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September 18, 2009

**TRANSMITTED AND FILED
BY ELECTRONIC MEANS**

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Re: Alcoa Power Generating, Inc. – Yadkin
Hydroelectric (Relicensing) Project,
Project No. 2197-073 (Application for
a New Major License)

Dear Secretary Bose:

Enclosed herewith for filing in the above-referenced proceeding is a pleading entitled "Motion of the State of North Carolina to Present Evidence in Support of its Request that the Commission Recommend Federal Recapture, Comments and Evidence of the State in Support of its Opposition to the Issuance of a New License to Alcoa, Motion of the State to Supplement Final Environmental Impact Statement, Request of the State for Waivers of Commission Regulations, if Necessary, and Motion of the State for Oral Argument Before the Full Commission," with supporting Exhibits 1-5.

Exhibit 1 to the State's Motion, entitled "The State of North Carolina's 21st Century Plan for the Use of the Yadkin River Resources," has two volumes: (i) volume 1, which is the text of the State's 21st Century Plan; and (ii) volume 2, entitled "Attachments to the State of North Carolina's 21st Century Plan for the Use of the Yadkin River Resources."

The Honorable Kimberly D. Bose
FERC Secretary
September 18, 2009
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I am simultaneously serving these papers on all persons listed on the official service list compiled by your office in this matter, either by electronic means or by First-Class United States Mail.

On behalf of the State of North Carolina and Governor Perdue, I would be grateful if you would file these pleadings and Exhibits with the Commission.

Should you have any questions concerning this letter, its enclosures or anything else, please let me know. My contact information is as follows:

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Thank you very much for your assistance in this matter.

Very truly yours,

A handwritten signature in black ink, appearing to read "I. Faison Hicks", written in a cursive style.

I. Faison Hicks
Special Deputy Attorney General
Counsel for the State of North Carolina

Enclosures

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Alcoa Power Generating, Inc.	)	Project No. 2197-073
	)	Yadkin Hydroelectric Project
	)	Application for a New Major License

**MOTION OF THE STATE OF NORTH CAROLINA TO
PRESENT EVIDENCE IN SUPPORT OF ITS REQUEST
THAT THE COMMISSION RECOMMEND FEDERAL
RECAPTURE, COMMENTS AND EVIDENCE OF THE
STATE IN SUPPORT OF ITS OPPOSITION TO THE
ISSUANCE OF A NEW LICENSE TO ALCOA, MOTION OF
THE STATE TO SUPPLEMENT FINAL
ENVIRONMENTAL IMPACT STATEMENT, REQUEST OF
THE STATE FOR WAIVERS OF COMMISSION
REGULATIONS, IF NECESSARY, AND MOTION OF THE
STATE FOR ORAL ARGUMENT BEFORE THE FULL
COMMISSION**

NOW COMES the State of North Carolina, by and through its Governor, Beverly Eaves Perdue (the "State"), pursuant to Rule 212 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (the "Commission" or "FERC"), 18 C.F.R. § 385.212, and Sections 4(e), 7(c), 10, 14, 15 and 309 of the Federal Power Act, 16 U.S.C. §§ 797(e), 800(c), 803, 807, 808 and 825h, and moves the Commission to receive the State's Comments and evidence in support of its request that the Commission recommend federal recapture in this relicensing proceeding and, after consideration of the State's Comments and evidence, that the Commission recommend to the United States Congress that the Yadkin Hydroelectric Project, FERC Project No. 2197, now subject to relicensing, be proposed for recapture by the United States Government, and for transfer thereafter, following the enactment by Congress of appropriate legislation, to the State of

North Carolina for the public purposes described below, upon the terms proposed below for such transfer.

In conjunction with its request for recommended recapture, the State further moves the Commission to deny the new license application of Alcoa Power Generating, Inc. (“Alcoa” or “APGI”) and requests that this pleading and the other materials of the State in support of this pleading which have been attached hereto accompany any recommendation made by the Commission for recapture, pursuant to Section 7(c) of the Federal Power Act. In addition, the State requests that the Commission supplement the Final Environmental Impact Statement (“Final EIS”) issued by the Commission’s Staff for the Yadkin Project in April 2008¹ to address the State’s evidence and to evaluate the recapture alternative proposed by the State.

The State of North Carolina further requests that the Commission schedule the State’s recapture request for oral argument before the full Commission. The provisions of law applicable to recapture, though of long standing in the Federal Power Act, have not been recently interpreted. The State therefore believes that the Commission will benefit from oral argument because of the significant public policy considerations raised in the State’s submission regarding the future management of the State’s natural resources and the State’s urgent concern that the Commission give adequate and proper weight to the importance of water resources to the State, especially the waters of the Yadkin River.

¹ Final Environmental Impact Statement for the Yadkin and Yadkin-Pee Dee River Projects, Project Nos. 2197-073, 2206-030, at 35 (Apr. 18, 2008), *available at* eLibrary Accession No. 20080418-4000.

Summary of the State's Argument

The State's argument in opposition to Alcoa's relicensing application is simple and straightforward. It is grounded in basic principles of fairness and common sense. Alcoa's initial license in 1958 was premised on an agreement among Alcoa, the State and the Commission. Alcoa told the State and the Commission that, in exchange for a full, prospective 50-year license, it would use the flows of the Yadkin River to create a significant public benefit for the people of North Carolina by creating and maintaining nearly 1,000 jobs near the Project site. The State supported Alcoa's license application on this basis and the Commission awarded Alcoa a 50-year license that was predicated on the significant public interest in the creation and maintenance of these jobs.

Alcoa did not keep this commitment. It has not provided 1,000 jobs to the people of the Yadkin River Basin for decades. In 2007, Alcoa permanently shut down the Aluminum smelting plant in Badin that was the source of these jobs. Its relicensing application and proposal do not contemplate using the flows of the Yadkin River to restore these jobs or to create any other comparable benefit for the people of North Carolina.

In addition to Alcoa's failure to maintain these jobs or to propose to the Commission that it will otherwise use the Yadkin River in the next 50 years to create another, comparable public benefit, the evidence suggests that Alcoa has failed in its statutory duty to be a good steward and trustee of the Yadkin River, Badin Lake and the health and safety of the people who live nearby. Recent evidence points to conduct by Alcoa that substantially polluted and damaged the land, the Yadkin River and Badin Lake. This record also suggests that, out of concern for its own economic interests,

Alcoa has shown little interest in expediting the actual clean-up of its pollution, which today remains largely unremediated.

