA's Section 316(b) demonstration, EPA found that the powerplant was having severe adverse impacts upon the Cherokee Reservoir and the Holston River including but not limited to: fish extirpation; thermal effects on spawning and fish residents; and thermal damage to benthic fauna downstream from the powerplant.[417] EPA found that these effects were due primarily to TVA's closure of a man-made, low-head detention dam (which formed a cooling water intake pool for use by the powerplant cooling system), the use of most or all Holston River flow for condenser cooling purposes at certain times, and thermal discharge.[418]

Accordingly, in a tentative Section 316(b) determination in 1986, EPA required TVA to study alternative pathway systems for spawning fish. The study was to include "fish locks, ladders, elevators, and pumps; Gabion weirs; wickets; rollers; diversion structures; fine-mesh screens with return mechanisms; bypass of stream flow; . . . lake water level controls," and removal of the dam.[419] TVA challenged the imposition of these requirements, arguing in the alternative that they were infeasible, unavailable technologies, and/or involved costs wholly disproportionate to anticipated benefits.[420]

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414. *Id.* at 7.

415. Interview with Theresa R. Hanczor, *supra* note 145.

416. Region IV, EPA, Application for National Pollutant Discharge Elimination System Permit to Discharge Treated Wastewater to U.S. Waters, No. TN 0005436, Fact Sheet (Jan. 23, 1986) [hereinafter John Sevier Fact Sheet].

417. *Id.* at 11.

418. *Id.* at 11-12. Apparently, TVA's closure of the dam interrupted spawning from a nearby reservoir. *Id.*

419. *Id.* at 12.

420. *Id.*

EPA subsequently agreed with TVA that the mitigation spawning pathway measures were either "infeasible" or "not available."[421] Moreover, although EPA found removal of the dam to be both "feasible" and "available," it agreed with TVA that the costs for removing the dam were wholly disproportionate to the environmental benefits to be conferred.[422] EPA noted that the results of future monitoring could alter this decision.[423]

Accordingly, in *John Sevier*, EPA determined that TVA's implementation of the following measures would constitute BTA for minimizing adverse environmental impacts: (1) conducting a continuous fish stocking program to ensure replacement of fish populations depleted or extirpated by the powerplant CWIS; (2) assessing BTA annually with implementation of any technology that became available at a "cost not wholly disproportionate to anticipated benefits"; (3) conducting or supporting research and development of fish passage technology; (4) employing thermal modeling studies and assessments; and (5) maintaining a minimum stream flow of at least 350 cubic feet per second at all times.[424]

3. Crystal River

EPA's most recent attempt at requiring conversion of an existing once-through cooling system to closed-cycle cooling also proved to be futile. *In re Florida Power Corp.* (*"Crystal River"*), pertained to a 1988 EPA-issued NPDES permit for Units 1, 2, and 3 of Florida Power Corporation's (FPC's) Crystal River once-through cooling powerplant in Citrus County, Florida.[425] FPC Units 1-3 withdrew 1.898 MGD of cooling water from the Crystal Bay, which is an "estuarine nursery area" located in the Gulf of Mexico.[426] Citing concern about environmental impact, EPA issued a modified permit in 1979 imposing a cooling water flow limitation of 100 MGD, subject to a final Section 316 determination by EPA Region IV.[427] Thereafter, FPC submitted Section 316(a) and Section 316(b) studies and a renewal application containing a mitigation

421. *Id.*

422. *Id.*

423. *Id.*

424. *Id.* at 12-13.

425. Region IV, EPA, Findings & Determinations Pursuant to 33 U.S.C. § 1326, *In re* Florida Power Corp., Crystal River Power Plant Units 1, 2 & 3: NPDES Permit No. FL0000159 (Sept. 1, 1988) [hereinafter *Crystal River*].

426. *Id.* at 4.

427. *Id.* at 2.

proposal which included marsh creation, seagrass planting, fish hatchery construction and operation, biological monitoring, extension of a discharge canal, installation of "helper" cooling towers,[428] imposition of an intake flow reduction, and various temperature controls.[429]

The Director of Region IV's Water Management Division ("EPA Region IV Director"), did not make a final Section 316 decision until 1988. The Director found that FPC's Section 316 studies demonstrated that Crystal River Units 1, 2, and 3 were having "significant adverse biological effects" and were adversely affecting 3,300 acres of Crystal Bay.[430] He then noted that the powerplant was responsible for destroying 1,100 acres of seagrass and attached macro algal communities, excluding locally indigenous and recreational, commercially, or forage-important fish and invertebrate species, and otherwise impinging approximately twenty-three tons of valuable finfish and shellfish each year.[431] Accordingly, the EPA Region IV Director ruled that the CWIS for FPC's Units 1-3 at Crystal River did not "reflect the best technology available for minimizing adverse environmental impacts as required by § 316(b) of the Clean Water Act."[432]

Surveying available technologies, the EPA Region IV Director ruled that fine-mesh screen technology was not "technically feasible" at the site despite being viewed as BTA for TECO's Big Bend Station in Tampa.[433] The EPA Region IV Director found that closed-cycle cooling towers were available and would have reduced entrainment damage by over 85%, although at a cost of $150 million more than FPC's mitigation proposal.[434] Due primarily to this difference, he found the cost of retrofitting "to be wholly disproportionate to the environmental benefits to be derived."[435]

To minimize adverse effects, the EPA Region IV Director "tentatively" determined that, in conjunction with the installation of four

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428. "Helper cooling towers" reduce the discharge wastewater temperature of a powerplant's cooling system; they operate in tandem with a once-through system and should not be confused with closed-cycle recirculating cooling towers. *Id.* at 3 n.2.

429. *Id.* at 3.

430. *Id.* at 6.

431. *Id.* at 5. The Director made no explicit findings regarding the impact of entrainment losses caused by the powerplant. *Id.* at 6.

432. *Id.* at 7.

433. *Id.* at 7-8.

434. *Id.* at 7.

435. *Id.*

"helper" cooling towers at an estimated cost of $80 million,[436] the following would constitute compliance with Section 316(b):

> (1) reduction of plant flow by 15 percent during the months of November through April, in conjunction with, (2) construction and operation of a fish hatchery over the remaining operating life of the three units (in an attempt to replace fish and shellfish eggs, larvae, and juveniles entrained by the plant) will constitute minimization of the environmental impacts of the [CWIS] as required by Section 316(b) . . . .[437]

FPC unveiled its $2 million "mariculture" project in 1992, including a laboratory, spawning and incubation tanks, and eight one-acre ponds.[438]

4. Chalk Point

Some states have been quick to mimic EPA's acceptance of mitigation projects borne out by the 1980 Hudson River Agreement, *Crystal River*, *John Sevier*, and, to some extent, *Pittsburg*.[439] Maryland took the plunge in 1991, in the Potomac Electric Power Co. (PEPCO) state discharge permit proceeding (*"Chalk Point"*). *Chalk Point* involves an NPDES permit issued in 1991 by the State of Maryland Department of the Environment (MDOE) to PEPCO. The NPDES permit would allow PEPCO to continue to operate a coal-fired powerplant in once-through cooling mode at its Chalk Point powerplant in Aquasco, Prince Georges County, Maryland along the Patuxent River.[440]

Pursuant to PEPCO's submission of a Section 316(b) demonstration, *Chalk Point* is based on MDOE's determination that although "there is some impact due to entrainment . . . this impact is not large enough to require additional changes to the intake structures."[441] Nevertheless,

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436. Ken Moritsugu, *Florida Power Opens Hatchery*, ST. PETERSBURG TIMES, Apr. 23, 1992, at 1.

437. *Crystal River*, *supra* note 425, at 8.

438. Moritsugu, *supra* note 436, at 1.

439. *See supra* Part III.D.6.

440. Department of the Environment, State of Maryland, Discharge Permit, Potomac Electric Power Co.: State Discharge Permit No. 81-DP-0627B, NPDES Permit No. MD0002658B at cover sheet, 2 (effective Sept. 25, 1987) (modified Apr. 29, 1991) [hereinafter Chalk Point Discharge Permit].

441. Department of the Environment, State of Maryland, Discharge Permit, Potomac Electric Power Co.: State Discharge Permit No. 81-DP-0627B, NPDES Permit No. MD0002658B (effective Sept. 25, 1987) (modified Apr. 29, 1991) (Rationale for Modification of Permit) [hereinafter Rationale for Modification of Chalk Point Discharge Permit].

PEPCO agreed "to compensate for the losses caused by the entrainment impact."[442] *Chalk Point*'s "entrainment compensation" package required PEPCO to spend $400,000 per year on striped bass aquaculture and another $50,000 per year on yellow perch or other species' aquaculture in contemplation of the production of 200,000 striped bass and 50,000 yellow perch per year;[443] pay $100,000 per year to the MDOE for environmental education or projects to remove obstructions to anadromous fish; and submit an annual statement describing use of allocated funds.[444] *Chalk Point* also requires PEPCO to report any episodes of impingement substantial enough to modify the plant's operations and to develop plans to avoid repeating such events.[445]

5. Earth Island

Despite not addressing Section 316(b) on point, the private settlement agreement in *Earth Island* helps to illuminate the extent to which mitigation projects have become industry practice. In *Earth Island Institute v. Southern California Edison Co.* ("*Earth Island*"), the Earth Island Institute ("Institute") and others filed a citizens' suit under Section 505 of the CWA in 1990 against the Southern California Edison Company (SCE) in the United States District Court for the Southern District of California, in which it alleged various violations of the CWA and state nuisance law.[446] The Institute's action pertained to SCE's San Onofre Nuclear Generating Station (SONGS) located in San Diego County, approximately two and one-half miles southeast of San Mateo Point and twelve miles northwest of the City of Oceanside.[447] SONGS is comprised of three once-through cooling units with a rated capacity of 2,000 MW and an intake flow from the Pacific Ocean of approximately 2.1 BGD.[448]

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442. *Id.*

443. Chalk Point Discharge Permit, *supra* note 440, at 10.

444. *Id.* at 10-10A. MDOE referred to these provisions in short-hand as "Mitigation Studies." Rationale for Modification of Chalk Point Discharge Permit, *supra* note 441.

445. Chalk Point Discharge Permit, *supra* note 440, at 9. The permit does not make clear what technologies PEPCO had installed at the plant to address entrainment, if any. Moreover, the permit seems not to contain any reference to Section 316(b) whatsoever.

446. Complaint at 12-15, Earth Island Inst., Inc. v. Southern Cal. Edison Co., 838 F. Supp. 458 (S.D. Cal. 1993) (No. 90-1535-B(BTM)). Incidentally, the plaintiffs filed their notice of intent to sue on the twentieth anniversary of Earth Day (April 22, 1990). *Id.* at 1.

447. *Id.* at 4.

448. *Id.*; *Earth Island Inst.*, 838 F. Supp. 458 (S.D. Cal. 1993); Unit 1 began commercial operation in 1968, and Units 2 and 3 began commercial operations in 1984. *Id.*

SONGS' CWIS and discharge conduit are approximately 3,000 and 2,500 feet offshore, respectively.[449]

At the heart of the Institute's action was an allegation that SONGS' cooling water discharge diffusers, which affected kelp beds in the area, were discharging a pollutant without a permit in violation of Section 301 of the CWA.[450] The Institute argued that the increased morbidity caused by the discharge of cooling water from SONGS powerplant caused a reduction of light levels enjoyed by existing sea kelp beds in violation of state water quality standards.[451] As such, the Institute requested that the court declare SCE to be in violation of the law, enjoin SCE from engaging in future violations, assess civil penalties, establish an environmental trust fund, exact damages for nuisance claims, assess punitive damages, and award litigation costs.[452]

Because the ultimate resolution of the action is fact intensive, the following subsections sketch out both the historical background of the case and the settlement reached between the parties.

a. Historical Background

Prior to constructing SONGS Units 2 and 3, SCE obtained an NPDES permit from the California Regional Quality Control Board ("Regional Board") and a coastal zone approval from the California Coastal Commission (CCC).[453] Although SCE obtained its NPDES permits in 1976, the CCC would not issue construction permits until SCE demonstrated that Units 2 and 3 would not have adverse environmental effects.[454] In 1974, however, the CCC granted a permit for SCE to construct in the coastal zone provided that it: (1) conduct a comprehensive and continuing environmental study of the affected marine ecosystem in the water column affected by the plant; and (2) demonstrate that SONGS was complying with regulatory requirements and was not otherwise adversely affecting the environment.[455]

To administer and supervise the environmental study, the CCC created the Marine Review Committee ("MRC"). In August, 1989, the MRC issued a 346-page report concluding that SONGS was having

449. Complaint at 5, *Earth Island Inst.* (No. 90-1535-B(BTM)).

450. *Id.* at 8, 12-13.

451. *Id.* at 11-12.

452. *Id.* at 15-17.

453. *Earth Island Inst.*, 838 F. Supp. at 461.

454. *Id.*

455. *Id.*

substantial adverse environmental impact.[456] The MRC report found that SONGS' CWIS created substantial turbidity thereby impeding propagation of natural light necessary for the growth of kelp beds affected by the facility.[457] In fact, the MRC found that turbidity was responsible for reducing the existing kelp beds by approximately 60%.[458] This loss resulted in an attendant reduction of dependent aquatic life, including giant kelp, fish, and large benthic (bottom-dwelling) invertebrates.[459] As such, the MRC concluded that SONGS was not in compliance with state water quality standards, particularly those regulating activities which impeded the flow of natural light. The MRC found the natural light to be some 6% to 16% lower than it would have been but for the plant.[460] The MRC also found that the SONGS' CWIS was responsible for killing large numbers of organisms directly through impingement and entrainment.[461]

SCE vehemently contested the MRC's report on scientific and economic grounds.[462] SCE estimated the costs of retrofitting the facility with a new closed-cycle cooling tower system would be approximately $2 billion,[463] a cost it believed was wholly disproportionate to any conferred environmental benefits. SCE also argued that substantial design changes to SONGS' CWIS would cost in the range of $1 to $2 billion and would cause different environmental problems.[464]

In response to the report of the MRC and SCE's cost claims, the CCC ordered SCE to undertake a "compensatory mitigation" program to offset the facility's adverse environmental impacts by restoring 150 acres of wetlands and by constructing 300 acres of sea kelp habitat (reef) at an approximate cost of $30 million.[465] The CCC also required SCE to reopen

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456. *Id.* (citation omitted).

457. *Id.*

458. *Id.*

459. *Id.*

460. *Id.* at 462.

461. *Id.* at 461. The MRC concluded that SONGS was having a substantial adverse environmental effect including, but not limited to, adversely affecting kelp communities and kelp beds due to excessive water turbidity caused by cooling water discharge; killing at least 20 tons of fish per year in the CWIS; reducing natural light levels at the ocean bottom; reducing bottom dwelling fish by up to 70%; reducing macroinvertebrates by up to 90%; and entraining billions of fish larvae per year. Complaint at 9-11, *Earth Island Inst.*, (No. 90-1535-B(BTM)). Plaintiffs alleged that SONGS is responsible for killing 57 tons of fish per year located in the water column, a countless amount of the San Onofre kelp bed, and somewhere between four to five billion eggs, larvae and juvenile fish, with a commensurate 600 ton reduction of adult stocks of fish in the area. *Id.* at 7-9.

462. *Earth Island Inst.*, 838 F. Supp. at 462.

463. *Id.*

464. Plaintiffs' Position Memorandum at 3, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

465. *Id.* at 4.

a tidal entrance to a degraded wetlands to provide tidal flushing with seawater, install behavioral barrier devices such as light and sonic equipment to divert fish from CWISs, construct an artificial kelp reef, and install a fish hatchery project.[466] Concurrently, the California Regional Water Quality Control Board, San Diego Region, concluded after conducting hearings that there was insufficient evidence to find that SONGS was violating its NPDES Permit.[467] Earth Island Institute and others immediately appealed this decision to the California State Water Resources Control Board.

The Institute then sought relief in federal court. After filing their complaint, the Institute discovered that SCE had submitted a Section 316(b) demonstration for Unit 1 in 1983, and for Units 2 and 3 in 1988.[468] The Institute subsequently maintained that SCE was apprised of the possibility of having to install cooling towers at the time of facility design to prevent further harm at a future cost of $1 to $2 billion.[469] The Institute proposed that the court fashion a remedy which would require SCE to engage in "greater mitigation efforts" than installing the 150 acres of wetland and 300 acres of artificial reefs required by the CCC.[470]

On January 25, 1991, SCE moved to stay the action pending exhaustion of the Institute's administrative appeals.[471] The court denied this request on May 14, 1991.[472] SCE then filed a motion for summary judgment claiming, *inter alia*, that ongoing administrative enforcement activities under CWA Section 309(g)(b)(6), 33 U.S.C. Section 1319(g)(b)(6), barred the Institute from pursuing the matter in federal court.[473] On June 1, 1992, plaintiffs moved to amend their complaint, alleging that the California Water Resources Control Board had failed either to review the Section 316(b) demonstration or to issue a Section 316(b) determination, and therefore the court should order EPA to perform

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466. *SoCal Ed Wetlands and Fish Projects at Nuclear Unit to Cost $122-Million*, UTIL. ENV'T REP., Sept. 17, 1993, at 11.

467. Stipulation of Settlement and Consent Decree at 3, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

468. Memorandum in Support of Points and Authorities in Support of Motion for Leave to Amend Complaint at 4-5, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

469. Plaintiffs' Position Memorandum at 15, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

470. *Id.* at 15-20.