Furthermore, the circumstances in North Carolina and with Alcoa have dramatically changed since 1958. Today, the State's citizens look to the State to help foster the types of conditions that will promote the creation of jobs to replace those lost, as well as new jobs, as the State's population grows. The current worldwide economic recession, which has cut deeply into the State's employment levels, makes it even more imperative that the State fully harness North Carolina's natural and other resources to stimulate and support economic development, growth and job creation. As the State considers the next 50-year license period and how best to plan for the needs of its people in terms of jobs, economic development, growth, recreation and a better quality of life, it is essential that the State be able to provide individuals, communities and industries with adequate and dependable supplies of clean consumptive water. These and other significant changes in the State's and Alcoa's situation today as compared to 1958 compel a reevaluation of which entity should be the licensee for the Yadkin Project.

The question is: how are these vital public interests to be met? The answer seems clear. The Federal Power Act provides the State with the tools to assist it in meeting its responsibilities and in responding to these public interest challenges. The Commission itself is charged in this proceeding with licensing only that project that is *best adapted* to a comprehensive plan for the use of the Yadkin River to serve the public interest. North Carolina's 21st Century Plan for the Use of the Yadkin River Resources, Exh. 1 hereto (the "21st Century Plan" or the "Plan") addresses these public interest responsibilities and

challenges. It is the best adapted proposal to serve the public interest in the broadest sense. Alcoa has offered nothing comparable.

I. THE RELEVANT FACTS

The State's opposition to Alcoa's relicensing application and its request for a recapture recommendation arise out of: (A) Alcoa's failure to keep its promise to the State that, in exchange for the State's support of Alcoa's initial license application, it would create, maintain and provide North Carolina's people with significant socio-economic benefits; (B) Alcoa's failure as a trustee and steward of the Yadkin River, Badin Lake and the health and safety of the people who live nearby; and (C) significant changes which have occurred since 1958 and which the State believes require a completely new analysis of how best to use the flows of the Yadkin River as a public resource – in particular, the need for clean, accessible water supplies has become critical to the State's continued growth, development and prosperity. Each of these is explained below.

A.

The Loss of the Economic Development Public Benefit That Was the Underlying Basis for the Commission's Decision to Grant Alcoa the Initial License and Alcoa's Failure in its Current Relicensing Proposal to Provide Any Comparable Substitute Economic Development Benefit to the Public

At the heart of the original licensing of the Yadkin Project was the promise made by Alcoa to the State that Alcoa would modernize and increase the size of its Badin

smelting plant, thereby creating and thereafter maintaining nearly 1,000 jobs at the plant. *See Carolina Aluminum Co.*, 19 F.P.C. at 715-16, 719, 722, 730.²

The State's support of Alcoa's license application was predicated upon this promise. *See* Exh. 2, ¶ 4, at 2-3; Exh. 1, Attach. II, ¶ 8, at 7-8. At that time, the State recited in its Petition to Intervene that, unless the Federal Power Commission issued a 50-year license to Alcoa, "aluminum production at Badin would . . . be reduced and, possibly, ultimately abandoned." Exh. 2, ¶ 4, at 3. The State said essentially the same thing in its brief filed in the original license proceeding. Exh. 1, Attach. II, ¶ 8, at 7-8. The State further noted that such an event "would strike a serious blow to the economy of Stanly County and to the State . . . as a whole." Exh. 2 at 3. Alcoa made the same arguments to the Commission. Exh. 3 at 17-27 (Br. of Carolina Aluminum Co. in *Carolina Aluminum Co.*, Project Nos. 2197, 2206 (Nov. 18, 1957) ("1957 Alcoa Brief")).

Much of the evidence presented by Alcoa during the original license proceedings was designed to persuade the Commission to grant Alcoa a 50-year license, beginning in 1957, for all of its Yadkin River power plants (three such power plants were then in existence)³, rather than just for the new (fourth) power plant that Alcoa then proposed to construct. The Commission initially balked at issuing a full 50-year license for the three hydropower plants that had been constructed and had been operating without a federal license since the 1920s. *Carolina Aluminum Co.*, 17 F.P.C. 493, 495 (1957). It was eventually persuaded to issue such a license to Alcoa for all four dams and power plants, however, after Alcoa made it clear to the Commission, the State and the local community

² *See, e.g.*, Finding and Conclusion No. (20) in *Carolina Aluminum Co.*, 19 F.P.C. at 722.

³ *See* 19 F.P.C. at 704, where the Commission noted that the license for the three constructed plants had been backdated to January 1, 1947, resulting in a license just short of a 40-year term.

that it would not modernize the existing Badin smelting plant unless it obtained this 50-year license for all four power plants. *See Carolina Aluminum Co.*, 19 F.P.C. at 707. *See also* Exh. 3, 1957 Alcoa Brief, at 23 (stating that new investment in the Badin smelting works would “not be effectuated” absent a 50-year license term).

A decision by Alcoa to shut down the smelting plant at this point would have left approximately 1,000 workers without jobs which, at that time, paid high wages. The State was concerned that many long-time Alcoa employees, many of whom had worked for Alcoa for over 25 years, would be left without employment. Exh. 1, Attach. II, ¶ 8, at 7-8.

In support of its argument that it needed a 50-year license, Alcoa noted:

. . . the overwhelming public support of the project indicated by the intervention of the State of North Carolina, the strong recommendation of the State’s two Senators, interested Congressmen and local governmental officials, and the telegrams, letters, petitions and statements from civic groups, organizations and individuals in North Carolina and, *particularly, those directly affected by the economy of the Badin area.*

As to both objections to the Yadkin Project, it is obvious that the answer lies in the proper balancing of interests. The question is whether the full potential of the affected reach of the Yadkin River should be developed to sustain *an industry which is the life blood of this section of North Carolina* or whether this valuable resource should be wasted in favor of small and relatively unaffected private interests or private aims and desires.

Exh. 3, 1957 Alcoa Brief, at 12 (emphasis supplied) (footnote omitted).

The State, Alcoa and the Commission all understood that the Badin jobs were the *quid pro quo* for the State’s support for Alcoa’s application. Indeed, the Commission’s Presiding Examiner, whose decision was adopted by the Commission, predicated his

decision granting Alcoa its initial 50-year license on, *inter alia*, Finding and Conclusion number (20), which stated that:

The Applicant . . . proposes to reconstruct its smelting plant at Badin to increase both its maximum capacity and its firm or continuous smelting capacity in order to increase the usefulness and efficiency of the . . . smelting plant, and such proposed reconstruction is expected to afford continued employment to more than 900 persons in the Badin area.^[4]

This was the bargain that Alcoa made with the State, the local community and the Commission. The *quid pro quo* for North Carolina's support of Alcoa's quest for a full prospective 50-year license for all four of its hydro plants was this promise to expand the Badin smelting plant and to create and maintain nearly 1,000 high-paying jobs for North Carolina's citizens. In return, Alcoa received a license of great value.

By the latter part of the twentieth century, however, Alcoa decided to shift its Aluminum smelting operations elsewhere. Thus, it significantly reduced employment at its Badin plant over time and, in early 2007, it shut down this facility altogether. As a result, Alcoa eliminated all but approximately 35 jobs.⁵ When it closed its Badin smelting plant, Alcoa offered the people of North Carolina nothing of meaningful value to replace these lost jobs.

⁴ See *Carolina Aluminum Co.*, 19 F.P.C. at 722. In Finding (21), the Presiding Examiner further found that the smelting facilities last about 25 years, and that "full utilization" of the Badin smelting facilities could occur *twice* if a 50-year license were awarded, thus allowing the "continued employment" he referred to in Finding (20). Based on Findings (20), (21) and (22), he concluded that the public interest required that Alcoa be given a 50-year license. *Id.* (Emphasis supplied). This part of the Presiding Examiner's decision demonstrates that the Commission's decision 50 years ago was based on the public interest, as it should be now, and that a key public interest which persuaded the Commission to license Alcoa was its promise of these jobs. Since that time, these jobs have since largely vanished, such that, now, the public interest is no longer supported by licensing Alcoa, but, rather, by recommending recapture and transfer of the license to the State.

⁵ It is the State's understanding that these 35 or so jobs are in Alcoa's hydropower business at the Project site.

A study recently conducted by an economic research team from the North Carolina Department of Commerce estimated the scope of the economic loss caused to the people of the State by Alcoa's abandonment of this smelting plant. *See* Exh. 1, Attach. XVIII. Using a hypothetical new plant and available information as its basis, this study found that direct employment at such an Aluminum smelting plant today would range from 160 people (conservative) to 610 people (average); that the plant would foster total employment (that is, direct, indirect and induced employment) ranging from 571 persons (conservative) to 2,176 persons (average); that the plant would engender one-time facility construction employment ranging from 3,352 persons (conservative) to 12,793 persons (average); that capital investment in plant and equipment would range from \$232,506,550 to \$887,400,000; that the total annual output of the plant (the value of all goods and services produced and sold each year) would range from \$223,503,653 (conservative) to \$852,107,661 (average); that the plant's one-time, construction-related total output would range from \$368,000,000 (conservative) to \$1.5 billion (average); that the plant's total "value added" economic impact annually would range from \$71,711,276 (conservative) to \$273,399,238 (average); and that the plant's total annual recurring employee compensation (including wages and salaries, benefits, health and life insurance, retirement payments and all other non-cash compensation) would range from \$32,000,000 (conservative) to \$122,000,000 (average). *Id.* at 3-5.

These numbers are significant, and the total economic development impact on the State of such a facility, whether built along the lines of the conservative or the average model, would be tremendous. Multiplying this economic impact over an entire 50-year license period increases the economic impact of such a facility manyfold.

Conversely, the closure of such a plant would have an equally tremendous negative economic impact on the State, the Yadkin River region and the local community – an impact that can be seen in the numbers summarized above. This was the negative economic impact that Badin, Stanly County, the Yadkin River Basin and the State sustained when Alcoa closed its Badin smelting plant.

In 1957, Alcoa was well aware of the negative economic effect that failing to maintain these jobs would have on the State and the local economy. In words that would prove all too prophetic, Alcoa stated to the Commission that:

The . . . discontinuance or diminution of [Carolina Aluminum Company's] smelting operation at Badin . . . , would entail losses to the community in taxes and employment that would be *disastrous* in their effect.

Exh. 1, Attach. I, ¶ 3, at 2-3 (Motion for Reconsideration and Rescission of Order of Carolina Aluminum Company in *Carolina Aluminum Co.*, Project Nos. 2197, 2206 (Aug. 28, 1957)) (emphasis supplied). With Alcoa's closing of its Badin smelting plant and the consequent loss of these jobs, this disastrous effect has now come to pass.

After almost 100 years of operations on the Yadkin River, Alcoa now plans to use the flows of the Yadkin River, which belong to the public, solely to generate private profit for itself and its shareholders. Unlike North Carolina's investor-owned public utilities, which are subject to extensive regulation by the North Carolina Utilities Commission, have substantial business operations located here in North Carolina, employ thousands of North Carolinians and have a long-standing tradition of actively working in close partnership with the State in economic development and other productive activities, Alcoa employs very few North Carolinians, is not subject to utilities regulation by North

Carolina and now sends and will continue to send the profits it realizes from its use of the Yadkin River's flows to its shareholders and corporate operations in other states.⁶

B.

Alcoa's Failure as the Project's Trustee and Steward to Protect the Public Interest in the Environment and the Health and Safety of the Public

During its initial license term, Alcoa's actions and decisions as the Government-licensed trustee and steward of Badin Lake, the Yadkin River and the health and safety of the people who live in this area raise serious concerns about whether it is able to fulfill its stewardship and trustee role when its own economic interests conflict with its duty to act as a steward of the public interest. This conflict and Alcoa's failure to act as a public steward can be seen in evidence only recently surfacing as to: (1) the extent of the environmental pollution of Badin Lake and Alcoa's subsequent resistance to the efforts of State officials to warn the public of the resulting dangers; and (2) Alcoa's inaction with respect to the dissolved Oxygen problems caused by its own operation of the Project.

1. Alcoa's Pollution of Badin Lake and its Lawsuit Against the North Carolina Division of Public Health

For almost 100 years, Alcoa has conducted industrial operations at its Badin smelting plant. During this period, it produced large amounts of hazardous wastes.⁷

⁶ In fact, Alcoa has even announced that it intends to use the profits generated from the Yadkin River for investment in other countries. See *The New York Times* article on the agreement reached between Iceland and Alcoa, in which Iceland is reported to have agreed to construct a \$3 billion hydropower project, the output of which will be used to supply a \$1 billion new Aluminum smelting plant being constructed by Alcoa in that country. This article can be accessed via the following link: <http://www.nytimes.com/2003/03/19/business/alcoa-and-iceland-agree-on-smelter-project.html>.