471. Stipulation of Settlement and Consent Decree at 2, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

472. *Id.*

473. *Id.*

these tasks.[474] In addition, the Institute argued that EPA had failed to perform its nondiscretionary duty to promulgate regulations addressing BTA under Section 316(b).[475] On August 5, 1992, the court denied SCE's motion for summary judgment and denied plaintiffs' motion to amend their complaint.[476]

b. Earth Island/SCE Settlement Agreement

On or about December 23, 1992, the parties agreed to settle their dispute. The substantive thrust of the settlement was its requirement that SCE engage in mitigation measures beyond those required by the CCC. The $17 million settlement required SCE to: (1) spend $7.5 million to acquire and restore wetlands in the San Dieguito area; (2) pay $2 million to the San Diego State University Foundation and the Pacific Estuary Laboratory to fund wetlands restoration and research; (3) allocate $5.5 million to develop a Marine Educational program at Redondo Beach, California, with Earth Island Institute;[477] and (4) agree not to oppose Earth Island's petition to the court requesting litigation costs up to $2 million.[478] In return, Earth Island agreed to waive their right to seek any penalties, to withdraw all of their administrative appeals, not to oppose modifications to SCE's NPDES permits, and not to provide voluntarily or otherwise any of the discovery obtained from SCE in the action.[479] Upon petition for litigation costs the court ultimately awarded plaintiffs $1,407,594.94.[480]

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474. Memorandum in Support of Points and Authorities in Support of Motion for Leave to Amend Complaint at 5, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

475. *Id.* at 6. The National Alliance of River, Sound and Baykeepers pursued this issue more vigorously in *Cronin v. Browner*. *See supra* notes 126 through 145 and accompanying text.

476. Stipulation of Settlement and Consent Decree at 2-3, *Earth Island Inc.*, (No. 90-1535-B(BTM)).

477. The settlement also provides for $400,000 per year for ten years for administration of the Marine Science Center. *SoCal Ed Wetlands and Fish Projects at Nuclear Unit to Cost $122-Million*, *supra* note 466, at 11.

478. *Earth Island Inst.*, 838 F. Supp. at 462.

479. Stipulation of Settlement and Consent Decree at 12-15, *Earth Island Inst.*, (No. 90-1535-B(BTM)).

480. *Earth Island Inst.*, 838 F. Supp. at 467. In this case the court denied plaintiffs' request to enhance the attorney fee calculation by $492,495. The court ruled that it was bound by the Supreme Court's decision in City of Burlington v. Dague, 112 S. Ct. 2638 (1992), which limited enhancement of loadstar determinations for calculating attorney fees in citizen suits. Indeed, the Court noted that "plaintiffs have not persuaded the court that the results obtained are a tremendous victory. In their original complaint plaintiffs sought declaratory and injunctive relief as well as substantial monetary damages and penalties for what they asserted was serious violations of environmental standards. Yet, under the terms of the settlement, none of this relief is obtained. The SONGS units continued to operate as they have for more than ten years." *Earth Island Inst.*, 838 F. Supp. at 465-66. The court also dismissed Earth Island's argument that a non-negotiated, non-disputed fee award is deserving of

The mitigation program required by the CCC and Earth Island settlement will reportedly cost SCE about $63 million.[481]

6. Salem

Along the estuarine banks of one of the most ecologically important flyways and ecosystems in the world, Public Service Electric and Gas Company (PSE&G) operates the Salem Nuclear Generating Station ("Salem"), one of the largest once-through powerplants in the world. Salem has engendered more Section 316(b) activity than any other powerplant in the nation. In 1994, the State of New Jersey issued a CWA permit which bends far past the breaking point the application of mitigation projects under the purview of Section 316(b). It quickly spawned two legal challenges. In 1995, each legal challenge was resolved with an eye toward implementation of Section 316(b) with renewed vigor when the facility's CWA permit is renewed in 1999. Salem is examined below, along with its background, 1994 Permit, and resolution of legal challenges in its 1995 Permit.

a. Background

Salem is located along the Delaware River Estuary at Artificial Island on the eastern shore of the Delaware River in Salem County, New Jersey, approximately fifty miles northwest of the mouth of Delaware Bay and thirty miles southwest of Philadelphia.[482] Salem has two nuclear reactors, Units 1 and 2, which came on line in 1977 and 1981, respectively.[483] Both Units 1 and 2 employ once-through cooling which results in the continuous withdrawal of water from, and the discharge of wastewater into, the Delaware Estuary.[484]

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enhancement: "The fact that SCE agreed not to oppose plaintiffs' motion for approval of the fee is not persuasive, given the interest by SCE in consummating what appears to the court to be a settlement favorable to SCE." *Id.* at 466. Interestingly, the court did award the plaintiffs' attorneys an additional $1,000 for the "aggravation" of losing the stipulated fee. *Id.* at 467.

481. *SoCal Ed Wetlands and Fish Projects at Nuclear Unit to Cost $122-Million*, *supra* note 466, at 11.

482. Wastewater Facilities Regulation Program, Department of Environmental Protection and Energy, State of New Jersey, Draft NJPDES Permit Renewal Including Section 316(a) Variance Determination and Section 316(b) BTA Decision: NJPDES Permit No. NJ0005622, Fact Sheet at 7 (June 24, 1993) [hereinafter Salem Fact Sheet].

483. *Id.* at 8.

484. *Id.* at 7-8. PSE&G's permit also allows it to discharge 17,000 gallons per day of low level radioactive liquid waste. *Id.* at 9.

Salem withdraws cooling water from the estuary by means of a CWIS that is unparalleled in size. The CWIS has twelve intake bays with associated screens that rotate at an average of 0.9 inches per second, and twelve water pumps.[485] Each pump has a capacity of 266 million gallons per day, giving Salem a cooling water intake capacity of 3.2 BGD,[486] which is apparently the second largest rated capacity of any system in the world. After use, Salem's cooling water is discharged into the Delaware Estuary near the New Jersey-Delaware state line.[487] Salem operates pursuant to the conditions and provisions of a New Jersey Pollutant Discharge Elimination System (NJPDES) permit which became effective September 1, 1994, and is due to expire August 31, 1999.[488]

Salem's construction began in 1968.[489] PSE&G applied for an NPDES permit for the station in 1973.[490] Salem Unit 1 began commercial operation in 1977.[491] Salem's Unit 2 commenced commercial operation in 1981.[492] In 1978, EPA (which at the time had permitting authority over Salem) issued a consent decree requiring PSE&G to submit a Section 316(b) demonstration.[493] Thereafter, EPA provided PSE&G with technical guidance to assist the company with submission of the Section 316(b) demonstration.[494] PSE&G subsequently submitted its first Section 316(b) demonstration in 1984.[495] Following delegation of the NPDES program to New Jersey in 1982, the State undertook the task of evaluating the demonstration.[496]

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485. *Id.* at 11.

486. *Id.*

487. *Id.* at 7-8.

488. Department of Environmental Protection, State of New Jersey, Discharge Permit, PSE&G, Permit No. NJ0005622 at cover sheet (July 20, 1994) [hereinafter Salem Discharge Permit].

489. Salem Fact Sheet, *supra* note 482, at 8.

490. *Id.* at 103.

491. *Id.*

492. *Id.* at 106.

493. *Id.* at 103. Incidentally, EPA at the time deferred taking action on PSE&G's Section 316(a) variance request until after a decision was made regarding PSE&G's Section 316(b) demonstration. *Id.* at 104.

494. Thereafter, EPA assembled a Technical Advisory Group comprised of various federal and state scientific personnel to assist PSE&G with developing a "plan of study" for the Section 316(b) demonstration to evaluate Salem's impingement and entrainment effects. *Id.*

495. *Id.* at 107.

496. In early 1986, DEP commissioned Versar, Inc. (formerly Martin Marietta Environmental Systems), a highly-regarded environmental consulting firm. Versar has been retained by the Delaware Estuary Program (DELEP) to analyze PSE&G's 1984 316(b) demonstration. The DELEP is composed of state and local governmental, industrial (including representatives of PSE&G), and environmental interests to assist with the development of the DELEP's Estuary Management Plan. *Id.* at 108. Thereafter, in late 1986, Versar published its findings. VERSAR, TECHNICAL REVIEW AND

In 1989, the State's environmental consultant, Versar, Inc., issued a "Technical Review and Evaluation of Thermal Effects Studies and Cooling Water Intake Structure Demonstration of Impact for the Salem Nuclear Generating Station—Revised Final Report."[497] In this report, Versar concluded that "the [ongoing] adverse impacts of the Salem NGS are large and indicate the potential for substantial long-term population and ecosystem level impacts is great."[498] Versar found that the once-through cooling system employed at Salem adversely affects the Delaware Estuary and threatens "the protection and propagation of balanced indigenous populations."[499] The 1989 Versar Report estimated that Salem is responsible for annual net productivity losses of 17,909,400 pounds of bay anchovy, 11,448,890 pounds of weakfish, and 38,969 pounds of white perch.[500] This translates into 800 million bay anchovy, 1 million weakfish, 300,000 spot, 200,000 blueback herring, and countless other organisms.[501] The 1989 Versar Report also found that Salem's CWIS resulted in "adult losses for herring, spot, and white perch [that] exceed the average commercial or recreational fishery for the Delaware Estuary for the period of 1975-1980."[502]

EVALUATION OF THERMAL EFFECTS STUDIES AND COOLING WATER INTAKE STRUCTURE DEMONSTRATION OF IMPACT FOR THE SALEM NUCLEAR GENERATING STATION—FINAL REPORT [hereinafter 1986 VERSAR REPORT].

The 1986 Versar Report concluded that Salem's existing once-through cooling operation was having a significant impact upon the Delaware Estuary and its aquatic life due to impingement and entrainment. Versar correspondingly recommended that DEP require PSE&G to retrofit Salem with closed-cycle cooling towers. *See generally* 1986 VERSAR REPORT. PSE&G contested the findings of the 1986 Versar Report. Thus, in 1987, DEP convened a technical workshop and conducted public hearings to try to resolve the dissonance between the 1986 Versar Report and PSE&G's 1984 Section 316(b) demonstration. Salem Fact Sheet, *supra* note 482, at 108. Correspondingly, in 1988, PSE&G submitted written comments which provided new data and analyses not submitted previously with its 1984 Section 316(b) demonstration and, therefore, not considered by the 1986 Versar Report. *Id.* at 109.

497. The 1989 Versar Report notes that any deficiencies in either the 1986 or the 1989 Report are a result of the many inadequacies of PSE&G's submissions. VERSAR, TECHNICAL REVIEW AND EVALUATION OF THERMAL EFFECTS STUDIES AND COOLING WATER INTAKE STRUCTURE DEMONSTRATION OF IMPACT FOR THE SALEM NUCLEAR GENERATING STATION at VI-4 (Jan. 1989) (Revised Final Report) [hereinafter 1989 VERSAR REPORT].

498. *Id.*

499. *Id.* at VI-1. In particular, the 1989 Versar Report maintained that the entrainment and impingement of aquatic life resulting from the operation of the CWIS at Salem significantly effects: (1) important spawning and nursery functions for representative important species (RIS); (2) the food web of the Delaware Estuary; and (3) the commercial and recreational fishing uses of the Delaware Estuary. *Id.* at VIII-1.

500. *Id.* at V-26.

501. *Id.*

502. *Id.* at V-27.

Accordingly, Versar concluded that the only means of reducing "the risk of long-term population and ecosystem level impacts from occurring," would be to institute "major reductions in entrainment and impingement losses (e.g., [greater] than 50%) at Salem."[503] Versar noted that a closed-cycle cooling system would reduce Salem's cooling water intake requirements by more than 95% and result in a concomitant 95% reduction of entrainment and impingement losses.[504] Versar also acknowledged that there are other types of advanced technology that might adequately minimize Salem's adverse environmental impact, including wedgewire screens, variable speed pumping, flow reductions and seasonal shut-downs.[505] However, Versar found that there was *insufficient evidence* at the time to determine whether any alternative technology to cooling towers would provide an adequate reduction (greater than 50%) of impingement and entrainment losses.[506] Versar therefore recommended that DEP require PSE&G to retrofit Salem with closed-cycle cooling towers.[507] Versar found that the costs of retrofitting Salem would be a mere $0.20 per month per ratepayer, and that this cost was not wholly disproportionate to the environmental benefits conferred by the conversion.[508]

On October 3, 1990, DEP issued a Draft Permit ("1990 Draft Permit") which firmly embraced the findings and recommendations of the 1989 Versar Report. DEP required PSE&G to comply with Section 316(b) by retrofitting Salem with a closed-cycle cooling system.[509] In the succeeding years, PSE&G threatened DEP with legal action unless it backed down, EPA neither promulgated regulations nor objected to use of mitigation elsewhere, and DEP administrations waxed and waned. In short, the situation was ripe for the most unabashed use of a mitigation project yet.

On June 24, 1993, DEP issued a second draft permit for Salem ("1993 Draft Permit") which reconsidered the 1990 Draft Permit. The 1993 Draft Permit proposed a mitigation experiment and associated measures in lieu of the more stringent technology-based controls (i.e., a closed-cycle cooling system) required by the 1990 Draft Permit.[510]

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503. *Id.* at VI-4 (alteration in original) (emphasis added).

504. *Id.* at VII-8.

505. *Id.* at VII-6 to VII-11.

506. *Id.*

507. *Id.* at VII-23.

508. *Id.*

509. Salem Fact Sheet, *supra* note 482, at 4.

510. Department of Environmental Protection, State of New Jersey, Draft Discharge Permit, PSE&G, Permit No. NJ0005622 [hereinafter 1993 Salem Discharge Permit]. DEP did so over the objections of its project manager for Salem, who argued against any such mitigation experiment and

b. 1994 Permit

Following extensive public comment, DEP issued a final permit ("1994 Permit") on July 20, 1994, which allows PSE&G to continue to operate Salem with little change. Following the trend initiated by the 1980 Hudson River Settlement, the 1994 Permit's conditions combine both technological and mitigative means for attempting to minimize adverse environmental impacts. The 1994 Permit contains seven "special conditions."[511] DEP contends that three of these conditions represent compliance with Section 316(b). The four extra non-BTA related conditions, DEP maintains, are included as further means of minimizing adverse environmental impact.[512]

c. BTA-Related "Special" Conditions

The three special conditions DEP identified as addressing BTA are: (1) reduction of the permitted intake flow of Salem from its maximum design capacity to its maximum actual operating capacity;[513] (2) modification of the design of the screens on Salem's intake structure;[514] and (3) development and implementation of a plan to study the feasibility of deterring fish from entering the area surrounding Salem's intake structure through the use of underwater speakers and/or sound projectors.[515]

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in favor of a closed-cycle cooling system. *See* Letter of Richard Delgado to Leroy T. Cattaneo, May 23, 1989 (on file with the authors).

511. Clearly DEP believes that the special conditions are the bulwark of the permit—the 1994 Permit requires PSE&G to set aside an irrevocable letter of credit of $20 million in trust to ensure completion of the special conditions. Department of Environmental Protection, State of New Jersey, Discharge Permit, PSE&G, Permit No. NJ0005622 at 28 [hereinafter 1994 Salem Discharge Permit].

512. *See generally* Department of Environmental Protection, State of New Jersey, Response to Comments, PSE&G, NJPDES/DSW Permit No. NJ0005622 at 5 (1994).

513. 1994 Salem Discharge Permit, *supra* note 511, at 18. Salem's permit limits average daily intake flow to 3.024 BGD, calculated using a monthly average rate. *Id.* Unfortunately, however, DEP's use of the phrase "intake flow limitation" is somewhat deceptive. In fact, 3.024 BGD matches Salem's maximum flow requirement, and represents no reduction whatsoever in either entrainment, impingement, or water withdrawal from the Delaware Estuary.

514. *Id.* Salem's permit requires PSE&G to install a new fish bucket design including an inwardly placed lip extended to prevent fish escape, smooth woven mesh screens with rectangular pore openings to reduce injury to impinged fish, and a 30-inch wide fish sluiceway with a 3-inch deep water reservoir to facilitate fish return. *Id.*

515. *Id.* at 26. Salem's permit requires PSE&G to study behavioral means of deterring fish from the CWIS through use of underwater speakers and/or sound projectors. *Id.*

d. Non-BTA-Related "Special" Conditions

The 1994 Permit also contains four special conditions that do not directly involve Section 316(b), which include: (1) a wetlands restoration and enhancement program in and around the Delaware Estuary;[516] (2) establishment of a Management Plan Advisory Committee to "provide technical advice" to PSE&G concerning the development and implementation of the mitigation project;[517] (3) spending at least $425,000 to build and maintain five "fish ladders" at approved locations for tributaries to the estuary;[518] and (4) conducting a baywide biological monitoring study.[519] To help execute the biological monitoring study, DEP required PSE&G to establish a Monitoring Advisory Committee.[520] The Committee was empaneled to advise PSE&G regarding biological monitoring design, implementation, modifications and results interpretation.[521]

Instead of explicitly infusing Salem's permit with a condition requiring that Salem comply with Section 316(b) (as the New York DEC had in *Hudson Riverkeeper Fund*), DEP's acknowledgment of Section 316(b)'s requirements was decidedly abstruse and, perforce, unsatisfactory to one attempting to divine DEP's application of Section 316(b). DEP must have realized the tenuous Section 316(b) thread that ran through the

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516. *Id.* at 19-20. The wetlands restoration and enhancement program requires PSE&G to:

> (1) [R]estore [at least] 8,000 acres of [a] diked wetlands (including salt hay farms, muskrat impoundments and/or agricultural impoundments) to normal daily tidal inundation so as to become functional salt marsh; and/or [b] wetlands dominated by common reed (*Phragmites australis*) to primarily *spartina* species with other naturally occurring marsh grasses. . . . No less than 4,000 of the 8,000 acres required to be restored must have been diked wetlands. . . .
>
> (2) [R]estore an additional 2,000 acres of wetlands . . . and/or preserve in a state that precludes development through appropriate title ownership or [c]onservation [r]estriction of no less than 6,000 acres of ["upland buffers"; and] . . . .
>
> (3) [I]mpose a [c]onservation [r]estriction [in favor of DEP on] approximately 4,500 acres of land in Greenwich Township, Cumberland County, commonly known as the "Bayside Tract."

Id.

517. *Id.* at 24.

518. *Id.* at 24-25.