⁷ For example, Alcoa's smelting plant produced approximately 4,800 tons per year of spent pot linings, a hazardous waste containing cyanide complexes. See, e.g., Scoping Comments of Stanly County and Request for Additional Information from Licensee at 9 (Feb. 26, 2007), available at eLibrary Accession No. 20070305-0171 ("Stanly County Scoping Comments"). The State has significant additional documentation on industrial pollutants and environmental contamination associated with the Badin

Some of these wastes were discharged into the air and water of Stanly County. Others were stored on or buried in the land.⁸ This environmental contamination of the Badin smelting plant site and the official disposal sites used by Alcoa in Stanly County, all of which are located on or near the shore of Badin Lake, have been documented by Alcoa's own environmental consultants.⁹

In addition, Alcoa used, *inter alia*, PCBs and materials containing polycyclic aromatic hydrocarbons ("PAHs") in its smelting and hydropower operations.¹⁰ It has acknowledged its use of PCBs and certain of its PCB disposal practices, describing one waste disposal operation referred to as the "Aerated Lagoon," where hazardous wastes were stored or disposed of. *See* Stanly County Scoping Comments, Attach. C (at T4-2, T4-4).

Today, Badin Lake is contaminated with both PCBs and PAHs, *see, e.g.*, the RETEC Report and the Matthews Memorandum, substances suspected of causing cancer in human beings. The presence of these potentially cancer-causing contaminants in the

smelting works, and is prepared to make these materials available to the Commission if it would assist the Commission's record and decision in this matter.

⁸ These other hazardous waste materials included, *inter alia*, spent pot linings and other refuse from Alcoa's smelting operations, which were stored or buried underground. "Spent pot lining" waste ("SPL") is a hazardous waste regulated under the Resource Conservation and Recovery Act. This waste contains cyanide and fluoride generated from cleaning and refurbishing the smelting pots. *See* Stanly County Scoping Comments, Attach. C (at T4-2).

⁹ *See generally* Stanly County Scoping Comments at 9-21. *See also* MFG, Inc., *RCRA Facility Investigation Report* (March 2001), attached to letter from Frances E. Francis to Kimberly D. Bose, Sec'y, FERC, *Alcoa Power Generating, Inc.*, Project No. 2197-073 (Dec. 10, 2007), available at eLibrary Accession No. 20071210-5059; Stanly County Board of Commissioners, public meeting (Feb. 5, 2007), video file, which provides an overview of: (i) the contamination that Alcoa acknowledges at the Badin smelting plant and official dumping locations; and (ii) the steps that Alcoa has taken as of February 2007 to address this contamination, Attach. B to the Stanly County Scoping Comments.

¹⁰ *See, e.g.*, Exh. 4, at E-1, "Characterization of the Toxicity and Bioavailability of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake," prepared for Alcoa by The RETEC Group, Inc., (Feb. 16, 2007) (the "RETEC Report"); Exh. 5, at 1-3, Memorandum from Dexter Matthews, Dir., DENR Waste Mgmt. Div., to Rob McDaniel, DENR Hazardous Waste Section, Re: PCBs in Badin Lake, at 1-3 (Feb. 25, 2009) (the "Matthews Memorandum").

sediments of the Lake gives rise to the concern, *inter alia*, that these toxins will be absorbed by micro-organisms living in the Lake or its sediments and that these micro-organisms will then enter the Lake's food chain, a process that could ultimately result in high concentrations of these toxic substances in fish that are caught and eaten by human beings. The State is particularly concerned that people with limited budgets living in the area around Badin Lake may be especially vulnerable to health risks because they supplement their diet by catching and eating the fish from the Lake.

And indeed, in 2008, when a sample of fish was taken from Badin Lake and the tissues of these fish were analyzed, PCBs were found in the tissues of a number of them.¹¹ These PCB-contaminated fish included, among other species which are routinely caught and eaten by humans, Largemouth Bass and Catfish.¹²

The preliminary findings of one study recently conducted for Stanly County by John H. Rodgers, Jr., Ph.D., a Clemson University professor,¹³ suggest that the source of the PCBs found in the tissues of these Badin Lake fish is the PCB-laden sediment at the bottom of the Lake, including those PCB-laden sediments lying in the southwest quadrant of the Lake, directly adjacent to the old Alcoa smelting plant and resulting from Alcoa's past industrial activities. *See* Exh. 1, Attach. VI.¹⁴

¹¹ *See, e.g.*, Exh. 1, Attach. VI (Review of PCB Data From Badin Lake, John H. Rodgers, Jr., Ph.D. (July 27, 2009)).

¹² *See* North Carolina Department of Health and Human Services, Division of Public Health, Epidemiology Fish Consumption Advisory, Badin Lake in Stanly County and Montgomery County (Feb. 11, 2009), <http://www.epi.state.nc.us/epi/fish/current.html> (the "DPH Fish Consumption Advisory").

¹³ Professor Rodgers is the Director of the Ecotoxicology Program in the Department of Forestry and Natural Resources at Clemson University. *See* Exh. 1, Attach. VII (*Curriculum Vitae* of John H. Rodgers, Jr., Ph.D.).

¹⁴ The Matthews Memorandum, dated February 25, 2009, summarized the (DENR) Division of Waste Management's review of the data then available on the source of the PCBs found in the tissues of the fish caught in Badin Lake. Exh. 5 at 1. This data review concluded that: "[w]ith the information available at this time, considering the vast array of PCB congeners found present in the fish tissue, it would be

After the 2008 fish tissue studies found PCBs in the tissues of Badin Lake fish, the North Carolina Department of Health and Human Services and its Division of Public Health announced a fish consumption advisory for Badin Lake in February 2009.¹⁵ This advisory was intended to warn all pregnant women and certain other at-risk people not to eat Badin Lake Largemouth Bass or Catfish at all and to warn others to eat no more than limited quantities of these PCB-contaminated fish.

In addition, the fish consumption advisory noted that the Division of Public Health would be posting signs at Badin Lake warning people of the health hazards of eating these fish. DPH Fish Consumption Advisory; *see also* Exh. 1, Attach. VIII. Alcoa informed the Division of Public Health that it disagreed with the Division's findings.

When the Division of Public Health announced its fish consumption advisory in February 2009 and stated that it intended to post warning signs at Badin Lake concerning the health hazards of eating Largemouth Bass and Catfish, Alcoa was waiting for DENR to make its decision on Alcoa's application for a Clean Water Act Section 401 Certification, a document that Alcoa was required to have in order to qualify for a new 50-year license for the Project.