519. *Id.* at 26. As part of the biological monitoring study PSE&G must complete: (1) comprehensive thermal monitoring and performance of biothermal assessment on representative important species; (2) baywide aquatic abundance monitoring; (3) impingement and entrainment monitoring; (4) abundance monitoring for ichthyoplankton and juvenile blueback herring and alewife in connection with fish ladder sites; (5) detrital production monitoring; and (6) residual pesticide release monitoring, and other studies as DEP may require. *Id.* at 26-27.

520. *Id.* at 27.

521. *Id.*

1994 Permit, and in a last ditch codicil to the permit acknowledged Section 316(b) with a wheeze and a whimper: "With respect to Section 316(b), the Department's determination [at the time of permit reissuance, scheduled for September 1, 1999] will include, but not be limited to, an evaluation of whether technologies, their costs and benefits, and potential for application at the Station have changed."[522] At its core, Salem's permit represented something of a departure from other BTA determinations. It largely abandoned the use of technological means of complying with Section 316(b), and does nothing to reduce entrainment. These deficiencies resulted in two lawsuits challenging the 1994 Permit.

e. Third Party Appeals of the 1994 Permit

On or about August 19, 1994, both the State of Delaware and a group of fourteen environmental, conservation, and fishing interests ("Coalition") appealed issuance of the 1994 Permit.[523] The State and the Coalition's legal arguments were, in principle, aligned. They each argued that the 1994 Permit did not ensure that the design, capacity, and location of Salem's CWIS reflect BTA for minimizing adverse environmental impact in accordance with Section 316(b);[524] that the costs of certain technology-based compliance measures not required by DEP were not wholly disproportionate to the environmental benefits conferred by such measures;[525] and that Salem's CWIS was having an undue impact on interstate waters.[526] Both appeals were settled by Spring 1995 and are discussed in the following paragraphs.

(i) State of Delaware PSE&G Agreement

On or about March 31, 1995, the State of Delaware announced that it had entered into a $10.5 million settlement to benefit Delaware's coastal

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522. *Id.* at 31.

523. Letter from James R. May, Associate Professor of Law and Director of the Environmental Law Clinic, Widener University, to Office of Legal Affairs, Department of Environmental Protection and Energy, State of New Jersey 10-11 (Aug. 19, 1994) (request for an adjudicatory hearing) (on file with the author). The Coalition included the American Littoral Society, Delaware Riverkeeper Network, Central Jersey Anglers, Clean Ocean Action, Del-AWARE Unlimited, Inc., Delaware Audubon Society, Delaware Bay Waterman's Association, Delaware Nature Society, Delaware River Fisherman's Association, New Jersey Environmental Federation, New Jersey Public Interest Research Group, Raymond Proffitt Foundation, Venatores Gun Club, and Watch Our Waterways. *Id.*

524. PSE&G/Salem Coalition, Settlement Agreement, at 2 (Mar. 17, 1995) [hereinafter Salem Coalition Settlement Agreement].

525. *Id.*

526. *Id.*

fisheries, wetlands, and open spaces.[527] Specifically, Delaware's settlement requires PSE&G to pay:

(1) $4.7 million for restoration and maintenance of at least 2,000 acres of degraded wetlands along the Delaware Bay and River;[528]

(2) $1.7 million for construction of as many as three fish ladders in Delaware State waters;[529]

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527. State of Delaware, Office of the Governor, *Carper Closes $10.5 Million Deal to Enhance Delaware Fisheries, Wetlands*, Press Release 1 (Mar. 31, 1995). The Delaware Press Release closely follows the terms of the State of Delaware/PSE&G Settlement Agreement (March 23, 1995) (on file with the authors). The State of Delaware and the Environmental Coalition certainly were not alone in arguing that Salem is not complying with Section 316(b). For example, among an avalanche of public opposition to the permit were findings of various independent technical and agency experts which challenged whether Salem employs BTA, including: Dr. R. Ian Fletcher, Commentary on the Proposed Alterations of the Intake Screening System at the Salem Nuclear Station, NPDES Draft Permit NJ0005622 (Nov. 20, 1993); Fletcher, Further Comments on the Proposed Alterations of the Intake Screening System at the Salem Nuclear Station, With Reference to 'Response to Comments Document' PS&G [sic] Salem Generating Station NJPDES/DSW Draft Permit NJ0005622 (Nov. 20, 1994) (concluding that Salem's intake screens do not reflect BTA); Statement of Dr. Jeffrey B. Waxman, Vice President, Coastal Environmental Services, Inc. at Public Hearing on the Issuance and Draft NJDEP Permit for the Salem Nuclear Generating Station at 3 (Sept. 9, 1993) (Dr. Waxman concluded that Salem's permit conditions "regarding the design, location, and capacity of [Salem's CWIS] do not reflect best technology available (BTA) to minimize the adverse impacts of [Salem] as required by Section 316(b) of the Clean Water Act. In particular, the alleged BTA measures incorporated into the 1993 Draft Permit, and other mitigation measures including the proposed wetlands creation/restoration, will not reduce the losses in fish populations to a minimal level that would occur if a closed-cycle cooling system (or possibly some other type of technology based compliance measures were installed)."); John Boreman, Ph.D., Evaluation of the PSE&G Estimates of Entrainment and Impingement Mortality at the Salem Nuclear Plant, (Univ. of Mass., Dec. 1993) (concluding that PSE&G had underestimated entrainment and impingement mortalities by as much as 50%).

A detailed discussion of the Herculean efforts the Coalition, led by the Delaware Riverkeeper Network, made to enforce Section 316(b) is beyond the scope of this article. Suffice it to say that they initially petitioned New Jersey in November 1992, renewed their concerns in March 1993, solicited EPA involvement in July 1993, submitted extensive public comments in Fall 1993, petitioned EPA to exercise its veto authority in 1994, and supplemented the record with expert testimony. The futility of these efforts led to the Coalition's appeal of the 1994 Permit. The author, James R. May, as Director of the Widener University School of Law Environmental Law Clinic (WUSLELC), served as lead counsel for the Coalition. The other contributor to this article, Maya van Rossum, contributed to the Coalition's efforts from September 1992 until May 1994, as Fellow to the WUSLELC. Mr. Edward Lloyd, as Director of the Rutger's University School of Law Environmental Law Clinic, assisted as counsel. Messrs. Richard B. Stuart and Angus MacBeth, from the law firm of Sidley & Austin, joined by various in-house attorneys, served as counsel to PSE&G. Mr. Stuart is a Professor of Law at New York University School of Law.

528. *Carper Closes $10.5 Million Deal to Enhance Delaware Fisheries, Wetlands* at 3. Wetland types targeted for restoration include impounded wetlands or publicly-owned wetlands dominated by the pest plant species *phragmites*, also known as "common reed." *Id.*

529. *Id.* The fish ladders will be designed to help fish negotiate migration barriers such as dams and spillways to better enable them to reach spawning grounds. The fish affected include: river herring, white and yellow perch, and striped bass. Sites targeted to receive ladders include Silver Lake in Dover, McColley's Pond near Milford, and McGinis Pond near Frederica. *Id.*

(3) $950,000 for restoration of approximately 1,000 additional acres of impounded wetlands along Delaware River and Bay;[530]
(4) $700,000 for *phragmites* control, to be used on 3,000 acres of publicly or privately owned coastal wetlands;[531]
(5) $2.0 million to fund acquisition of approximately 2,000 acres of upland buffer for protection of important tidal wetland areas;[532]
(6) $500,000 for construction of artificial reefs in Delaware Bay.[533]

In addition, as part of its agreement with the State of Delaware, PSE&G agreed to review Salem's CWIS problems with fish entanglement with marsh grasses or other debris found in the intake screens and to test new technology designed to reduce associated fish mortality if necessary.[534] PSE&G also agreed to fund any DEP review of PSE&G's evaluation of alternative intake technologies for the Salem plant.[535]

(ii) Coalition/PSE&G Agreement

On May 12, 1995, PSE&G also reached agreement with the Coalition. In the Coalition/PSE&G settlement, the company agreed to:
(1) Consult an independent scientist named by the Coalition to reevaluate Salem's cooling water intake screening systems so as to minimize impingement losses from the station;[536]
(2) Evaluate existing and newly-developed impingement and entrainment-reducing technologies and assess their potential for reducing fish losses at Salem;[537]
(3) Cause the appointment of two independent scientists designated by the Coalition to the Monitoring Advisory Committee and one independent

530. *Id.*

531. *Id.* Privately-owned lands would be treated under the protocols of the State's *phragmites* cost-share program. *Id.*

532. *Id.*

533. *Id.*

534. *Id.*

535. *Id.*

536. In this regard, PSE&G agreed to provide the scientist (Dr. Ian Fletcher) with engineering drawings, documentation relating to debris and fish removal and return systems, and operability tests. PSE&G has also agreed to pay for the professional services and expenses of the consultant. Salem Coalition Settlement Agreement, *supra* note 524, Article 2 at 4.

537. As such, PSE&G agreed to conduct by April 1, 1997, a plan of study to assess technologies for reducing entrainment and impingement losses and to evaluate their appropriateness for application at Salem in light of engineering and biological suitability, environmental benefits, and environmental and economic costs. *Id.* Article 3 at 8.

scientist to the Management Plan Advisory Committee[538] to better monitor and evaluate Salem's impact on aquatic ecosystems;

(4) Provide the Coalition and its counsel with copies of applications to renew the permit and the settlement;[539]

(5) Reimburse the Coalition and its counsel for the costs of pursuing the permit appeal in an amount of $100,000.[540]

In return for the above, the Coalition agreed to withdraw its permit appeal.[541]

In the final analysis, the Hudson River Agreements, *John Sevier*, *Crystal River*, *Chalk Point*, *Earth Island*, and *Salem* all fall short of requiring full compliance with Section 316(b). In each of these instances, all concerned would have been better served by taking a clearer aim at the CWA's requirements, i.e., explicitly determining whether the design, location, capacity, and construction of a CWIS reflects BTA for minimizing adverse environmental impact. Just how this may be done is explored in Part IV.

IV. DETERMINATION OF WHETHER THE DESIGN, LOCATION, CAPACITY AND CONSTRUCTION OF A CWIS REFLECTS BTA FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT

As the federal court observed in *Hudson Riverkeeper Fund*, the requirements of Section 316(b) are clear: any point source subject to the requirements of Sections 301 or 306, utilizing a CWIS, must ensure that the location, design, construction, and capacity of its CWIS reflect BTA for minimizing adverse environmental impact.[542] Therefore, ascertaining compliance with Section 316(b) requires close scrutiny of the operative words and phrases of the Section: "adverse environmental impact;" "minimize;" "design;" "location;" "capacity;" "construction;" "cooling water intake structure;" and "best technology available." Each of these terms is detailed below.

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538. *Id.* Article 4 at 8. PSE&G also agreed to pay the professional services and expenses of these independent scientists. *Id.* Article 4 at 10-11.

539. *Id.* Article 6 at 12.

540. *Id.* Article 5 at 12.

541. *Id.* Article 1 at 2-3.

542. *Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc.*, 835 F. Supp. 160, 166 (S.D.N.Y. 1993) (determining that the language of Section 316(b) was clear and therefore the plain meaning of the provision controls its construction).

A. Determination of "Adverse Environmental Impact"

Section 316(b) is applicable to CWISs that are having an adverse environmental impact. Thus, as in *Brunswick I*, only if a CWIS is determined to be having an "adverse environmental impact" will the BTA requirements of Section 316(b) become relevant.[543] As we shall see, the threshold for "adverse" contained in Section 316(b) is a relatively low one. For example, in the 1973 Proposed Regulations, EPA suggested that any detrimental environmental impact could be considered "adverse."[544] This definition conceivably includes loss of individual aquatic organisms. In 1977, EPA published a guidance document in order to remove doubts about the meaning of the term "adverse."

In its 1977 Guidance For Evaluating the Adverse Impact of Cooling Water Intake Structures On the Aquatic Environment: Section 316(b) P.L. 92-500 ("1977 Adverse Impact Guidelines"),[545] EPA recognized that CWISs can adversely impact the environment by virtue of impingement and/or entrainment.[546] Due to the large amount of fish killed by the nation's CWISs, EPA remarked that "[t]he extent of *fish losses of any given quantity* needs to be considered on a plant-by-plant basis, in that the language of Section 316(b) . . . requires cooling water intakes to 'minimize [such] adverse environmental impact.'"[547]

In defining the term "adverse environmental impact," the 1977 Adverse Impact Guidelines pronounced that such adverse impacts "occur *whenever* there will be entrainment or impingement damage as a result of the operation of a specific [CWIS]."[548] To determine the extent of adverse impact, EPA considered six factors: (1) absolute damage (i.e., the number of fish impinged or percentage of larvae entrained on a monthly or yearly basis); (2) percentage damage (i.e., the percent of existing fish and/or larval populations impinged or entrained); (3) absolute and percentage damage to endangered species; (4) absolute and percentage damage to any critical aquatic organisms; (5) absolute and percentage damage to commercial and/or sport fisheries yield; and (6) whether the impact jeopardizes the protection and propagation of shellfish and fish (i.e., the

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543. *Brunswick I*, Region IV, EPA 28 (Nov. 7, 1977) (Initial Decision re: Permit No. NC0007064).

544. 38 Fed. Reg. 34,410 (1973) (to be codified at 40 C.F.R. pts. 401-402) (proposed Dec. 13, 1973).

545. 1977 ADVERSE IMPACT GUIDELINES, *supra* note 35.

546. *Id.* at 1.

547. *Id.* at 3 (emphasis added).

548. *Id.* at 15 (emphasis added).

long-term impact).[549] Thus, EPA uses both short-term and long-term criterion measurements to determine the extent of a CWIS's impact on the environment.

In practice, EPA has defined the term "adverse" in general terms to mean "unfavorable, harmful, difficult, or detrimental," but not "irreversible" or "irretrievable."[550] Therefore, CWISs having a present or short term harmful impact on the environment, including loss of individual organisms, are subject to the BTA requirements of Section 316(b).

B. Determination of "Minimize"

Section 316(b) requires that powerplants use BTA to "*minimiz[e]* adverse environmental impact."[551] The American Heritage Dictionary defines "minimize" as: "[t]o reduce to the smallest possible amount, extent, size, or degree."[552] EPA interprets the term "minimize" to mean a reduction to the "smallest possible amount or degree."[553] The 1976 Regulations captured EPA's definition that "minimize" means reducing to the smallest degree possible.[554]

Although this standard does not require elimination of all losses of organisms due to plant operations,[555] minimization of adverse environmental impact is required regardless of whether the adverse environmental impact a CWIS is having is considered to be significant or not. "*All* environmental harm should be avoided."[556] In other words, a facility which is having an adverse environmental impact must use a BTA which will reduce adverse environmental impact to the smallest possible amount or degree.

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549. *Id.*

550. *See, e.g., Brunswick I*, at 28, 31 (Initial Decision re: Permit No. NC007064) (citing WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY (1976)).

551. 33 U.S.C. § 1326(b) (emphasis added).

552. AMERICAN HERITAGE DICTIONARY, 1150 (3d ed. 1992).

553. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 183.

554. Preamble to § 316(b) Regulations, 41 Fed. Reg. 17,387-88 (1976) (proposed Apr. 26, 1976) (subsequently withdrawn following invalidation of the accompanying Development Document by the Fourth Circuit in Appalachian Power v. Train, 566 F.2d 451 (4th Cir. 1977)); *accord Seabrook II*, 10 Env't Rep. Cas. (BNA) 1257 (EPA June 17, 1977).

555. *See, e.g.*, In the Matter of Boston Edison Electric Company (Pilgrim Nuclear Station NPDES Permit Nos. MA00003557 and MA0025135).

556. *Id.* (emphasis added).

C. Determination of "Design," "Location," "Capacity," and "Construction"

Section 316(b) next contemplates a discussion of the following terms: "design," "location," "capacity," and "construction." Each of these are discussed in the following subsections.

1. "Design" and BTA

The design features contemplated by Section 316(b) revolve around technologies that will reduce fish losses due to both entrainment and impingement effects.[557] Presently, however, as is apparent in *Hudson Riverkeeper Fund*, most of the technologies used by steam electric powerplants involve antiquated fish screening and fish return devices designed only to prevent debris from entering the cooling water system.[558] The 1993 EPA Background Paper remarked that these systems "are limited in their abilities to minimize adverse aquatic impact."[559]

Yet there have been some improvements to CWIS design since passage of the CWA. The 1976 Development Document found design to include screening devices,[560] use of fish handling and bypass systems,[561] pumps,[562] trash racks,[563] and behavioral barriers.[564] Additionally, as EPA noted in *Seabrook* and *Brunswick I* and their progeny, the "design" factor contemplates such items as fish ladders, fish buckets, improved fish screens, protective coatings, intake depth adjustment, modified velocity caps, and sound deterrent devices.[565]

By far the most direct influence on CWIS design involves fish screening devices. Screening and fish return designs employed to minimize adverse environmental impact of CWISs can be divided into

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557. BACKGROUND PAPER NO. 3, *supra* note 25, at 2.

558. *Id.* at 2, 9.

559. *Id.* at 9.

560. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 27.

561. *Id.*

562. *Id.*

563. *Id.*

564. *Id.* at 180.