At this critically important moment for Alcoa, it was presented with a dilemma arising from its dual role as: (i) a for-profit business enterprise that wanted DENR to issue it a Clean Water Act Section 401 Certification so that it could obtain a new 50-year

extremely difficult and unlikely to conclude that these congeners are due solely from one source with any degree of confidence." *Id.* at 3. The DWM data review that is reported in the Matthews Memorandum was conducted five months or more before Dr. Rodgers' PCB congener analysis and his reported preliminary conclusion that the source of the PCBs found in the tissues of the Badin Lake fish is Alcoa's industrial pollution of the Lake. *Compare* Exh. 1, Attach. VI, with Exh. 5, the Matthews Memorandum. As noted elsewhere in this pleading, Dr. Rodgers' report has recently been provided to DENR and is now being reviewed by that agency.

¹⁵ See the DPH Fish Consumption Advisory.

license to operate the Project; and (ii) the Government-licensed trustee and steward of the public interest, including the health and safety of the people who live near the Project. Looking to its own economic needs and interests, Alcoa resolved this conflict by acting so as to increase its chances of obtaining the Section 401 Certification and a new 50-year license.

Alcoa thus chose not to cooperate with the Division of Public Health in its efforts to protect the public's health and safety – even if that meant temporarily setting aside any disagreements with the Division over the Division's conclusions. Instead, Alcoa filed a lawsuit *against* the Division of Public Health in the Office of Administrative Hearings (the “OAH”) challenging the Division's legal right to take this protective action.¹⁶

Alcoa justified its lawsuit by asserting that the Division's actions had “deprived [Alcoa] of *property*” and had “otherwise substantially prejudiced [Alcoa's] rights.”¹⁷ Significantly, Alcoa's lawsuit challenged not only the Division's issuance of the fish consumption advisory, but even its proposed posting of signs at Badin Lake to warn local people of the danger of eating these PCB-contaminated fish.¹⁸

¹⁶ Alcoa's OAH litigation potentially subjected the Division, in the event it lost this case, to an award of at least a substantial portion of Alcoa's attorneys' fees and court costs, which could include expensive expert witness fees. *See, e.g., Walker v. North Carolina Coastal Res. Comm'n*, 124 N.C. App. 1, 10-12, 476 S.E.2d 138, 144-45 (1996), *rev. denied*, 346 N.C. 185, 486 S.E.2d 220 (1997) (attorneys' fees and court costs expended by prevailing OAH litigant during the Superior Court [and beyond] judicial review stage of the administrative proceedings are awardable under North Carolina law). Despite this chilling effect on the Division of Public Health's planned fish consumption advisory and sign posting plan, the Division proceeded.

¹⁷ Exh. 1, Attach. IX (Petition for a Contested Case Hearing filed by Alcoa with the OAH, No. 09-DHR-2505, filed Apr. 9, 2009) (emphasis supplied).

¹⁸ *See id.*, Exh. 1, Attach. IX at 1 of 4, where Alcoa stated: “[b]y virtue of the [Division of Public Health's] issuance of the *Advisory and the posting of the Advisory Signs*, and the impacts of those actions as discussed herein, [Alcoa] is an aggrieved person . . . because the *Advisory and Advisory Signs* directly and indirectly affect [Alcoa] in its property and has [sic] otherwise substantially prejudiced [Alcoa's] rights” (emphasis supplied).

Alcoa's OAH Petition strongly hints at the fact that Alcoa was itself keenly aware of its own conflict of interest between its public trust responsibilities and its narrow economic interests. Thus, in what appears to have been an all-out attempt by Alcoa to find and identify *some* public interest basis for opposing the Division of Public Health's efforts to protect the health and safety of people living near the Project, Alcoa seized upon what it claimed was the public's interest in being able to swim and fish in Badin Lake without having to worry about the health-related dangers of doing so. Exh. 1, Attach. IX, at 1 of 4.¹⁹

But the last two pages of the four-page, single space attachment to Alcoa's OAH Petition suggest that Alcoa was motivated by different considerations and provide evidence of Alcoa's conflict of interest. In this portion of Alcoa's OAH Petition, it complained about "[m]isimpressions of the quality of the Badin Lake environment created as a result of the issuance of the Advisory and [the] posting of the Advisory Signs." *Id.* at 3 of 4. Alcoa's Petition added that:

[T]he Advisory and the Advisory Signs . . . also threaten to have an adverse impact on future decision-making processes involving Badin Lake and Dam. For example, [Alcoa] is in the process of seeking a long-term renewal of the FERC License ("FERC Renewal"). The issuance of the FERC Renewal is conditioned upon [Alcoa] receiving a Water Quality Certificate for Project discharges, including discharges from Badin Lake, under Section 401 of the Clean Water Act ("401 Certification"). In order for [Alcoa] to receive the FERC Renewal, [DENR's] Division of Water Quality ("DWQ") . . . must either issue or deny the 401 Certification by May 7, 2009

* * * * *

¹⁹ Specifically, Alcoa's OAH Petition stated that its purpose in filing this lawsuit was to protect "the public's ability to fully utilize the recreational benefits of Badin Lake without undue concern." Exh. 1, Attach. IX, at 1 of 4.

[Alcoa's] timely receipt of the 401 Certification is important to [Alcoa's] receipt of the ultimate long-term FERC Renewal

Id.

On May 7, 2009, DENR issued the Section 401 Certification to Alcoa (albeit with significant conditions). Exh. 1, Attach. XI.²⁰ Having achieved this key business objective, Alcoa hastened to end this episode, which must by this time have become a public relations embarrassment to Alcoa. Despite its concern that the DPH Fish Consumption Advisory might interfere with the ability of people to swim and fish in the Lake without undue concern for their health, Alcoa entered into negotiations with the Division of Public Health as a result of which it negotiated and consented to an Order staying this OAH lawsuit pending the resolution of the other ongoing and related cases in the OAH dealing with the issuance by DENR of the Section 401 Certification.²¹

2. Alcoa's Failure as the Project Licensee to Take Those Steps Necessary to Deal With the Dissolved Oxygen Problems in the Yadkin River Caused by its Operation of the Project

Alcoa's own filings with the Commission show that it has failed to take those steps necessary to deal with dissolved Oxygen deficiencies in the Yadkin River that were caused, in whole or in part, by its operation of the Project. In 1999, Alcoa filed an application to amend its Project license to obtain authorization to perform major maintenance and install equipment upgrades at eight of the existing, older hydroelectric

²⁰ DENR issued the Section 401 Certification to Alcoa several months before the study conducted for Stanly County by Dr. John H. Rodgers, Jr. was completed or made available to DENR and at a time when no studies existed demonstrating or suggesting that the PCBs in the Badin Lake sediments were or might be moving up the Lake's food chain into the Lake's fish.

²¹ Exh. 1, Attach. X (OAH Order Granting Motion to Amend Scheduling, *Alcoa Power Generating, Inc. v. North Carolina Dep't of Health & Human Servs. and its Div. of Pub. Health*, No. 09-DHR-2505 (July 27, 2009)).

generating units located at the powerhouses for three of the four developments that are part of the Project (High Rock, Narrows and the Falls). When completed, this maintenance and upgrade project would: (1) enable the hydroelectric units to generate more electricity; and (2) improve the dissolved Oxygen (“DO”) content of the water flowing between the reservoirs and dams of the Yadkin system.²² Alcoa proposed to complete this work before its Project license expired in April 2008.

DENR was concerned during this time frame with the DO content of the water, which violated State water quality standards during several months of the year.²³ Thus, DENR wanted Alcoa to make these DO-related equipment upgrades, as did the United States Environmental Protection Agency (“EPA”).²⁴ Nevertheless, it is unclear under the law whether a state environmental agency such as DENR may actually require a FERC licensee such as Alcoa to perform equipment upgrades like these on its Project during the Project’s license term except when the licensee is seeking to modify its existing license, obtain a new license or obtain a Clean Water Act Section 401 Certification.

The Commission approved Alcoa’s amendment application in 2000, but it did so subject to a condition (Article 39) providing that, if necessary to comply with the State’s water quality standards, Alcoa should be prepared “to develop and implement measures

²² When Alcoa submitted the application to amend its license, it declared that its then-current federal license to operate the Project “contemplated that the four developments [of the Project] would continue to serve the electricity needs of Alcoa’s Badin plant, a role that continues to this day.” Application for Commission Authorization to Amend Project License, *Yadkin, Inc.*, Project No. 2197-038, at 2 (Dec. 3, 1999), available at eLibrary Accession No. 19991207-0101. This was just seven years before Alcoa’s complete shutdown of the Badin plant.

²³ Exh. 1, Attach. XIII (Fish and Aquatics IAG and Water Quality IAG Joint Meeting, Final Meeting Summary, at 2-5 (Feb. 3, 2004), reprinted in Alcoa Power Generating, Inc., Application for License, Project No. 2197, vol. V (C) (2006)). See also Environmental Assessment issued May 2000, attached to *Yadkin, Inc.*, 92 F.E.R.C. ¶ 62,084, at 64,106 (Table 3), 108 (2000).

²⁴ *Id.*; Letter from Heinz J. Mueller, Chief, NEPA Program Office, Office of Policy & Mgmt., U.S. EPA, to Kimberly D. Bose, Sec’y, FERC (Dec. 10, 2007), available at eLibrary Accession No. 20071210-5069.

to improve DO, either through structural or operational modifications at the project.”

Yadkin, Inc., 92 F.E.R.C. ¶ 62,084, at 64,101 (2000).

Furthermore, the Commission warned Alcoa that:

[Alcoa] is on notice that a licensee has no guarantee that the costs it decides to incur will be recovered, or even that a new license will be issued. [Alcoa] assumes the risk that our balancing of all public interest considerations on relicensing will result in requirements that may diminish the economic value of the project. It is for [Alcoa] to take these risks into account in determining whether undertaking the proposed upgrades is a reasonable business decision.

Id. at 64,100-01 (footnotes omitted).

When the Commission conditionally approved Alcoa’s license amendment application in 2000, there were eight years left on Alcoa’s initial license to operate the Project. The Commission’s DO condition (Article 39) and its warning to Alcoa that it might not be relicensed or otherwise enabled to recover its upgrade costs presented Alcoa with another conflict between its statutory role as trustee and steward of the Yadkin River and its economic interests in maximizing profits.

Again, Alcoa’s response to this conflict was dictated by its economic interests, not the public interest. By 2001, Alcoa had completed work on one unit at the Narrows plant (Narrows Unit 4) and a DO improvement resulted; however, although it was clear that the discharges from all four Project developments still did not meet State water quality standards for DO during several months of the year,²⁵ Alcoa decided to postpone the refurbishment of the remaining seven units.²⁶

²⁵ *Id.*

²⁶ Exh. 1, Attach. XIII (Fish and Aquatics IAG and Water Quality IAG Joint Meeting, Final Meeting Summary at 3-5 (Feb. 3, 2004), *reprinted in* Alcoa Power Generating, Inc., Application for License, Project No. 2197, vol. V (C) (2006)). An Alcoa representative explained that “the economics of the planned upgrades were stalled when capital dried up . . .” *Id.* at 3.

In March 2006, Alcoa announced that it would complete this work at only two of the eight units before its license expired in 2008. One month later, in April 2006, Alcoa stated as part of its relicensing application that it would refurbish the six remaining units, as well as units at the Tuckertown development,²⁷ only during its anticipated *next* license term.

The economic benefits to Alcoa of its postponement decision following the Commission's conditional license amendment approval are obvious. Among other things, Alcoa avoided the financial risk that it might resolve the long-standing DO problem but then not receive a new license. It also delayed having to spend a significant sum of money on an issue the resolution of which does not contribute to its financial bottom-line or other corporate goals.

The detrimental impact to the public interest of Alcoa's delay in completing the approved facilities is equally obvious, however: (1) the additional renewable energy that would have been generated if the upgrades had been made has been permanently lost; and (2) the River and the State's citizens have been denied the benefits of the improved quality of the water that would have resulted from the installation of the aeration facilities. These benefits are not insubstantial.²⁸

²⁷ Alcoa had by this time secured DENR's consent to this delay as to the Tuckertown development, but only as to this development.

²⁸ As Alcoa itself comments in its RSA, Joint Explanatory Statement for the RSA, para. 7.6.1:

The improved DO concentrations in the Project tailwaters that will be achieved as a result of the proposed DO enhancements will have many significant benefits. Increasing tailwater DO conditions will certainly improve habitat conditions for invertebrates, including mussels, and fish, which in turn should produce better recreational fisheries in these tailwaters.