565. *See, e.g.*, *Brunswick I*, (Initial Decision re: Permit No. NC007064). After discussing the lengthy approach channel used by Brunswick's intake system, the RA in *Brunswick I* determined that the design of the Brunswick intake structure did not fulfill the BTA requirements of Section 316(b) for minimizing adverse environmental impacts. *Id.* at 55-57. In *Seabrook II*, the EPA equated intake velocity with design. *See Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1270. "[D]esigning for a single velocity cannot protect all fish at all times." *Id.*

three basic types: (1) removal and return technologies, namely, traveling, disk, drum, and fixed screens; (2) exclusion technologies, namely, wedgewire screens, perforated pipes, radial wells, porous dikes, and artificial filter beds; and (3) diversion and/or avoidance technologies, such as louvers, velocity caps, and physical and hydraulic barriers. These are briefly addressed by the following subsections.

a. Removal and Return Technologies

The most common CWIS configurations have a fish and debris removal system followed by a system that returns impinged fish and debris back to a waterbody.[566] The removal entry systems are usually designed with front-end, fixed-bar trash racks to keep large debris out of the CWIS, followed by a phalanx of traveling screens designed to prevent smaller debris from bypassing the CWIS and clogging condenser tubes.[567] The return systems usually involve high- and low-pressure sprays followed by combined or separate fish and debris return troughs, which re-introduce impinged fish and debris to their aquatic environment. The design of the fish removal and return systems typically distinguish one CWIS from the next. Designs of such systems include an assortment of screens, such as traveling,[568] modified traveling,[569] inclined traveling,[570] Passavant,[571] dual

566. BACKGROUND PAPER NO. 3, *supra* note 25, at 3.

567. *Id.*

568. Known as "conventional traveling screens," single-entry, single-exit vertical traveling screens are used by 60% of all steam-electric powerplants in the United States. *Id.* at 6. Conventional traveling screens were not designed with Section 316(b) in mind these systems impinge fish, debris and refuse in screen-wells. *Id.* Powerplants using this type of technology have virtually unfettered adverse environmental impact.

569. Some designs modify conventional systems in an attempt to reduce impingement losses by treating impinged organisms less harshly than impinged debris. Modified traveling screens attempt to sequester impinged organisms from debris with a series of high and low pressure sprays and thereafter return them to waterbodies with as little additional stress as possible. *Id.* The success of such intervention is often unclear. *Id.* at 6. One type of modified traveling screen, called a "Fletcher-Modified Ristroph" screen, is currently being tested at a powerplant in the Delaware Estuary. *See* discussion of Salem, *infra* Part III.D.6.

570. Inclined traveling screens are placed at an angle to incoming flow which fish are more likely to avoid. BACKGROUND PAPER NO. 3, *supra* note 25, at 7. Such systems must be combined with a bypass system using independently-induced flow as a means of directing fish away from the CWIS. *Id.*

571. The "Passavant" screen uses a single-entry, double-exit design to increase screen surface area and thereby increase debris removal rates. Passavant screens do not reduce impingement losses any more than conventional vertical traveling screens. *Id.*

flow,[572] horizontal traveling,[573] fine mesh,[574] horizontal drum,[575] vertical drum,[576] rotating disk,[577] and fixed.[578] One commonality shared by all screens is that they do not reduce entrainment and have only a limited ability to minimize impingement losses. Moreover, they are generally ineffective in their ability to treat fish less severely than debris.[579]

b. Exclusion Technologies

Exclusion technologies attempt to dissuade aquatic organisms from entering the CWIS in the first place, thereby reducing impingement and entrainment losses. In order of general effectiveness, exclusion

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572. Dual flow screens use a double-entry, single-exit vertical traveling screen design. These systems use an approach flow parallel to the intake screen which allows for increased debris removal capabilities. Dual flow screens do not reduce impingement losses any more than conventional vertical traveling screens. *Id.*

573. Horizontal traveling screens rotate in a continuous fashion with an upstream face placed at an angle which guides fish away from the CWIS. *Id.* However, various mechanical problems have foreclosed extensive research into this type of technology although it may hold some promise in limited circumstances.

574. Fine mesh screens mounted on traveling screens are virtually the only type of traveling screen designed to reduce both impingement and entrainment losses. *Id.* at 8. This type of system is still unproven and is not used continuously by any powerplant.

575. Horizontal drum screens remove debris from intake water more efficiently than do conventional screens. *Id.* Horizontal drum screens are used extensively outside of the United States. These systems have not been shown to minimize fish losses more than conventional systems. *Id.*

576. Vertical drum screens, like horizontal drum screens are used outside the U.S. *Id.* They have been used for fish diversion and for protection of salmonids with varying success, but have yet to be prototype-tested by utilities in the United States. *Id.*

577. Rotating disk screens rotate around a horizontal axis where high pressure sprays remove fish and debris before they enter the CWIS. *Id.* It is believed that horizontal rotation disk screens do not reduce impingement losses more than conventional systems. *Id.*

578. Fixed screen technology is used at smaller stream powerplants in the United States. *Id.* at 9. Fixed screens require an operator to remove fish and debris from the fixed screen on a periodic basis. *Id.* Long impingement times and operator dependency make fixed screens a less desirable type of screen system.

579. BACKGROUND PAPER NO. 3, *supra* note 25, at 6-9.

technologies include wedgewire screens,[580] perforated pipes,[581] radial wells,[582] porous dikes,[583] and artificial filter beds.[584]

c. Behavioral Barriers

Behavioral barriers are designed to take advantage of natural fish behavioral patterns which would cause them to avoid CWISs altogether.[585] Behavioral barriers include louvers,[586] velocity caps,[587] fish barrier nets,[588] and air bubble, electrical, light, sound, cable, chain, and water jet

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580. Wedgewire screens use a combination of exclusion and hydrodynamics to reduce significantly entrainment losses. *Id.* at 10. First, the screen's mesh size is smaller than the organisms susceptible to entrainment; therefore, fish, fry, larvae and eggs never make it into the CWIS. *Id.* Second, maintenance of a low, "through-slot" velocity further impedes entrainment losses by forcing aquatic organisms away from the system. *Id.* Although shown to be effective at various powerplants in the United States, the potential of wedgewire screen technology has yet to be fully explored.

581. Perforated pipes withdraw water through slots in cylindrical CWISs. *Id.* at 10. These devices, however, have thus far found limited use solely with powerplants having small intake flow requirements.

582. Radial wells consist of a vertical pump caisson sunk below the water table. *Id.* Then perforated collector screen pipes (radial wells) are "jacked" out through well ports in a surrounding porous aquifer. *Id.* Although radial wells reduce impingement and entrainment losses significantly, the need for a viable porous aquifer has limited their application. *Id.*

583. Porous dikes resemble a "breakwater" engulfing a CWIS. *Id.* at 10. The core of the porous dike consists of cobble, stone, or gravel which acts as a physical and behavioral barrier to aquatic organisms. *Id.* Although porous dikes have been shown to reduce fish losses, they still represent a developing technology and have thus far been relegated to powerplants with small flow requirements. *Id.* at 11.

584. Much like porous dikes, artificial filter beds surround CWISs and provide both a physical and behavioral barrier to aquatic organisms. *Id.* at 11. Artificial beds can be made with granular filter materials, *id.*, or fabrics designed to prevent the entrance of debris and aquatic life into a CWIS. A prototype of an artificial bed with a fabric filter, called a "Gunder" boom, is currently being tested at a powerplant along the Hudson River. *See* discussion of *Hudson Riverkeeper*, *supra* Part III.C.1.

585. BACKGROUND PAPER NO. 3, *supra* note 25, at 12.

586. Louvers consist of a series of vertical panels placed at 90• angles to water flow direction. *Id.* at 12. Panel placement capitalizes on the natural tendency of fish to avoid changes in water flow direction and velocity. *Id.* Water currents parallel to the louvers then carry fish to a bypass system, *id.*, and thereafter, to safety. The potential of louvers to reduce fish losses at powerplants has not been fully explored.

587. Velocity caps are used on vertical intakes to convert vertical into horizontal flow, *id.*, thereby taking advantage of the natural tendency of fish to avoid rapid changes in flow direction. Velocity caps have proven to be successful at many powerplants throughout the United States. *Id.* at 13. The potential of velocity caps to reduce fish losses at powerplants has not been fully explored.

588. Fish barrier nets are large nets placed in front of CWISs. They perform both screening and behavioral purposes. *Id.* Fish barrier nets have proven to be useful on a seasonal basis at numerous powerplants, *id.*, whose CWISs are located along significant fish migration paths.

barriers.[589] The principal drawback of behavioral barriers is that they do not reduce entrainment, and have only limited capacity to reduce impingement losses.[590]

The ultimate success or failure of a specific cooling water intake design will depend upon the individual characteristics of a powerplant, the waterbody from which it is drawing its cooling water, and the aquatic organisms affected by the cooling water intake structure.[591] There is no generally accepted intake design which can be said to fulfill the requirements of Section 316(b) for all facilities, although improvements can be realized as technology improves.

2. "Location" and BTA

Next, CWISs must be located so as to minimize adverse environmental impact. In the 1976 Development Document, EPA said that the "location" of an intake structure "can be the most important consideration relevant to applying the best technology available for cooling water intake structures."[592] When cooling water intake structures draw water from a source waterbody, they also pull into the system all of the organisms living within that water. "The quantities of life destroyed by impingement on the screens or entrainment through the condenser cooling system are a direct function of the density of organisms residing in the source water[body]."[593] Therefore, by locating an intake structure where the quantity of aquatic organisms is high, a powerplant inevitably increases the adverse environmental impacts it will have on the source water.

The 1993 Background Paper maintains that decisions concerning the location of a CWIS require an "extensive ecological survey in the vicinity of the proposed site."[594] This survey should be used to determine the

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589. Air bubble, electrical, light, sound, cable and chain and water jet barriers are behavioral mechanisms using various electrical or physical means for deterring fish from entering a CWIS. *Id.* at 13-14. Electric barriers produce an electric shock promoting fish avoidance; light barriers and sound barriers produce light or sounds that deter fish; cable and chain barriers move through the water and have the effect of deterring fish from the area; and water jets produce a high pressure shield of water to usher fish away from the intake area. These technologies have each met with varying degrees of acceptance and interest. *Id.* at 14. For instance, a utility recently embarked on a study of sound barriers at a powerplant in the Delaware Estuary. *See generally* notes 482-541 and accompanying text (discussing *Salem*).

590. BACKGROUND PAPER NO. 3, *supra* note 25, at 14.

591. *See, e.g.*, BACKGROUND PAPER NO. 3, *supra* note 25, at 2-10; 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 27-144.

592. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 178.

593. Brunswick Memorandum, *supra* note 275.

594. BACKGROUND PAPER NO. 3, *supra* note 25, at 2.

potential impacts a CWIS may have "to important wildlife and aquatic breeding, nursery, feeding, and/or migration areas," and it may "enable determinations to be made with regard to concentrations of aquatic life within specific and proposed siting areas."[595] EPA's 1993 Background Paper makes clear that determinations regarding the location of an intake structure are dependent on the physical characteristics of the source waterbody to be used as well as hydraulic and economic factors.[596]

Under Section 316(b), "location" factors primarily concern the siting or alternate placement of the CWIS with respect to the affected environment.[597] Siting and alternate placement issues involve proximity to estuaries and the cumulative impact of other CWISs, as the following paragraphs explore in greater detail.

a. Cooling Water Intake Structures Located In Estuaries Deserve Strict Scrutiny To Ascertain Compliance With Section 316(b)

While few generally applicable rules exist regarding Section 316(b) and its BTA requirements, one general rule has been stressed by EPA—intake structures should be located so as to avoid highly productive biological areas and estuarine environments. EPA's 1976 Development Document stated that when considering the location of a CWIS for minimization of adverse environmental impacts, permit writers should avoid spawning areas, fish migration paths, shellfish beds, and locations where aquatic life is concentrated.[598] Additionally, the 1976 Development Document made clear that a proposed CWIS should be placed at a depth so as to avoid aquatic life.[599] EPA followed this reasoning in *Seabrook*, *Brunswick*, the 1980 Hudson River Agreement, and *Big Bend*.

In *Seabrook II*, the powerplant was located near Hampton Harbor Estuary, about two miles from the Atlantic Ocean.[600] In upholding once-through cooling as constituting BTA, EPA noted that "the general design and location of Seabrook Station's intake and discharge offshore, *and not in an estuary*, were . . . special considerations that have been factored into the environmental characteristics of the area."[601]

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595. *Id.*

596. *Id.*

597. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 15.

598. *Id.* at 178.

599. *Id.*

600. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1259.

601. *Seabrook IV*, 1978 NPDES LEXIS 15, at *86 (emphasis added).

In the extensive Section 316(b) proceedings in *Seabrook*, the EPA Administrator cautioned that the "conclusions [are] based on the . . . ecology of this area . . . and [are] not transferable to another area with different, and its own special, environmental characteristics. . . . [I]ntake and discharge offshore, and not in an estuary, are also special considerations."[602]

In *Brunswick I*, the "intake canal (a part of its CWIS) beg[an] in a dredged ship channel (a migratory pathway for aquatic organisms), interrupt[ed] a tidal creek (another migratory pathway), and cut[] across 6,000 feet of highly productive marshland (a nursery area)."[603] In addition to the fact that the CWIS was located in such a highly productive area, the intake canal was attracting populations of fish which exacerbated the entrainment and impingement impacts created by the CWIS.[604] As a result of its location in these highly productive biological areas, the RA determined that the Brunswick CWIS was having significant adverse impingement and entrainment impacts on the source waterbody and, therefore, that the location of the Brunswick CWIS did not comply with the requirements of Section 316(b).[605] EPA noted that

> [t]he proper location of intake structures is the most important consideration relevant to applying best technology available for cooling water intake structures. Careful location of intake structures can greatly minimize adverse environmental impacts. For example, intake structures should be located to withdraw water from areas that are the least productive biologically and contain the lowest population densities of critical aquatic organisms. Additionally, they should be located to avoid spawning areas, nursery areas, fish migration paths, shellfish beds, or any location containing a high concentration of aquatic life.[606]

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602. *Id.*

603. *Id.* at *47.

604. *Id.*

605. *Id.* at *54.

606. *See Brunswick I*, at 45 (Initial Decision re: Permit No. NC007064) (citing 1976 DEVELOPMENT DOCUMENT). The RA in *Seabrook I* also quoted the 1976 Development Document in support of his BTA decision to require installation of closed-cycle cooling towers:

> Care in the location of the intake [structure] can significantly minimize adverse environmental impacts. . . . [A]mong the many factors that can be considered in locating the intake structure to minimize adverse environmental impacts [are] . . . : Avoidance of important spawning areas, fish migration paths, shellfish beds or any location where field investigations have revealed a particular concentration of aquatic life.

Seabrook II, 10 Env't Rep. Cas. (BNA) 1257, at 1264.

EPA later reiterated its support for this position in the Brunswick Memorandum.[607]

The 1980 Hudson River Agreement involved powerplants along the Hudson River estuary, and was concerned with long-term regional population, forage organism and food web impacts.[608] In making its initial BTA decision, EPA focused on the impacts of the facility on aquatic life in the affected area and required these powerplants to institute closed-cycle cooling.[609] In *Big Bend*, EPA took note of the sandy, tidal-swept nature of the estuary subject to impact by the CWIS in making its Section 316(b) determination.[610]

Accordingly, a powerplant seeking to fulfill the requirements of Section 316(b) should avoid locating cooling water intake structures in estuarine environments. CWISs already located in an estuary deserve the strictest scrutiny to ascertain compliance with Section 316(b). EPA's focus on fish population, forage, and food web impact stresses the importance of avoiding the siting of intake structures near spawning areas, fish migration paths, or any location with a particular concentration of aquatic life. Poor location may cause adverse environmental impacts that may be offset only by a reduction in intake capacity.

b. Cumulative Impact of Other CWISs in the Area

In *Brunswick I*, the Office of Regional Counsel for EPA Region IV suggested that it is impossible to determine the impact of a single CWIS on an estuary and its aquatic life and, therefore, that location decisions should include consideration of the existence of other CWISs in the area.[611] The RA in *Brunswick I* stated: "The environmental decision to be made

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607. The Brunswick Memorandum, drafted in 1980 by the Office of Regional Counsel for EPA Region IV, discussed Section 316(b) and the Brunswick Steam Plant. Again, EPA noted that location of CWISs should avoid estuarine environments. The Brunswick Memo firmly stated that intake structures should be located in "areas where densities of immature stages of finfish and shellfish are minimal." Brunswick Memorandum, *supra* note 275, at 2. The memorandum then proceeded to point out that because "[e]stuarine nursery areas, such as marshes and tidal creeks, are areas supporting *maximum* densities of immature finfish and shellfish[,] intakes in such areas *maximize* losses." *Id.* (emphasis in original). The natural conclusion drawn from these statements is that intake structures should *not* be located in estuarine environments. It is noteworthy that the memo refers to the 1976 Development Document, which it characterizes as containing EPA's policy regarding Section 316(b), and quotes the 1976 Development Document for the proposition "that intakes located in estuarine nursery areas and/or on migratory pathways cannot
meet the 316[b] test." *Id.*

608. *See generally* 1980 Hudson River Settlement Agreement, *supra* Part III.D.1.

609. *Id.*

610. Big Bend Permit No. FL0000817, *supra* note 360, at 2.

611. *Brunswick I*, at 2-3 (Initial Decision re: Permit No. NC007064).

by the regulatory agency is—at what point do we draw the line—at this powerplant, or the next, or the next? It appears that Congress has answered this question by requiring best technology to minimize impact *at all plants*."[612] *Brunswick I* suggests that, although a CWIS may appear to have little impact on populations, the cumulative effect of many intakes "must eventually spell doom for important marine resources."[613] Thus, it is evident that Section 316(b) requires consideration of the impacts of all CWISs on a source waterbody.

3. "Capacity" and BTA

The two principal issues concerning the term "capacity" revolve around how it is defined and to what extent it can be used as a basis for requiring closed-cycle cooling. These issues are addressed in turn.

a. Defining "Capacity"

For all intents and purposes, "capacity" means volume withdrawn. For example, the 1976 Regulations and the 1976 Development Document have each defined the term "capacity" to mean "the volume of water withdrawn through a cooling water intake structure."[614] There is good reason to equate capacity with volume. Doing so provides Section 316(b)'s best means of minimizing entrainment losses. Indeed, the principal factor in determining the amount of entrainment damage a CWIS will have is the volume of cooling water a plant is withdrawing from its source waterbody and the density of organisms located within the water withdrawn.[615] Thus, the level of entrainment caused by a given CWIS can be proportionally decreased by reducing its intake volume.[616]

Decision of the General Counsel No. 41, *Brunswick*, *Seabrook*, *Big Bend*, and the 1980 Hudson River Agreement have each followed this

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612. Brunswick Memorandum, *supra* note 275, at 3 (emphasis in original).