Since April 2006, Alcoa has even further delayed the implementation of any equipment upgrades designed to resolve the DO problems caused by its operation of the Project.²⁹ In addition, despite the fact that DENR issued Alcoa a Section 401 Certification the effectiveness of which was conditioned upon, *inter alia*, Alcoa posting a performance bond to ensure that it could afford to install this DO-related equipment,³⁰ Alcoa has never posted this bond. Instead, Alcoa filed a lawsuit against DENR in the OAH challenging DENR's legal right to impose this requirement on Alcoa.³¹

²⁹ For example, under the latest Alcoa schedule as presented in its RSA, there are further delays, as the monitoring and enforcement of the State's clean water standards would not become effective until after *all* the DO enhancement equipment and measures have been completed and have become operational (under Alcoa's relicensing application schedule, they are not due to be completed until 8 years after the license is issued, which would be 2017 if the license were issued this year), and there have been two more years of monitoring (which would move the timeline back to 2019). Exh. 1, Attach. XIV, RSA, para. 2.2.4. Even then, Alcoa has an additional year after notification that it has not met the State's DO standards in the preceding two years provided for consultation and to file a plan to correct the situation. *Id.* Thus, sometime in 2020 or 2021, over a decade from now, Alcoa should have submitted a plan for DO improvements. The Commission essentially approved most of these upgrades in 2000 – almost 10 years ago. These upgrades should have been completed far earlier, as part of the Project's ongoing maintenance program and consistent with a licensee's obligation to maintain its Project in good, working condition.

³⁰ See Exh. 1, Attach. XI, at 145-46, 150.

³¹ Furthermore, Alcoa is now attempting to totally bypass DENR, undercut the OAH litigation process that Alcoa itself initiated in North Carolina to challenge the Section 401 Certification's performance bond requirement and emasculate the Section 401 Certification process that has occurred in this case. Thus, on September 17, 2009, Alcoa filed in this docket a Petition with the Commission for a Declaratory Order finding that DENR's Division of Water Quality waived the State's water quality certification under Section 401(a)(1) of the Clean Water Act by imposing a term in the Section 401 Certification which it issued to Alcoa on May 7, 2009 that required Alcoa to provide the State, *inter alia*, with reasonable financial assurances that these DO upgrades would be installed at its facilities once all of its postponements have finally come to an end. See Alcoa's September 17, 2009 Petition for a Declaratory Order, *available at* eLibrary Accession No. 20090917-5101.

C.

**Significant Changes in the Circumstances of the State
and the Yadkin River Basin Since 1958 Which Require
a Completely New Analysis of How Best to Use the
Yadkin River Resources Now and in the Next Fifty
Years: the State's 21st Century Plan**

Significantly changed circumstances in and affecting the State, the Yadkin River Basin and the people of North Carolina since 1958 compel the denial of Alcoa's license application and the recapture of the Project license. In connection with this proceeding and its recapture request, the State has prepared its comprehensive proposal for the use of the Yadkin River, entitled the State's "21st Century Plan for the Use of the Yadkin River Resources." Volume 1, Section I of that Plan at 4-13 (Exh. 1 hereto) demonstrates the almost startling extent of the changed circumstances referred to above. The State here offers a summary of these changed circumstances.

In a nutshell, clean, reliable water resources are essential to the State's economic viability in the future. *See* Exh. 1 at 4-13. According to the North Carolina Division of Water Resources, the State's growing population, combined with severe drought conditions over the last decade, has resulted in a number of water supply problem areas, where water needs exceed supplies.³²

Consequently, there is a vital public interest in ensuring that the State's government, acting in partnership with local governments, is able to properly plan for water availability and use, administering water management laws and establishing policies that will help to solve the water problems facing the State and its people. *Id.*

³² Exh. 1 at 4-13 and Attach. III (North Carolina Drought Management Advisory Council Activities Report-2008, North Carolina Division of Water Resources, Department of Environment and Natural Resources, Division of Water Resources, Oct. 1, 2008 (Revised Dec. 17, 2008)).

The State must be able to ensure that backup systems are in place to protect communities in the event of water emergencies. *Id.*

As the effects of global warming become more pronounced over time and as the State's population increases and becomes more urban, the pressure on water supplies will become severe. At the same time, the availability of large reservoirs typically used to serve the needs of urban areas will decline.³³ The State must plan wisely now and secure a greater degree of control over the water supplies within its own borders in order to fulfill its obligation to promote future economic prosperity and to enhance the quality of the lives of its citizens.

Lack of adequate water supplies could curtail entirely the ability of communities and industries to grow and prosper. It could cause industries to close, thus eliminating jobs, and could cause other industries not to locate in North Carolina in the first place. This problem will also negatively impact people's ability to enjoy recreational and aesthetic activities in the State's rivers and lakes. In short, this problem threatens the continued prosperity and quality of life of virtually every citizen of the State, as well as the State's businesses and industries. *Id.* Thus, the public interests at stake here are vital ones.

When, in 1958, the State sought and obtained for its people the economic development *quid pro quo* discussed above, it had a population slightly over 4 million citizens.³⁴ The State's population is now well over 9.2 million. Exh. 1 at 18. The State's

³³ The pressure of urbanization and the need for adequate, cleaner water supplies in North Carolina are discussed more fully in Exhibit 1 hereto, particularly at pages 4-7, 11-12, 18-20, 45-46, 52, and Attach. V, which appears in Volume 2 of the State's 21st Century Plan.

³⁴ In 1950, North Carolina's population was 4,061,929. In 1960, it had grown to 4,556,155. See United States Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 1990

population is projected to increase by almost another million people by 2013. *Id.* These millions of North Carolinians need the economic development power of the Yadkin River as never before to enable them to achieve and sustain the kind of economic development, job creation, prosperity and quality of life that all Americans seek.

Of equal significance, the elected leaders of North Carolina and the State's many local communities also realize that we are now rapidly approaching the day when water itself may be more valuable than the electricity that the water can generate. Water is critically needed now by local communities and their surrounding regions for growth, development, jobs and improved life quality – indeed, for the very survival of many of these communities. As North Carolina's population continues to grow, water use experts foresee conflicts between communities, industries, counties, regions and even states³⁵ over the uses to which the State's available water will be put. *Id.*

The fundamental importance of the Yadkin River Project to the State was dramatically underscored by a record drought that the State and the Yadkin River region experienced in 2007-2008. As a result of this drought, it became apparent to the State that, if Alcoa continued to control the flows along the Yadkin-Pee Dee River system, the State would not have the ability to plan effectively – or to implement its plans – for the urgent water needs of its growing and increasingly urbanized population and its

Census Population and Housing, North Carolina, 1990 CPH-2-35, available at <http://www.census.gov/prod/cen1990/cph2/cph-2-35.pdf>.