613. *Id.*

614. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 177. *See also* 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 149; *Brunswick I*, at 58-60 (Initial Decision re: Permit No. NC007064); 41 Fed. Reg. 17,387, 17,390 (1976).

615. *Brunswick I*, at 58-59 (Initial Decision re: Permit No. NC007064).

616. *See, e.g.*, *id.* at 59-60 ("A reduction of cooling water intake volume should reduce the number of organisms subject to entrainment in direct proportion to the fractional flow reduction"; "[C]ontinuous operation of its proposed . . . closed-cycle cooling system would result in a flow reduction at Brunswick of approximately 96%. This flow reduction should thus produce a 96% reduction in the number of organisms entrained by the plant. . . .") (footnote omitted). Similarly, Versar found that a 95% reduction in cooling water intake at Salem would result in a corresponding 95% reduction in fish impingement and entrainment. 1989 VERSAR REPORT, *supra* note 497, at VII-8.

reasoning. In *Decision of the General Counsel No. 41*, the EPA General Counsel employed the Random House Dictionary definition of "capacity." EPA quoted "capacity" to mean "cubic contents; volume; that which can be contained."[617] The EPA Office of General Counsel also posited that "the volume [of water] withdrawn is *the* principal determinant of entrainment damage which is the major adverse environmental effect associated with most cooling water intake structures."[618] The EPA Office of General Counsel noted that the major adverse environmental impacts of intake structures are those affecting aquatic organisms in the water drawn through the cooling system, and that such adverse impacts may be reduced by restricting capacity.[619] The EPA Office of General Counsel found that the legislative history of the CWA supported its decision.[620] In *In re Central Hudson Gas & Electric Corp.*, the EPA Office of General Counsel reinforced its findings.[621]

Next, in *Brunswick I*, EPA stated that "one of the most effective methods that can be used to reduce [entrainment] impact is the reduction of volume of water withdrawn."[622] In *Brunswick I*, EPA considered what would constitute BTA for the Brunswick powerplant located on the Cape Fear River near Wilmington, North Carolina. The Brunswick plant uses once-through cooling and has an intake capacity of eighty-one cubic meters per second (approximately 1.85 BGD).[623] In *Brunswick I*, EPA initially decided that BTA mandated a permanent capacity restriction.[624] After the utility challenged this decision, EPA ultimately required that the plant reduce its flows during part of the year.[625] The Regional Administrator held that "[t]he best technology available to minimize the adverse environmental impacts of the plant is to restrict the capacity of the plant's

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617. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 178 (citing THE RANDOM HOUSE DICTIONARY OF THE ENGLISH LANGUAGE (unabridged 1970)).

618. *Id.* at 179 (emphasis in original) (citation omitted).

619. *Decision of the Gen. Counsel No. 41*, *supra* note 552, at 179.

620. The General Counsel's office cited with approval a summary of a conference debate on the Clean Water Act which occurred on October 4, 1972, which stated: "In response to concerns voiced by Senator Buckley that the Act would prevent the effective regulation of this problem [that is, the dangers posed to aquatic life by CWISs], Senator Muskie, the Chairman to the Senate Conference Committee, stated that EPA had authority under the [Clean Water] Act to regulate the withdrawal of cooling water so as to minimize adverse environmental aspects." *Id.* at 178-79.

621. *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 381. The EPA Office of General Counsel found that "in certain cases, the only means of minimizing serious entrainment damage is to restrict the volume of water withdrawn." *Id.*

622. *Brunswick I*, at 59 (Initial Decision re: Permit No. NC007064) (citations omitted).

623. *Id.* at 60 n.158.

624. *Brunswick I*, at 90 (Initial Decision re: Permit No. NC007064).

625. Brunswick Press Release, *supra* note 277, at 1.

intake structure."[626] Accordingly, EPA required CP&L to both institute seasonal flow reductions during periods when entrainment of larval forms would be highest,[627] as well as upgrade screening.

The powerplant in *Big Bend* was able to meet Section 316(b) requirements by implementing a 36% reduction in intake water volume and installing fine mesh screens.[628] Big Bend powerplant Units 1-3, were designed for once-through cooling. The intake flow water withdrawal capacity for the station's Units 1-3 was 70.8 m^3/sec (approximately 1.6 BGD). EPA found that the intake capacity did not reflect BTA because of the facility's entrainment effects on the bay.[629] Therefore, EPA required the utility to reduce the intake flow by more than one-third to 45 m^3/sec (approximately 1.03 BGD).[630] When the utility proposed to add another unit to the site, which would have increased total intake volume to 61 m^3/sec (approximately 1.39 BGD),[631] EPA required the utility to place a fine mesh screening apparatus on two of the four units, and to monitor their performance.[632]

The 1980 Hudson River Agreement required periods of reduced flow, partial power output reduction and seasonal shut-downs over substantial portions of the year during those times when aquatic organisms were most affected by the entrainment impact of the CWIS.[633] The restrictions were to be attained by complete unit outages. These outages were potentially coincident with the peak summer electric demands, and were not at times which would be economically more convenient to the utilities. The settlement also included modifications at several plants to further reduce adverse environmental impacts and the operation of a hatchery.[634]

In *Seabrook II*, the powerplant employed a design intake capacity of 1.2 billion gallons per day and a design intake velocity of one foot per second.[635] Because the powerplant operated at substantially less than full design capacity, EPA determined that actual capacity was not large enough to require further reduction in flow to meet BTA.[636] Nonetheless, some

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626. *Brunswick I*, at 90 (Initial Decision re: Permit No. NC0007064).

627. Brunswick Press Release, *supra* note 277, at 1.

628. Region IV, EPA, Record of Decision, Tampa Electric Co. Big Bend Unit 4: NPDES Permit No. FL0037044 (June 12, 1989) [hereinafter *Big Bend RoD*].

629. *Id.*

630. *Id.*

631. *Id.*

632. *Id.*

633. *See generally* 1980 Hudson River Settlement Agreement, *supra* Part III.D.1.

634. *Id.*

635. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1270.

636. *Id.*

utilities seeking NPDES permits have repeatedly attempted to redefine "capacity" as the intake velocity. Each time this canard has been served, as in *Decision of the General Counsel No. 41*, *In re Central Hudson Gas & Electric Corp.*, and *Seabrook II*, it has been firmly rejected by EPA.[637] For example, in *Decision of the General Counsel No. 41*, EPA found that "capacity" does not refer to the velocity of water withdrawn through a cooling water intake structure,[638] nor is it limited to the physical size of the inlet of a cooling water intake structure.[639] An interpretation which narrows the definition of "capacity" to velocity alone (to the exclusion of volume) would effectively remove capacity as a potential factor meaningfully reducing adverse environmental impacts.

b. Using "Capacity" to Require Specific Flow-Reduction Technology

When mandating an intake technology that meets the requirements of Section 316(b), EPA's authority is limited to factors associated with the location, design, construction or capacity of a cooling water intake structure.[640] "Cooling towers or other closed-cycle cooling systems are not cooling water intake structures."[641] Therefore, as discussed, agencies may not require closed-cycle cooling *per se* at a given facility.[642] Though EPA may not directly require use of closed-cycle cooling pursuant to the "capacity" portion of Section 316(b), it may require use of closed-cycle cooling indirectly.[643] As in *Brunswick* and *Seabrook II*, an agency may restrict the capacity of a cooling water intake structure to such an extent that use of closed-cycle cooling would be a "predictable consequence" of the capacity limitation.[644]

For instance, *Brunswick I* involved a CWIS with an intake capacity of 1.85 billion gallons per day, located in an estuarine environment.[645]

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637. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 177; *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 381; *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1262 (stating that there is "no justification for giving 'capacity' [this] restrictive meaning").

638. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 177.

639. *Id.* at 179.

640. *Id.* at 181; *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 378.

641. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 183; *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 378.

642. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 181; *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 378.

643. *Id.*

644. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 181; *Seabrook II*, 10 Env't Rep. Cas. (BNA) 1257.

645. *Brunswick II*, at 12 (Initial Decision re: Permit No. NC007064).

After considering the impingement and entrainment effects the powerplant was having on the aquatic organisms in its source waterbody, the RA determined that the capacity of the plant did not fulfill the BTA requirements of Section 316(b).[646] Information provided by CP&L indicated that use of closed-cycle cooling at the plant would provide a 96% reduction in its intake capacity.[647] As a result, based on *Decision of the General Counsel No. 41*, the RA determined that BTA for the Brunswick CWIS could be achieved by reducing the plant's intake capacity[648] by an amount approximating 96%.[649]

4. "Construction" and BTA

The "construction" aspect of Section 316(b) encompasses all aspects of the building process including preparation, actual construction, and habitat loss and alteration. These are discussed below.

a. Preparation

The term "construction," as it is used in Section 316(b), requires consideration not only of the actual building of the facility, but also of the preparatory steps needed to begin and complete the construction of the CWIS. The term "construction" is defined in Section 306 of the Clean Water Act (the Section that applies to new sources) as "any placement, assembly, or installation of facilities or equipment (*including contractual obligations to purchase such facilities or equipment*) at the premises where such equipment will be used, *including preparation work* at such premises."[650] Accordingly, in *Brunswick I*, the RA for EPA Region IV determined that the need for extensive preparatory work precluded relocation of the CWIS in favor of flow reduction.[651] The RA specifically noted that, because relocation of the cooling water intake structure would involve extensive studies, a lengthy permitting process, new environmental assessments, and a new environmental impact statement, there would be

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646. *Id.* at 33.

647. *Id.* at 60.

648. *Id.* at 91.

649. *Id.* After this decision was challenged before the EPA Administrator, it was remanded to the RA. Upon remand the RA supplemented, but did not alter, its original decision. The case was ultimately settled. Brunswick Press Release, *supra* note 277, at 1. While the settlement did not require a 96% reduction in intake flow, it did require a significant flow reduction in conjunction with a new screening device. *Id.*

650. 33 U.S.C. § 1316(a)(5) (1976) (emphasis added).

651. *Brunswick I*, at 71-73 (Initial Decision re: Permit No. NC007064).

significant delays before actual building of the facility could take place, and, as a result, the damage that would occur to the estuary and ecosystem in the interim would be unacceptable.[652] The significant further environmental damage associated with the long period of delay led the RA to reject the option of relocating the Brunswick CWIS in order to fulfill the BTA requirements of Section 316(b).[653] Therefore, when considering whether construction of a CWIS meets BTA, construction delays should be considered.

b. Actual Construction

The term "construction," as it is used in Section 316(b), also includes the actual physical construction work needed to build a CWIS. In its 1976 Development Document, EPA specifically stated that the term "construction" included the increased levels of turbidity that can result from construction of the intake structure, the location of disposal areas for the materials excavated during construction, and construction activities.[654]

c. Habitat Loss and Alteration

The 1976 Development Document also indicates that alterations of, and effects upon, the habitats of aquatic species associated with construction of CWISs must be considered within the term "construction."[655] As EPA stated in the 1976 Development Document, the following adverse environmental impacts associated with construction of a CWIS must be considered in making a BTA determination: (1) loss of potential habitat because of the physical occupation of space by the cooling water intake structure; (2) increased turbidity levels resulting from the erosion of inadequately protected slopes around excavations; (3) increased levels of turbidity resulting from inadequately stabilized spoil areas associated with construction; and (4) filled aquatic areas resulting from construction operations.[656] Thus, when considering the "construction" of a CWIS, alterations and impacts upon the aquatic environment must be included in a BTA determination.

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652. *Id.*

653. *Id.*

654. 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 145.

655. *Id.*

656. *Id.*

D. Determination of "Cooling Water Intake Structure"

The 1976 Development Document definition of "cooling water intake structures" includes all structures that help direct and draw cooling water into the cooling system. The document stated:

> A cooling water intake structure comprises the total structure used to direct cooling water from a water body into the components of the cooling system wherein the cooling function is designed to take place, provided that the intended use of the major portion of the water so directed is to absorb waste heat rejected from the process or processes employed or from auxiliary operations on its premises, including air conditioning. As defined above, the intake structure includes circulating and service water pumps where those pumps are located in the cooling system prior to the heat exchanger or condensers.[657]

Later in the same document, when discussing the damage cooling water intake structures may have on the aquatic environment, EPA defined intake and discharge structures as "including dikes or dredged channels."[658] The 1976 Regulations defined "intake structure" similarly.[659]

In *Decision of the General Counsel No. 41* and *Decision of the General Counsel No. 63*, the General Counsel of EPA remarked that conditions imposed under Section 316(b) may only address intake structures.[660] The OGC also observed that the proper definition of the term "cooling water intake structure" includes all structures or components that are an integral component of the cooling water intake structure and help to direct or draw cooling water into the powerplant's cooling system.[661] In *Decision of the General Counsel No. 41*, EPA illustrated the direct relationship between intake structures and design, location, capacity, and construction issues.[662]

In practice, EPA has construed the term broadly. For example, in *Brunswick*, the powerplant's CWIS was connected to its source waterbody

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657. *Id.* at 2-3.

658. *Id.* at 8.

659. 41 Fed. Reg. 17387, 17,389-90 (1976).

660. *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 183; *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 378.

661. *Id.*

662. In *Decision of the Gen. Counsel No. 41*, *supra* note 225, at 183, EPA said that:

> Under § 316(b) a permit may restrict the volume of flow or capacity of an intake structure. If the capacity of an intake structure is so restricted, the adverse environmental impact of the intake structure will have been minimized to a given level regardless of whether the company installs a cooling tower. That is, the limitation on intake volume—not the cooling towers—protects the endangered aquatic organisms.

Id.

via an intake canal which stretched across several highly productive marshlands out to the Cape Fear River.[663] In *Brunswick*, the RA determined the intake canal to be a "cooling water intake structure."[664] When analyzing whether the Brunswick CWIS reflected BTA, the RA specifically included the intake canal, which helped to direct water into the cooling system as part of the powerplant's cooling water intake structure.[665] In *John Sevier*, the powerplant used a detention dam to provide an adequate supply of condenser cooling water to the powerplant.[666] As a result of the intimate connection between the dam and the cooling water system, EPA determined that the dam was "an integral component of the intake structure and is subject to the provisions of Section 316(b)."[667] Therefore, it appears that the term "CWIS" includes all structures and components of the intake system which are an integral component of the CWIS, that is, all structures which are necessary for withdrawing cooling water out of the source waterbody and into the cooling system.

An open question remains as to whether closed-cycle cooling systems are a part of the CWIS. EPA believes that a closed-cycle cooling system may not be directly mandated by an NPDES permit to fulfill the requirements of Section 316(b). For example, in *Decision of the General Counsel No. 63*, EPA noted that closed-cycle cooling systems do not withdraw cooling water into the condenser cooling system, but instead facilitate powerplant condenser cooling, and as such are not technically a CWIS.[668] However, in *Decision of the General Counsel No. 41*, EPA found that permit flow restrictions under Section 316(b) may necessitate a closed-cycle cooling system (as EPA found in *Seabrook II*)[669] as a consequence of the Section 316(b) requirement.[670] In addition, in

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663. *Id.* at 47.

664. *Brunswick I*, at 85 (Initial Decision re: Permit No. NC007064).

665. *Id.* at 10 ("The first major component of the existing cooling system is an open canal which has been dredged from the plant to the ship channel in the Cape Fear River, cutting a course through Snow's Marsh."). "A lengthy approach channel intake design, generally has such potential for adverse environmental impact that careful evaluation should be given prior to its use." *Id.* at 55.

666. John Sevier Fact Sheet, *supra* note 416, at 11.

667. *Id.*

668. *Decision of the Gen. Counsel No. 63*, *supra* note 73, at 378.

669. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1262.

670. In *Decision of the General Counsel No. 41*, *supra* note 225, at 181, EPA remarked:

> [A]lthough § 316(b) does not authorize the Agency to impose a specific closed-cycle cooling technology, it does authorize the restriction of the capacity of an intake structure. Such a restriction may necessitate a closed-cycle cooling system. This result is not inconsistent with Agency restrictions on the volume of pollutant discharge under §§ 301 and 306. That is, while the Agency cannot specify abatement technologies to be employed under those Sections, the use of a particular treatment system may be a predictable consequence of the limitation imposed on the discharge of specific pollutants.

Brunswick I, EPA found that closed-cycle cooling allows a CWIS to comply with 316(b) by reducing capacity as a means of minimizing adverse environmental impact, thus fulfilling the mandate of Section 316(b). Therefore, closed-cycle cooling technologies would be an integral component of a CWIS.

E. Determination of "Best Technology Available"

The 1976 Regulations stated that BTA is that technology which produces the greatest reductions in damage inflicted upon aquatic resources by entrainment and impingement.[671] In the absence of regulations, however, determination of whether a technology is "available" is an issue of fact.[672] BTA determinations are made on a case-by-case basis,[673] and on a general level contain several factors, including, but not limited to, "the age of the facility, the number of fish killed, and additional energy . . . needed to support improved technology [and] other relevant concepts."[674]

BTA is an organic concept planted firmly in the CWA's technology-forcing preference, and evolves along with developments in engineering. *Brunswick* and *Big Bend* dealt directly with the issue of availability of technologies, and are indicative of the technology-forcing nature of Section 316(b). At *Brunswick*, CP&L eventually installed fine mesh screens, using a technology described by EPA as a "recent breakthrough" available at a reasonable cost.[675] In *Big Bend*, EPA approved the use of a "*new* fine mesh screen technology"[676] which was developed and prototype-tested during the permit review process.[677] After determining whether the design, location, construction, and capacity of a CWIS reflects BTA for minimizing adverse environmental impact, agencies must next turn to examine the role of costs in making a Section 316(b) determination, which is examined in Part V.

V. THE ROLE OF COSTS IN A BTA DETERMINATION

Following a determination as to what design, location, capacity, and construction reflects BTA for a given CWIS, the question remains as to

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Id.

671. *See* 41 Fed. Reg. 17,387, 17,388 (1976).

672. *See, e.g., Hudson Riverkeeper Fund*, 835 F. Supp. at 166.

673. *Id.* at 165.

674. *Id.* at 166.

675. Brunswick Press Release, *supra* note 277, at 1-2.

676. *Big Bend RoD*, *supra* note 628, at 4.

677. Big Bend Permit No. FL0000817, *supra* note 360, at 5.

what degree, if any, the requirements of Section 316(b) must be tempered by economic pragmatism. Looking to the four corners of Section 316(b), one finds no direct requirement for consideration of costs, as contrasted with other aspects of the CWA which specifically contemplate economic considerations when addressing adverse environmental impacts.[678] Indeed, the legislative history of Section 316(b) is almost non-existent and provides scant guidance to implementing agencies as to legislative intent.[679] It is only a thin sliver of legislative history which provides a sufficient gap to allow the nose of the camel inquiring "how much does it cost?" into the tent of a Section 316(b) BTA determination.[680] One could argue that by omitting any reference to costs, Congress simply did not wish for costs to be considered in implementing Section 316(b).[681]

Based on the passing and uncodified remarks of a congressman in 1972, EPA and the courts have determined that costs are an appropriate

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678. EPA has noted that "[t]here is nothing in § 316(b) indicating that a cost/benefit analysis should be done, whereas with regard to "best practicable control technology currently available" and "best available technology economically achievable" Congress added express qualifiers to the law indicating a requirement for [an implementing agency to perform] a cost/benefit analysis." *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261. Yet how costs are to be considered is not clearly evident: "[W]hen Congress intended for costs to be considered under the [Clean Water Act], Congress so stated." *Brunswick I*, at 32 (Initial Decision re: Permit No. NC007064). For example, Section 304 uses the phrase "best technology economically achievable" in defining how effluent standards for specified categories of pollution sources are to be created, pursuant to Section 301(b)(1)(A). 33 U.S.C. § 1314(b)(1)(B). *See also* 33 U.S.C. § 1311(b)(1)(A). Again, in Section 307, when discussing effluent limitations for toxic pollutants, Congress used the phrase, "best available technology economically achievable." 33 U.S.C. § 1317(a). Comparatively, no where within the language of Section 316(b) is any reference made to consideration of costs. 33 U.S.C. § 1326(b).

679. EPA found this to be of particular concern in *Brunswick I*, at 31 (Initial Decision re: Permit No. NC007064).

680. As EPA has noted: "Indeed, but for one bit of legislative history, there would be no indication that Congress intended costs to be considered under Section 316(b) at all." *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261; *Brunswick I*, at 32 (Initial Decision re: Permit No. NC007064) (citing A Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong. 1st Sess. 264 (1973)).

681. To be sure, it could be argued that Congress has already taken costs into account. In its first annual report to Congress in 1974, "EPA estimated that achieving a zero discharge of thermal pollutants by 1983 [as required by the CWA] would increase consumer electric bills by only 1.7% to 6.1%." Rabago, *supra* note 42, at 458. In contrast, in 1977, the steam electric generating industry completed a study which concluded that substantial reduction in cooling water volume could increase consumer electric bills by as much as 10%. *Id.* at 458-59. However, "when considering all technologies available to the industry, even [the] 'worst case scenario' [envisioned by the utility industry] represented less than a one percent increase in capital expenditures, operating and maintenance expenses, and annual revenue requirements. EPA thus tried to establish that control of thermal discharges and concomitant reductions in adverse environmental impacts by [CWIS] could be achieved by converting existing cooling systems to closed-cycle cooling systems without undue economic impact." *Id.*

factor for consideration.[682] While costs may be an appropriate consideration in determining BTA for minimizing adverse environmental impacts caused by CWISs, EPA has maintained that a cost-benefit analysis is not required.[683] Instead the standard which EPA has adopted to implement Section 316(b) is whether the cost of the technology to be required is wholly disproportionate to the environmental benefit to be gained.[684]

Based on the Fourth Circuit's holdings in *Appalachian Power Co. v. Train*[685] and *E.I. du Pont de Nemours & Co. v. Train*,[686] PSCO argued in *Seabrook II* that a BTA determination should be accompanied by a formal cost/benefit analysis.[687] The Administrator clarified EPA's position on this issue in *Seabrook II*, stating that "[t]here is nothing in Section 316(b) indicating that a cost/benefit analysis should be done."[688] The Administrator remarked, however, that "it is [not] reasonable to interpret Section 316(b) as requiring use of technology whose cost is wholly disproportionate to the environmental benefit to be gained," reasoning that "some consideration ought to be given to costs . . . otherwise the effect would be to require cooling towers at every plant . . . regardless of whether any significant degree of entrainment or entrapment [impingement] was anticipated."[689]

In *Seabrook II*, EPA determined that the construction of an intake structure 19 feet in diameter, 17,500 feet in length (3.3 miles), and that tunnelled through bedrock at a depth of 170 to 250 feet below sea level at a cost in excess of $100 million, was not wholly disproportionate to the benefits obtained.[690] EPA found, however, that the incremental environmental benefit of locating an intake structure 4,000 feet beyond its approved location, at an additional cost of at least $20 million, crossed the

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682. *See, e.g.*, 41 Fed. Reg. 17,387, 17,388 (1976); *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261 (citing A Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong., 1st Sess. (1973)).

683. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261; Brunswick I, at 31-32 (Initial Decision re: Permit No. NC007064).

684. EPA first articulated this standard in *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261; *Brunswick I*, at 61 (Initial Decision re: Permit No. NC007064).

685. Appalachian Power Co. v. Train, 545 F.2d 1351, 1378 (4th Cir. 1976).

686. E.I. du Pont de Nemours & Co. v. Train, 541 F.2d 1018, 1030 (4th Cir. 1976).

687. CWA Section 304(b)(1)(B) provides that a cost/benefit analysis is: "the total cost of the application of technology in relation to the effluent reduction benefits to be achieved from such application." 33 U.S.C. § 1314(b)(1)(B).

688. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261; *accord* 41 Fed. Reg. 17,387, 17,388 (1976).

689. *Seabrook II*, 10 Env't Rep. Cas. (BNA) at 1261.

690. *Id.*

line and was not cost-effective.[691] EPA again applied the "wholly disproportionate" test in *Brunswick*. In *Brunswick I*, the Regional Administrator concluded that "an increase of approximately 2.5% from the . . . average monthly residential [electric] bill is not wholly disproportionate to a 96% reduction in the severe adverse environmental impacts of the plant."[692] *Brunswick I* still provides the most definitive qualitative guidance as to what is considered acceptable under the wholly disproportionate test. The "wholly disproportionate" test has proven to furnish an ineffectual middle ground between acceding to the demands of electric utilities for formal cost/benefit analyses (which they believe would preclude the necessity of installing closed-cycle cooling systems) and repudiating the preamble to the 1976 Regulations, which declared that a Section 316(b) determination does not require a formal cost-benefit analysis.[693]

Assuming the legitimacy of the construct of the "wholly disproportionate" test, one must next decide how best to determine costs. This inquiry involves two competing viewpoints and a wildcard. One school of thought maintains that the cost consideration means comparing the marginal cost to ratepayers of the technology with its environmental benefits. The other school holds that cost consideration equates to comparing the total capital and operation and maintenance costs of a technology with its environmental benefits. Which school prevails may be outcome determinative in some cases. The wildcard involves peering into both the finances and the mind of the utility in their financial predicament and attempts to divine whether they knew at the time of original permitting that they might have to retrofit an existing powerplant after completion of the Section 316(b) demonstration and determination process. Each of these are discussed in the following paragraphs.

A. "Total Cost" Versus "Marginal Cost"

In applying the cost analysis of Section 316(b), the devil is in the details. Some myopically tend to focus on the total cost of implementing a required Section 316(b) technology, as opposed to making a more rational viewing of the marginal costs to the ratepayers.[694] EPA fiddled with the notion of employing a "marginal cost" test in the 1970s. In *Brunswick I*, the RA ruled that Sectionn 316(b) cost considerations require

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691. "The costs of any further movement of the intake beyond the presently proposed far site would be wholly disproportionate to any environmental benefit." *Id.* at 1262. The depth of the CWIS for the "far site" would have been 58 ft., compared to 75 ft. at the site chosen by the petitioners.

692. *Brunswick I*, at 69 (Initial Decision re: Permit No. NC007064).

693. 41 Fed. Reg. 17,387, 17,388 (1976).

694. *See, e.g., Brunswick I*, (Initial Decision re: Permit No. NC007064).

consideration of the marginal cost to each ratepayer of implementing a proposed technology, and not the total cost of the technology to a utility.[695] When applying this method of analysis, the RA in *Brunswick* stated that while a reduction in capacity of 96% would cost a total of $106,300,000,[696] the monthly marginal cost to each residential ratepayer would be a mere $.77 to $.85 per month, or an increase of approximately 2.5%.[697] When the RA compared this 2.5% rate increase with the 96% reduction in the adverse environmental impact associated with conversion to a closed-cycle system, the RA determined that the costs of reducing the CWISs' capacity were not wholly disproportionate to the environmental benefits to be gained despite the seemingly large total cost.[698]

B. Environmental Benefits to Be Achieved Versus Ability of Powerplant To Pay

While costs are a factor to be considered in making a Section 316(b) BTA determination, the focus of the cost analysis should be upon the amount of environmental benefit to be achieved, not on the ability of the powerplant to pay. When Congress has determined that the ability of a facility to pay for pollution abatement measures should be considered, it has so specified. The decisions regarding cost considerations pursuant to Section 316(b) have not required a specific cost-benefit analysis and have not focused upon the ability of a facility to comply with Section 316(b).

Federal and state laws arguably require that BTA should reflect the environmental costs of failing to meet the mandates of Section 316(b). Specifically, Section 101 of the CWA states: "It is the national goal that wherever attainable, an interim goal of water quality which provides for the *protection and propagation of fish, shellfish, and wildlife* and . . . for recreation in and on the water" should be achieved.[699] Further, Section 316(b) of the CWA states that CWISs shall "reflect the best technology available for *minimizing adverse environmental impact*."[700] Clearly, a principal priority in the implementation of the provisions of these laws is

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695. *Id.* at 63.

696. *Id.* at 63.

697. *Id.* at 69.

698. *Id.*

699. 33 U.S.C. § 1251(a)(2) (1988) (emphasis added). Some state laws contain similar overtures. The New Jersey Water Pollution Control Act (NJWPCA), N.J. STAT. ANN. § 58:104-12 (1994) states: "It is the policy of this state to restore, enhance and maintain the chemical, physical and biological integrity of its waters, to protect public health, *to safeguard fish and aquatic life* and scenic ecological values, and to enhance the ... recreational . . . and other uses of water." N.J. STAT. ANN. § 58:10A-2 (emphasis added).

700. 33 U.S.C. § 1326(b) (emphasis added).

the protection of aquatic life. Thus, when considering the feasibility of a proposed technology or mitigation plan, agencies should, in addition to considering solely economic factors, consider external environmental costs of failing to implement a particular technology.[701]

Clearly, EPA has established that as the environmental benefits associated with a technology increase, so too do the acceptable cost levels associated with a proposed technology. In *Seabrook IV*, the Administrator found that while some organisms might benefit by moving the location of the CWIS farther off site than the "far site," this action would result in other undesirable environmental consequences.[702] As a result, the RA concluded that "the costs of any further movement of the intake beyond the presently proposed far site location would be wholly disproportionate to any environmental benefit."[703] In so doing, the Administrator focused on the relationship between the cost of relocating the proposed intake and the environmental benefits that such a relocation would bring. He found inapposite the issue of whether PSCO would be able to afford the possible conversion.

In *Seabrook IV*, EPA found that while some organisms would benefit from the location change, others would not, and there would be additional environmental harms caused by the change.[704] As a result, the Administrator determined that the costs of changing the location of the proposed CWIS were wholly disproportionate to the environmental benefit the change would provide.[705]

Additionally, in *John Sevier*, EPA considered whether it could require removal of a detention dam—which it deemed to be part of the cooling water intake structure of the plant—pursuant to Section 316(b).[706] EPA

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701. The "external" costs associated with cooling water intake structures are addressed in, Richard L. Ottinger et al., Pace University Center for Environmental Legal Studies, The Environmental Costs of Electricity (1989). *See also* Richard L. Ottinger, Getting at the True Cost of Electric Power, Electricity Journal (July 1990); Faith Halter & Joel T. Thomas, *Recovery of Damages by States for Fish and Wildlife Losses Caused by Pollution*, 10 ECOLOGY L.Q. 5 (1982).

702. *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15, at *68.

703. *Id.* at *70. This decision was challenged to the First Circuit Court of Appeals. The petition for review was dismissed. But in the course of rendering the dismissal, the court did cast some doubt on whether the cost of delaying construction was a proper consideration in a Section 316(b) cost analysis. The petitioners had argued that the cost of delay was improper in the context of a Section 316(b) cost determination. Ultimately, the court did not rule on this matter, stating that in reality the Administrator had only considered the actual costs of new construction in rendering his decision. Seacoast Anti-Pollution League v. Costle, 597 F.2d 306, 311 (1st Cir. 1979). In light of the fact that the Administrator, when deciding *Seabrook IV*, so clearly noted the environmental damage which would ensue during the period needed to locate and prepare for a new intake location, it seems that this impacted his decision. The Court of Appeals never ruled on the issue.

704. *Seabrook IV*, No. 76-7, 1978 NPDES LEXIS 15, at *69.

705. *Id.*

706. John Sevier Fact Sheet, *supra* note 416, at 11.

Region IV made it clear that the environmental benefits associated with a proposed technology are directly correlative to acceptable costs.[707] EPA determined then that the costs of removing the detention dam (the proposed Section 316(b) technology) were wholly disproportionate to the environmental benefits to be gained and could cause additional adverse environmental impact.[708] EPA further stated, however, that if the environmental benefits associated with removal of the dam were later determined to be greater than it had projected, the permit would have to be modified accordingly.[709] Thus, costs should be viewed in terms of the amount of environmental benefit that will be gained, and not in terms of the ability of the utility to shoulder those costs.

C. Knowledge of Future Costs

EPA has suggested that when considering the cost of implementing a proposed technology, it may be appropriate to determine whether a permit holder had reason to believe that such costs would be required when the plant was constructed. During the course of the Administrator's review of the RA's ID in *Brunswick II* (requiring CP&L to reduce its intake capacity by 96%) CP&L claimed that a requirement to retrofit the Brunswick facility would be financially prohibitive.[710] CP&L suggested that existing cooling systems should be subject to a different standard than new cooling systems.[711] In response, without passing on the merits of the issue, the Administrator stated:

> "I suggest that it would be useful for the RA to include in his revised decision, . . . findings concerning the timing of construction of the once-through cooling system. Specifically, did CP&L have reason to believe cooling towers might be required when it constructed its once-through system, and if so, what alternatives were available to it?"[712]

Thus, it appears that a permit holder's knowledge that Section 316(b) might impose additional requirements in the future might support a determination that a permit holder be required to expend a corresponding

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707. *See id.* at 12.

708. *Id.*

709. *Id.*

710. *Brunswick II*, Appeal No. 77-19, 1978 NPDES LEXIS 4 at *9 (EPA Feb. 20, 1978).

711. *Id.*

712. *Id.* at 9. The only record of the RA's remanded opinion was found in the Brunswick Historical Summary which stated that the RA "submitted a supplement to the ID which resulted in no change in the decision put forth in the ID." Region IV, EPA, Brunswick Historical Summary and Review, at 3 (on file with the Widener University School of Law, Environmental Law Clinic).

amount of money to comply. Thus, on notice that reduced capacity, or some other technology, may in the future be required, a powerplant should not be rewarded for ignoring that information and should instead be held responsible for technologies that were foreseeable at the time of construction.

In light of cost concerns, states have become increasingly enamored with the notion of satisfying the requirements of Section 316(b) with seemingly less expensive mitigation projects. The propriety of doing so is addressed by Part VI.

VI. WHETHER MITIGATION PROJECTS MAY BE USED TO SATISFY THE REQUIREMENTS OF SECTION 316(b)

As the 1980 Hudson River Agreement, *John Sevier*, *Crystal River*, *Chalk Point*, and *Salem* cases aptly demonstrate, in recent years some utilities have avidly advocated using "mitigation projects" as a means of fulfilling the requirements of Section 316(b). Mitigation projects have taken the form of creating and/or enhancing wetlands, developing and operating fish hatcheries and/or fish stocking programs, removing impediments to fish migration, or instituting a variety of other projects designated to replace fish and/or restore habitat. The following sections explore the prospect of whether such mitigation projects satisfy the requirements of Section 316(b).

A. Law Militating Against Use of Mitigation Projects as Satisfying Section 316(b)

Section 316(b) mandates that the "location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact."[713] Courts have found the language of Section 316(b) to be clear, and as such its plain meaning controls its construction.[714] To fulfill Section 316(b), EPA requires the chosen BTA to be affiliated with the CWIS. Mitigation projects, however, are not linked to, or associated with, CWISs or the

713. 33 U.S.C. § 1326(b) (1988).

714. Hudson Riverkeeper Fund, Inc. v. Orange & Rockland Utils., Inc., 835 F. Supp. 160, 166 (S.D.N.Y. 1993).

process of drawing water into the cooling system.[715] Therefore it appears as though they do not fulfill the requirements of Section 316(b).

Proponents of mitigation projects claim adverse environmental impacts can be minimized by replacing the organisms killed by CWISs. However, EPA requires that the chosen BTA minimize the actual impingement and entrainment harms associated with a particular CWIS. EPA has found that Section 316(b) cannot be satisfied simply by asserting that there is no long-term loss to fish populations in a source waterbody. The reason is clear. Long-term population impacts are a moving target, and it is nearly impossible to attribute long-term population losses to a single source. That is not the same, however, as saying that individual sources have no long-term impact. Congress clearly intended for the overall harm to be rectified by technology which "minimizes" the specific entrainment and impingement harms caused by a CWIS. While mitigation experiments may attempt to address loss to fish populations, they do not address individual losses, as required by Section 316(b).

For example, in *Brunswick I*, EPA focussed its "adverse environmental impacts" discussion on the need to reduce specific impingement and entrainment impacts. "Even if the adverse effects associated with entrainment and impingement would not cause an 'imbalance,' they must nevertheless be minimized under Section 316(b)."[716]

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715. Recall that EPA's 1976 Development Document defined "cooling water intake structures" as "the total structure used to direct cooling water from a water body into the components of the cooling system." 1976 DEVELOPMENT DOCUMENT, *supra* note 32, at 2. Furthermore, in *Brunswick I*, the RA of EPA Region IV characterized an intake canal which connected the actual CWIS to the source waterbody from which it was withdrawing water as being part of that facility's CWIS. *Brunswick I*, at 10 (Initial Decision re: Permit No. NC007064). "The first major component of the existing cooling system is an open canal which has been dredged form the plant to the ship channel in the Cape Fear River, cutting a course through Snow's Marsh." The RA continued, "[a] lengthy approach channel intake design, generally has such potential for adverse environmental impact that careful evaluation should be given prior to its use." *Id.* at 55.

Next, the primary purpose of the detention dam in *John Sevier* was to provide an adequate supply of condenser cooling water to the plant. John Sevier Fact Sheet, *supra* note 416, at 11. Because of the intimate connection between the dam and the cooling water system, EPA determined that the dam was "an integral component of the intake structure and is [therefore] subject to the provisions of [s]ection 316(b)." *Id.*

716. *Brunswick I*, at 57 (Initial Decision re: Permit No. NC007064) (emphasis added). Additionally, in Brunswick I the RA discussed the possibility of screen modifications for minimizing entrainment and impingement effects: "EPA considered the possibility of minimizing the effects of entrainment and impingement through modification of the plant's traveling screens . . . but was forced to reject that alternative because there are no known screen modifications capable of satisfactorily minimizing *those* [the impingement and entrainment] adverse effects." *Id.* at 57 (emphasis added). The RA found that the impingement and entrainment impacts caused by condenser cooling systems "are a direct function of the density of organisms residing in the source water[body]." Brunswick Memorandum, *supra* note 275, at 2. The RA then proceeded to link the location of a CWIS with the level of its environmental impact. He found that a CWIS located in areas with large numbers of

Next, in *Big Bend*, EPA found that because TECO was planning on applying technologies which would reduce the *specific impingement and entrainment* impacts of the three existing units, the permit would minimize their adverse environmental impacts for purposes of Section 316(b).[717]

In addition, Background Paper Number 3, entitled "Cooling Water Intake Technologies," has the stated purpose of presenting "findings of an initial examination of cooling water technologies currently used or being tested for minimizing loss of aquatic organisms due to entrainment and impingement effects."[718] This document does not refer to the use of mitigation experiments for minimizing the adverse environmental effects associated with impingement and entrainment impacts. The absence of any discussion on this subject, despite the fact that many have been touting mitigation experiments throughout the last decade, suggests that EPA does not consider mitigation experiments to be an appropriate method of fulfilling the technology requirements for minimizing adverse environmental impacts contained in Section 316(b).

In each of these EPA decisions and documents, EPA sought to utilize technology to reduce the specific impingement and entrainment harms caused by the CWIS at issue and to require that BTA minimize those adverse environmental impacts. Mitigation projects, therefore, fall outside of Section 316(b).

B. Agency Actions Do Not Necessarily Provide Support for the Use of Mitigation Projects as a Means of Complying with Section 316(b)

Proponents of using mitigation projects as a substitute for the technology-forcing aspects of Section 316(b) point to the 1980 Hudson

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aquatic organisms will have a correspondingly large adverse environmental impact. *Id.* He concluded that if a CWIS is located in an area with large fish and aquatic organism populations, the only option available for minimizing its adverse environmental impact is to reduce the capacity of the CWIS. *Id.* In addition, the Brunswick Memorandum stated that the impingement and entrainment impacts caused by condenser cooling systems "are a direct function of the density of organisms residing in the source water." *Id.* The Brunswick Memorandum also said that CWISs located in estuarine nursery areas, such as marshes and tidal creeks, "*maximize* losses." *Id.* (emphasis in original). The Brunswick Memorandum concluded by remarking: "Given a poor *location*, the only choice open is to minimize the *capacity* of the intake in terms of the quantities of source water used for cooling." *Id.* (emphasis in original).

717. *Big Bend*, NPDES Permit No. FL0037044 at 3-5. In *Big Bend*, EPA Region IV found that the three Big Bend Units already in operation were having an adverse environmental impact. *Id.* at 2. EPA determined that the retirement of a dilution pump system—which would reduce the withdrawal capacity of the then-existing facility by 36%, and thereby effect a proportional reduction in the level of entrainment—fulfilled the requirements of Section 316(b). *Id.* at 4. EPA Region IV further found that because fine-mesh screens on two of the Big Bend Units would minimize the entrainment effects of those CWISs, such technology would also minimize adverse environmental impacts for purposes of Section 316(b). *Id.* at 5.

718. BACKGROUND PAPER NO. 3, *supra* note 25, at 1.

River Agreement, *John Sevier*, *Crystal River*, and *Pittsburg*, and *Salem* cases, for the proposition that mitigation projects bear EPA imprimatur. In each of these cases, however, mitigation projects were employed only after a determination had been made that the costs of a proposed BTA were wholly disproportionate to the environmental benefit obtained. Further, each case also involved a sizeable reduction in cooling water withdrawal capacity, except for *Salem*, which represents a substantial departure from EPA precedent.

1. Hudson River Agreements

In the Hudson River Agreements, the electric utilities were required to: (1) reduce capacity substantially during certain times of the year; (2) construct, lease or contract for the operation of a hatchery for the stocking of the river with striped bass fingerlings;[719] (3) engage in a biological monitoring program;[720] and (4) provide an endowment to fund research to advance the scientific understanding and management of the Hudson River fishery.[721]

Although the Hudson River Settlement included mitigation as part of a solution to entrainment and impingement damages from multiple power plants, the greatest favorable impacts, however, have come from reductions in volumetric flows through the cooling systems of the plants.[722] The fish hatchery program has proven to be unsuccessful. So, whatever sympathy one has for supporting a mitigation approach, if a fresh review concludes that Section 316(b) is somehow satisfied, such enthusiasm should be tempered by the sobering realities of the Hudson River experience.[723]

2. John Sevier

In *John Sevier*, TECO used a detention dam to form a cooling water intake pool for the powerplant's cooling system.[724] In that case, EPA

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719. 1980 Hudson River Settlement Agreement, *supra* note 377, at 159.

720. *Id.* at 163.

721. *Id.* at 162.

722. Interview with Theresa R. Hanczor, *supra* note 145.

723. *Id.*

724. John Sevier Fact Sheet, *supra* note 416, at 11. Recall that the primary purpose of the dam was to provide an adequate supply of condenser cooling water to the plant, and EPA determined the dam to be an "integral component of the intake structure and is subject to the provisions of Section 316(b)." *Id.* The existence of the dam was contributing to adverse impacts in the Cherokee Reservoir and the Holston River upstream from the plant. *Id.* at 10-11. EPA determined that the plant's CWIS was having a significant adverse environmental impact and did not fulfill the BTA requirements of Section 316(b) because the dam interrupted spawning runs of indigenous migratory fish species and

initially determined that removal of the dam was not necessary because there were other mitigative measures to reestablish the migratory pathway for spawning fish, and removal of the dam "would probably result in additional severe adverse environmental impact."[725] EPA subsequently determined, however, that many of the technologies originally thought to be available were in fact not feasible.[726]

Ultimately, EPA required TVA to institute a stocking program and take other measures.[727] The Agency considered these conditions to satisfy Section 316(b) at the time of permit issuance, but acknowledged that this might change later.[728] The stocking program, however, was less an offset to future environmental damage than an effort to recover from the extensive aquatic species losses which had already occurred.[729] Thus, *John Sevier* did not signal a change in EPA policy.[730]

3. Crystal River

In *Crystal River*, EPA determined that the plant could fulfill the mandate of Section 316(b) by reducing its capacity by 15% during the most biologically active months of November through April, and by retrofitting with "helper" cooling towers.[731] To offset past harms, EPA

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was responsible, at least partly, for the depletion of these species in the local waterbodies, and because the dam did not allow for successful use of tailwater areas for spawning by reservoir fish. *Id.* at 11-12.

725. *Id.* at 12.

726. *Id.* Additionally, EPA determined that the construction of a new intake system, removal and disposal of sediments, and the modification that would result to flow release patterns from upstream impoundments, would result in removal costs wholly disproportionate to the environmental benefits to be obtained. *Id.* As a result, EPA did not find removal of the dam to be BTA.

727. EPA required TVA to: (1) conduct a stocking program to assure replacement of fish populations which had been extirpated or depleted "until such time as technology becomes available to modify the dam;" (2) annually assess available technologies for fish passage and implement such technologies if they become available at a cost that is not wholly disproportionate to the anticipated benefits; and (3) conduct or support research and development of fish passage technology, in addition to other monitoring requirements. *Id.* at 12-13.

728. *Id.*

729. Closure of the dam, and the resulting interruption of spawning runs for certain indigenous migratory game species, was responsible in part for the depletion and/or extirpation of those species in Cherokee Reservoir and in the Holston River upstream of the dam. *Id.* at 10-11.

730. The key to *John Sevier* is that the Agency was unable to identify a technology that could minimize adverse environmental impacts at the John Sevier Plant. Therefore, rather than do nothing, it appears that EPA resorted to mitigation as an expedient and interim measure to satisfy the concerns embodied in Section 316(b) as nearly as possible. EPA also required TVA to continue to assess and implement possible technologies as required by Section 316(b). Additionally, EPA explicitly found that if the environmental benefits associated with dam removal increased, the cost of removing the dam might no longer be wholly disproportionate, thereby leaving this option open for future Section 316(b) determinations. *Id.* at 12.

731. *Crystal River*, NPDES Permit No. FL0000159.

also required FPC to construct and operate a fish hatchery "*in an attempt to replace* fish and shellfish eggs, larvae, and juveniles entrained by the plant."[732] EPA found that these measures "constituted minimization of the environmental impacts of the cooling water intake [structure] as required by [s]ection 316(b) of the [Clean Water] Act for the Crystal River Power Plant" once-through cooling units.[733]

Yet the findings and determinations show that EPA did not allow mitigation to substitute for BTA. In *Crystal River*,[734] the central element of the utility's permit was a 15% capacity reduction and the construction of helper towers at a cost in excess of $100 million,[735] and not the mitigation actions completed at a reported cost of $2 million.[736] The fish ponds, egg tanks, and replanting of sea grasses were clearly intended not as an offset to alternative improvements in the plant but to recover from damage previously inflicted on the environment.[737]

To the extent *Crystal River* may have signaled greater EPA acceptance of mitigation projects, it cannot be sustained by the plain language of Section 316(b) or EPA precedent.[738]

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732. *Id.* at 8 (emphasis added). In *Crystal River*, the powerplant's CWIS is located in an estuarine nursery. The facility has five generating units, two of which employ closed-cycle cooling and three of which use once-through cooling systems. The three once-through cooling units withdraw 1,898 million gpd of cooling water from the estuary, and in so doing impinge and entrain 23 tons (46,000 pounds) of finfish and shellfish annually. *Id.* at 5, 7. In issuing an NPDES permit for the Crystal River Plant in 1988, EPA determined that the location, design, and capacity of its three once-through CWISs did not reflect the best technology available for minimizing adverse impacts as required by Section 316(b). *Id.* at 7. EPA then rejected fine mesh screens because they were not a feasible technology for the CWISs due to associated siltation problems, and rejected cooling towers because the cost of retrofitting was found to be wholly disproportionate to the benefits of an 85% reduction in flow. *Id.* at 7-8.

733. *Id.* at 8.

734. *Crystal River*, NPDES Permit No. FL0000159.

735. *Cooling and Restoration Covered in Utility Pact*, ENG. NEWS-RECORD, June 14, 1990, at 10.

736. Moritsugu, *supra* note 436, at 1.

737. A 1,100 acre area had formerly been denuded by the warm water discharges. *Powerplant Water Pact Will Preserve Wildlife*, ENG. NEWS-RECORD, March 31, 1988, at 30.

738. There are at least five reasons for this. First, EPA's allowance of the use of a fish hatchery to attempt to replace fish eggs, shellfish eggs, larvae, and juveniles which are entrained by the plant fails to address the appropriate adverse environmental impacts caused by the Crystal River Plant and dictated by previous EPA case law. Past EPA determinations require that the "adverse environmental impact" which must be addressed are the specific harms caused by the plant to individual aquatic organisms. There is no support for allowing the mandated Section 316(b) minimization of adverse environmental impact to be fulfilled by trying to address the overall harms to fish populations the plant has caused. Second, use of a fish hatchery is not supported by Section 316(b) law. Indeed, Section 316(b) requires implementation of BTA for CWISs. To fulfill the definition of "cooling water intake structure" the structure at issue must be an integral component of the cooling water intake structure and must be affiliated with the cooling water intake system. A fish hatchery cannot be considered to be a part of a "cooling water intake structure." Third, EPA determined that while closed-cycle cooling would provide an 85% reduction in the entrainment impacts of the Crystal River Plant, the fact that

4. Pittsburg

Pittsburg includes a fish replacement program requiring stocking of striped bass. However, the amount to be restocked was calculated by determining the amount of reductions in fish kills achieved by reducing the intake flows of Units 1-6 (which used once-through systems) while maximizing the utilization of Unit 7 (which employed a closed-cycle cooling tower).[739] Furthermore, the capacity at Pittsburg was limited to an approximately sixty-day period between May and August when about 90% of the entrainment impacts occurred. Once again, we find the principal components of minimizing adverse environmental impacts to be technological efforts, and that using mitigation projects to address harms does not satisfy BTA.

5. Salem

Most recently, the NJDEP allowed PSE&G to implement a mitigation project in an attempt to offset the Salem Nuclear Generating Station's adverse environmental impacts on the Delaware Estuary. *Salem* represents a substantial departure from prior decisions. Unlike the 1980 Hudson River Agreement, *John Sevier*, *Crystal River*, and *Pittsburg*, the mitigation project at *Salem* was not accompanied by a reduction in water withdrawal. Furthermore, *Salem* contained few technological means of addressing Section 316(b). For the first time, *Salem* represents mitigation sanctioning without attendant reductions in entrainment losses. This is particularly troubling in light of the powerplant's propensity to exact profound entrainment losses. Whether *Salem* signals EPA's categorical abdication of its responsibility to enforce Section 316(b) remains to be seen.

C. Congress Has Declined Invitations to Substitute Mitigation Projects for BTA

Congress has considered and specifically rejected the use of mitigation as a means of complying with Section 316(b)'s technology-based requirements. In 1982, EPA recommended that Congress amend Section

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it would cost $150 million more than the mitigation proposal to install was wholly disproportionate to the environmental benefits to be gained. EPA failed to discuss the marginal costs associated with such a retrofit as instructed by the *Brunswick I* decision. Fourth, in considering the costs of the retrofit, EPA focused on the total costs alone, and spent little time considering the environmental benefits such a retrofit would confer. Finally, EPA failed to "minimize" the plant's adverse environmental impacts. A reduction of capacity by 85% would have reduced impacts to the smallest degree possible.

739. *See generally Crystal River*, NPDES Permit No. FL0000159; Pittsburg Discharge Permit, *supra* note 326, at 12-15.

316(b) because "the existing statutory language is very restrictive in that it authorizes only one option, best technology available to mitigate such problems."[740] The amendment EPA suggested would have allowed, *inter alia*, "dischargers to use measures *equal in effect* to the best technology available to mitigate adverse effects."[741]

According to EPA, the proposed amendment would have provided needed flexibility with no loss of environmental protection.[742] The proposal garnered utility industry support as well as opposition from environmental groups.[743]

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740. *Clean Water Act Amendments of 1982: Hearings on S. 777 & S. 2652 Before the Subcomm. on Environmental Pollution of the Comm. on Environment and Public Works*, 97th Cong., 2d Sess. 279 (1982) at 114 [hereinafter *Proposed 1982 Amendments*].

741. *Id.* at 113 (emphasis added). The 1982 amendment to Section 316(b) proposed by EPA would have read as follows:

> . . . (1) that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts, or (2) *that other equally effective measures be applied either alone, or in combination with [BTA], to minimize adverse environmental impacts.*

Id. (emphasis added).

742. An EPA official, Dr. John Hernandez, reflected on the sentiment of the time by noting that

> [t]he intake structures of concern were largely constructed prior to the establishment of environmental standards under Section 316. As a consequence it is often infeasible or extremely costly to modify or relocate them to address such problems as the entrainment of larvae or juvenile fish in cooling water. Such factors are routinely taken into account now in the planning of new facilities.

Id.

743. The Edison Electric Institute (EEI), representing a consortium of utility companies, supported EPA's proposed changes to Section 316(b). PG&E, a member of EEI, testified that it wanted Section 316(b) to provide that any adverse effects of CWISs could be mitigated by a variety of other means in lieu of requiring the application of particular intake structure technology. *Id.* at 1169, 1170. According to EEI's testimony, impingement and entrainment of fish eggs and larvae have minor effects on aquatic ecosystems. *Id.* at 1196 (Testimony of the Edison Electric Institute). EEI posited that Section 316(b) should allow less costly but equally effective substitute mitigation measure methods in place of BTA stating: "It makes no sense to require huge expenditures on technical modifications to the intake structure themselves when such other methods will serve just as well at a more reasonable cost." *Id.* Environmental organizations opposing the amendment testified that EPA's proposals would undermine Section 316(b). Finding EPA's and the industry's agenda unnecessary and unworkable, the environmental organizations feared that the amendment would result in a return to the failed all-too flexible policies of previous years. *See Proposed 1982 Amendments*, *supra* note 740, at 224. Testifying for the Natural Resources Defense Council (NRDC), J. Taylor Banks stated:

> You have heard Administrator Gorsuch and Dr. Hernandez repeatedly characterize the EPA proposals as minor, or fine tuning amendments to the statute. *They are not.* In combination, EPA's amendments will make major adverse changes to the law. They present large, serious questions of policy and should be viewed in that posture . . . . not taken lightly as mere adjustments.

Id. (Overview of Proposals to Amend the Clean Water Act (July 21, 1982)). In particular, NRDC opposed any changes to the thermal discharge requirements. *Id.* at 276. It described EPA's proposal "as an attempt to satisfy the utilities, led by the Edison Electric Institute, in their years-long battle to gain relief from thermal discharge requirements, and particularly from the need to use cooling towers." *Id.* NRDC was also averse to any changes to Section 316(b), least of all the recognition of mitigation measures as substitutes for BTA. NRDC proclaimed that use of mitigation measures would

Nevertheless, Congress declined EPA's invitation to amend Section 316(b), and by 1982, the industry standard for new steam electric generating facilities was the closed-cycle system.[744] Arguably, Congress has chosen not to disturb this eventuality. By not revising Section 316(b), Congress neither undermined the purpose of the CWA nor strengthened it by making closed-cycle cooling systems mandatory. Congress clearly rejected the use of using mitigation projects, however, as a means of fulfilling the requirements of Section 316(b).

Congressional rejection of mitigation projects in 1982, however, has not ended like attempts to amend the CWA. Indeed, Congress is again flirting with the idea, as is explained in Part VII.

VII. RECENT PROPOSED LEGISLATIVE REFORM OF SECTION 316(b)

The 104th Congress is currently considering legislative proposals to amend Section 316(b). On May 16, 1995, the U.S. House of Representatives passed H.R. 961, which would significantly amend Section 316(b)'s existing requirements. Though H.R. 961 retains all of Section 316(b)'s present language, it would regulate new and existing powerplants differently.[745] At its best, H.R. 961 would simply codify prior

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compromise the original goals of the CWA.

744. Rabago, *supra* note 42, at 475.

745. H.R. Rep. No. 112, 104th Cong., 1st Sess. 27-28 (1995) [hereinafter H.R. 112]. H.R. 961 would amend Section 316(b) to read as follows:

> [316](b) Standards for Cooling Water Intake Structures
> (1) IN GENERAL —
> Any standard established pursuant to Section 1311 of this title or Section 1316 of this title and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.
> (2) NEW POINT SOURCE CONSIDERATIONS —
> In establishing a standard referred to in paragraph (1) for cooling water intake structures located at new point sources, the Administrator shall consider, at a minimum, the following:
> (A) The relative technological, engineering, and economic feasibility of possible technologies or techniques for minimizing any such adverse environmental impacts.
> (B) The relative technological, engineering, and economic feasibility of possible site locations, intake structure designs, and cooling water flow techniques.
> (C) The relative environmental, social, and economic costs and benefits of possible technologies, techniques, site locations, intake structure designs, and cooling water flow techniques.
> (D) The projected useful life of the new point source.
> (3) EXISTING POINT SOURCES —
> For existing point sources, the Administrator may require the use of best technology available in the case of existing cooling water intake structures if the Administrator determines such structures are having or could have a significant adverse impact on the aquatic environment. In establishing a standard referred

administrative interpretations of Section 316(b). At its worst, H.R. 961 would dramatically alter the course of Section 316(b) and breathe additional ambiguities into the war-torn provision.

By requiring that location, design, flow techniques, and the useful life of the facility be considered when determining what will constitute BTA for new sources, prior decisions construing Section 316(b) remain instructive. On the other hand, for existing powerplants, Congress has extended an invitation to use mitigation projects as a means of minimizing adverse environmental impacts.

A. H.R. 961's Application To New CWISs

H.R. 961 would give permit writers seemingly more flexibility when establishing Section 316(b) compliance requirements for "new point sources."[746] H.R. 961's amendments are narrowly tailored to address site-specific factors, techniques, and cost considerations for new CWISs. First, unlike Section 316(b)'s present application to new sources, H.R. 961 allows consideration of multifarious site-specific factors including the relative technological, engineering, and economic feasibility of possible technologies or techniques, site locations, intake structure designs, and cooling water flow techniques for minimizing adverse environmental impacts.[747]

Second, H.R. 961 requires consideration of "technologies or *techniques*."[748] The term "techniques" would seem to allow the BTA requirement to be fulfilled by actions transcending the actual construction of the CWIS itself, such as reducing flows during environmentally sensitive times of the year. But the term "techniques" does not contemplate the use of mitigation projects for new powerplants. H.R. 961

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to in paragraph (1) for such existing point sources, the Administrator shall consider, at a minimum, the following:

(A) The relative technological, engineering, and economic feasibility of reasonably available retrofit technologies or techniques for minimizing any such adverse environmental impacts.

(B) Other mitigation measures for offsetting the anticipated adverse environmental impacts resulting from the withdrawal of cooling water.

(C) Relative environmental, social, and economic costs and benefits of possible retrofit technologies, techniques, and mitigation measures.

(D) The projected remaining useful life of the existing point source.

746. H.R. 112, defines new point source as:

any point source the construction of which will commence after the publication of proposed regulations prescribing a standard for intake structures that will be applicable to such source if its such standard is promulgated in accordance with paragraph (2).

Id. at 28.

747. *Id.*

748. *Id.* (emphasis added).

would appear, however, to put at risk the presumption that Section 316(b) requires closed-cycle cooling systems for new CWISs, and opens the floodgate for interpretive litigation.

Third, regarding costs, H.R. 961 requires the permit writer to consider "[t]he relative . . . economic feasibility of possible technologies or techniques . . . ."[749] On its face, this would seem to suggest that the costs of available technologies and techniques for minimizing any adverse environmental impacts must be compared serially.[750] In addition, H.R. 961 would allow the permit writer to consider the "relative environmental, social, and economic costs and benefits" of Section 316(b) compliance measures.[751] Consideration of these factors could result in better-reasoned decision making by allowing a permit writer to consider collateral environmental matters.[752] Lastly, H.R. 961 allows the permit writer to consider the projected useful life of the new facility.[753] H.R. 961 does not, however, adopt EPA's "wholly disproportionate test."[754] Instead, H.R. 961 would again leave both permit writers and the courts largely at sea about how costs should be factored into BTA decisions for new CWISs.

B. H.R. 961's Application to Existing Point Sources

As it applies to existing CWISs, H.R. 961 represents a significant departure from the current incarnation of Section 316(b). In short, H.R. 961 could make Section 316(b) so vague and discretionary as to abandon its application to existing CWISs altogether.

First, regarding technological requirements for "existing point sources,"[755] H.R. 961 would require the permit writer to consider the

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749. *Id.* at 27.

750. This Section, though, can be interpreted in one of two ways: (1) the costs of available technologies and techniques for minimizing adverse environmental impacts is to be made in a vacuum without comparison as to which technologies or techniques would provide the greatest minimization of adverse environmental impacts; or (2) only techniques which provide co-equal environmental benefits to technologies can be considered, and once identified, the least costly alternative would be mandated.

751. *Id.*

752. These might include the "external" environmental costs associated with the operation of a CWIS, the need to conduct research and development, the short and long-term employment benefits of additional technologies, and the impact additional compliance measures would have on fishing, recreational interests, ecotourism, aesthetics, threatened and endangered species, and so on.

753. H.R. 112 at 27.

754. For example, recall that in *Seacoast Anti-Pollution League v. Costle*, *Seabrook* and *Brunswick*, both the First Circuit and EPA mandated that costs be a factor in any BTA decision-making, with EPA applying the "wholly disproportionate test."

755. H.R. 112 would define the term "existing point source" to mean "any point source that is not a new point source." H.R. 112 at 28.

"relative technological, engineering, and economic feasibility" of reasonably available retrofit measures.[756] Next, H.R. 961 would limit the technologies which can be required to those that are "reasonably available."[757] While H.R. 961 does not contemplate what is "reasonably available," its inclusion is clearly an attempt to relieve existing sources from the technology-forcing aspects of Section 316(b) in its present state. The use of the word "reasonably" dilutes Section 316(b)'s current requirement that permit holders use the "best" technology available. Additionally, as with new sources, the useful life of an existing source must be considered.[758] H.R. 961 also requires consideration of the "relative environmental, social and economic costs and benefits of possible retrofit . . . measures."[759]

Second, the most troubling aspect of H.R. 961 is the extent of adverse impact which must be demonstrated before Section 316(b) even applies. H.R. 961 only allows the Administrator to require use of BTA if a CWIS is having or could have a "*significant* adverse impact on the aquatic environment."[760] Injection of a subjective "significant" standard would greatly deflate present Section 316(b) requirements that *all* adverse impacts be minimized. To make matters worse, enforcement of Section 316(b) requirements would become discretionary even if environmental effects are found to be significant.[761] Therefore, H.R. 961 would leave the determination of whether to require BTA for existing sources to the abject caprice of the permitting agency. This represents, more or less, complete congressional abdication of the concerns meant to be remedied by Section 316(b).

Third, H.R. 961 would evince congressional sanction of mitigation projects for existing CWISs. Arguably the most controversial aspect of how H.R. 961 would alter Section 316(b) is that it would allow permit writers to consider "[o]ther mitigation measures" to offset the adverse environmental impacts caused by an existing CWIS.[762] This provision would open the door for experimental techniques that might not produce anticipated results, and would suppress what little exactitude Section 316(b) contains presently. In essence, H.R. 961, for better or for worse, here attempts to usher in the age of mitigation as a substitute for technology.

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756. *Id.*
757. *Id.*
758. *Id.*
759. *Id.*
760. *Id.* (emphasis added).
761. *Id.*
762. *Id.* at 28.

VIII. RECOMMENDATIONS

Like Darwin's theory of punctuated equilibrium, Section 316(b) has evolved rapidly at times, only to be followed by periods of little change. The Section yearns to be taken more seriously, and the environment and those dependent upon it continue to suffer the consequences of the regulatory vacuum caused by EPA's failure to promulgate regulations. Moreover, insufficient regulation has left the agency, states, and others tilting quixotically at the important, but quite often impotent, provision. Accordingly, the following paragraphs provide a few recommendations for EPA, states, and others for securing effective implementation and enforcement of the provision.

First, EPA must make promulgating Section 316(b) regulations a top priority. In the quarter century since Congress saw fit to pen the Section, the nation has beheld the end of the Vietnam War, enjoyed its and the United States Constitution's bicentennials, followed six Olympic games, survived five Presidents, witnessed the dying breath of communism, been transformed and transfixed by computers and cable television, and made way for an additional two billion people worldwide. In the meantime, EPA has debated, promulgated and implemented thousands of environmental regulations, while leaving Section 316(b) withering on the vine. In no other area of environmental regulation has EPA's failure to regulate had such dire consequences. Perhaps the National Alliance of River, Sound and Baykeepers can prevail upon EPA to fulfill its obligation to establish regulations with all due dispatch. Otherwise, agency attempts to interpret Section 316(b) will continue on in meandering ways.

Second, like archaeologists unearthing Urkesh—one of the long lost cities of antiquity—EPA must rediscover the more sublime qualities of Section 316(b) even before any regulations would become effective. Thus, EPA should fill the regulatory void by publishing guidance documents, regulatory guidance letters, and memorandums of understanding construing the provision. Indeed, EPA has made it a practice to do so with many other aspects of the CWA, and Section 316(b) seems aptly suited for such parenting. In addition, to smooth regulatory anxieties along the way, the EPA OGC should issue additional opinions interpreting the Section's core provisions. In any event, EPA need not abdicate responsibility until next century's projected promulgation.

Third, states need to be more circumspect when administering the Section. Metaphorically speaking, there is no question that Section 316(b) is taking in water, and that every state administrative action which falls short of Section 316(b) requirements drops another brick through the Section's hull. Without vigilant bailing, state trends indicate that the Section will soon be sunk in a harbor of despair, and with it, Congress'

preference for national, predictable and equitable technology-based standards. Of course, as standard-setter, permit-approver, and arbiter of the CWA, EPA sinks too, firmly clenching section-saving life jackets in hand.

Fourth, as with virtually any piece of compromise legislation, congressional refinement of the Section would be helpful. Congress should abandon current proposals to dilute the Section's requirements, and instead explore the option of adopting performance-based standards which allow for flexibility as long as any chosen Section 316(b) control method minimizes adverse environmental impact to the same degree as would BTA. Besides providing needed flexibility to regulators and the regulated, performance-based standards would once again provide an impetus for pursuing engineering solutions to the environmental challenges addressed by Section 316(b). Furthermore, Congress should couple the performance-based standards with a requirement that residual aquatic organisms that are unavoidably lost be replaced or restored and that affected fishing interests be compensated accordingly. In the alternative, but certainly not as substitute for BTA, well-conceived mitigation projects reflecting scientific uncertainties might also be used to offset unavoidable residual losses. As a measure of last resort, trading, banking, or allowance systems might be used to offset unavoidable residual losses. In the least, these measures would level the playing field among fishing interests, the public and operators of CWISs, and revoke the veritable carte blanche utilities enjoy to harm aquatic life.

Fifth, regulators should put into effect more logical and defensible bases for making Section 316(b) "determinations." Below are eleven determinations which should be made to effect more logical agency implementation of Section 316(b) in the absence of EPA regulations. This framework might also serve as a useful construct for any nascent Section 316(b) EPA regulations or congressional activity.

(1) *Applicability*. Determine whether the facility possesses both a point source and a CWIS.

(2) *Adverse Environmental Impact Determination*. Determine the extent of the "adverse environmental impact" (including losses to individual aquatic organisms) caused by the CWIS.

(3) *Survey of Alternative Available Technologies Determination*. Determine which technologies are available to "minimize" (reduce to the smallest extent or degree) adverse environmental impacts.

(4) *Design Determination*. Determine whether the "design" of the CWIS reflects BTA for minimizing adverse environmental impacts.

(5) *Location Determination*. Determine whether the "location" of the CWIS reflects BTA for minimizing adverse environmental impacts.

(6) *Capacity Determination*. Determine whether the "capacity" of the CWIS reflect BTA for minimizing adverse environmental impacts.

(7) *Construction Determination*. Determine whether the "construction" of the CWIS reflects BTA for minimizing adverse environmental impacts.

(8) *Total Cost Determination, Based On Assessment of Both Internal and External Costs*. Determine the "internal" construction and operation and maintenance costs of BTA, and discount them by external costs to society, including but not limited to, impacts on fishing interests, ecotourism, job creation and enhancement, etc.

(9) *Costs to Ratepayers Determination*. Determine the incremental or marginal cost of BTA to ratepayers.

(10) *Comparison of Costs and Adverse Environmental Impact*. Determine whether the incremental or marginal costs to ratepayers of BTA are wholly disproportionate to the environmental benefits conferred by the technology, noting that the ability of the permit holder to pay is not relevant, but that any prior knowledge of the possible imposition of additional compliance measures is relevant.

(11) *Mitigation of Unavoidable Impacts*. Determine how to address unavoidable adverse impacts. No BTA is likely to reduce all adverse environmental impact. Consequently, determine whether mitigation options might be explored to the extent that they offset any unavoidable adverse impacts not addressed by BTA.

No doubt some will consider the above framework to be a hyper-technical reading of the statute. Yet each of the words and phrases of Section 316(b) is meaningful; read together, they manifest clear congressional intent of how to address the devastating environmental toll exacted by the Nation's cooling water intake structures.

CONCLUSION

Implementation of Section 316(b) started out earnestly enough, yet consistency in agency implementation of Section 316(b) over the last twenty years has not been a priority. In the 1970s, EPA attempted to require substantial Section 316(b)-inspired modifications to existing CWISs for the Seabrook, Brunswick, Big Bend, and Hudson Utility powerplants. After these efforts were short-circuited, however, it became distracted. EPA began flailing shortly after its unsuccessful attempt to promulgate regulations and Administrator Costle's pronouncement of the "wholly

disproportionate" cost test. With the exception of the retrofitting measures EPA required in *Brunswick* and *Big Bend*, EPA has yet to require an existing powerplant to convert a CWIS to ensure that it reflects an emerging BTA technology. Moreover, in the 1980s, EPA began to warm to the notion of mitigation in the Hudson River Agreements, *John Sevier*, and *Crystal River* cases. In the 1990s, some states followed suit in *Chalk Point*, *Earth Island*, and *Salem*. Most states, however, as exhibited by the *Coffeen*, *Anclote*, *Hennepin*, *Diablo Canyon*, *Mercer*, and *Pittsburg* cases, have remained content merely to pursue the contours of Section 316(b) by requiring endless waves of biological monitoring studies. Clearly, therefore, state agencies and EPA must believe that they have been left with a Hobson's choice of sorts—to give their unequivocal blessings to cooling water use, or to be reduced to enforcement by supplication.

EPA's and the state's schizophrenic application of Section 316(b) has left it in a state of turmoil at a time when there has been a burst of activity regarding the provision. Indeed, in the summer of 1995 the United States House of Representatives passed legislation (H.R. 961) that would significantly diminish the already marginal effectiveness of Section 316(b). EPA is developing regulations to implement the requirements of Section 316(b). A federal court in New York is attempting to apply its operative language to a powerplant along the Hudson River. Finally, a significant settlement has just been reached to resolve a Section 316(b) dispute in New Jersey that severs Section 316(b)'s head.

As we have seen, given equal amounts principle and calculation, Section 316(b) provides the CWA agencies with the tools for effective and common sense application of Section 316(b). It is time for EPA to reawaken its efforts to implement the provision, and for states to reexamine how they apply the Section to particular CWISs.