³⁵ In this regard, note the lawsuit filed by the State of South Carolina against the State of North Carolina in the United States Supreme Court over what South Carolina claims is North Carolina's action in allegedly taking more than its share of the water of the Catawba River. This lawsuit, entitled *South Carolina v. North Carolina*, No. 138 (Original Jurisdiction of the Supreme Court), was filed on June 7, 2007 by the Attorney General of the State of South Carolina, has been referred to a master and is now on-going.

increasingly higher tech industries. Exh. 1, at 4-7, 11-12, 18-20, 45-46, and Attachs. V, XVII.³⁶

Many of the mitigation measures necessary to deal with drought, including assuring that the State has both the resources and the plans in place to deal promptly with emergencies, require long-term planning, coordination among many entities and the construction of new facilities. *See, e.g.*, Exh. 1 at 3-7 and Attach. III (North Carolina Drought Management Advisory Council Activities Report-2008, issued Oct. 1, 2008 (revised Dec. 18, 2008), by DENR, Division of Water Resources).

The planning needed to deal with these water availability problems and the public's need for assurance that adequate supplies of water will be available in the future will be made more practicable and effective if the State is permitted to gain a meaningful degree of control over the waters of the Yadkin River, one of the State's largest river systems. *Id.* at 5-6. This increased level of control would give the State the ability to act quickly and effectively when action is required by further changed circumstances, such as a drought, further population growth and other changes. *Id.* at 6. It would also provide stability and greater certainty to companies and individuals on an issue that is of crucial importance to everyone. *Id.*

The rapidly changing situation in North Carolina affecting the State's ability to provide adequate supplies of clean water is one that, absent effective planning and the

³⁶ Significantly, as the State's 21st Century Plan observes, the State has very few opportunities left to develop reservoirs to meet the public's current and future needs for clean water, as most available reservoir sites in the State have already been developed. *See, e.g.*, Exh. 1, Attach. V at 46 (*Water for Electricity and Public Water Supply in the Yadkin River Basin* (Aug. 26, 2009), by David H. Moreau, Ph.D.). This circumstance makes it even more challenging for the State to be able to provide for the most pressing needs of its citizens as regards available water supplies and demonstrates why the public interest in North Carolina requires that the State be given more meaningful control over this large waterway running through the heart of the State.

State's practical ability to exercise meaningful control over the Yadkin River, could threaten the people of North Carolina with dire future consequences. The pace of these changes will accelerate over the next 50 years. Furthermore, the problems associated with water availability and use will almost certainly be made even more complex and challenging by global climate change. The next licensee of the Project will have to make day-to-day decisions about water use and the dynamics of this water-supply-versus-water-demand dilemma. Therefore, the party licensed to conduct the Project for the next 50 years must be an entity that can be trusted to act in the public interest, not merely its own narrow economic interests. *See id.* at 4-7.

II. THE LAW APPLICABLE TO THIS PROCEEDING

A.

The Legal Standard Under Sections 7(c) and 10(a) of the Federal Power Act that is Applicable to and Controlling of the Issues Presented in This Proceeding – Optimization of the Public Interest in the Broadest Sense

In presenting what would become Section 7(c) of the Federal Power Act to Congress, the Commission recommended that the standard to be applied in relicensing should be the standard of Section 10(a) of the Federal Power Act, which it understood

to call for optimum development and accommodation, where a conflict arises, in terms of resource values including: water quality control; flood control; recreation and aesthetic considerations; fish and wildlife conservation and enhancement; protection of improvements along the reservoir shore line; drinking water and other domestic, municipal and industrial uses; irrigation requirements; optimum power development and coordination with other systems in light of regional power needs; hydraulic coordination with other projects on the stream; and navigation.

Letter from Lee C. White, Chairman, FPC, to the Honorable Hubert H. Humphrey, President of the Senate, 113 Cong. Rec. 26,186-87 (Sept. 20, 1967).

When the Federal Power Act was amended in 1986, Congress recognized that “[t]he Commission and the courts have held the Section 10(a) standard to be [a] *broad public interest* standard, requiring consideration of *all* factors affecting the public interest.” H.R. Rep. No. 99-507 at 12 (1986), *reprinted in* U.S.C.C.A.N. 2496, 2499 (emphasis supplied) (internal citation omitted).

Importantly, Congress explained that it intended Section 10(a) to provide the Commission with the flexibility to weigh different public interest factors differently on a case-by-case basis, so that “[a]s the public interest *changes over time*, the Commission’s considerations under the [S]ection 10(a) standard likewise change, encompassing new criteria or reevaluating the weight given established criteria.” *Id.* (Emphasis supplied).

Section 10(a) does not present “an exclusive list of values FERC must evaluate and address,” but rather “highlights the steps the Commission must take to inform itself regarding the needs and uses of the river in question.” H.R. Rep. No. 99-934 at 22 (1986), *reprinted in* U.S.C.C.A.N. 2537, 2539.

The key to the Commission’s determination of a license application is thus always the public interest. The Commission is required to make an independent, *de novo* assessment of whether the applicant’s proposal is best adapted to serve the public interest. The ultimate question in such a *de novo* assessment is which final proposal is best adapted to serve the public interest, taking into consideration on an equitable basis both non-power and power development values. *Id.* at 10. In addition, a license incumbent is not to be given any preference in the relicensing process. *Id.* at 16.

B.

The Authority and Right of the United States Government to Recapture a Project at the Expiration of its License Term are Long-Standing and Settled Principles of Law.

In the first major challenge to the Commission's authority to include a recapture clause in a federal hydroelectric license, the Appalachian Power Company ("AEP") argued that the "capture" clause was confiscatory. *United States v. Appalachian Elec. Power Co.*, 311 U.S. 377, 392 (1940). AEP, a privately owned utility and licensee, described the United States Government's position as arguing that "the right to engage in interstate commerce is a privilege which petitioner may grant, deny or barter upon such terms as it may choose – including the 'taking over' of the property of a citizen as a condition of the grant." *See* Syllabus, summary of respondent's brief to the Court, ¶ 28.

AEP concluded that the Government's argument was "totalitarianism run riot." 311 U.S. at 394. *See* Syllabus, summary of respondent's brief to the Court, ¶ 28. The United States Supreme Court responded as follows:

The point is that navigable waters are subject to national planning and control in the broad regulation of commerce granted the Federal Government. The license conditions to which objection is made have an obvious relationship to the exercise of the commerce power. Even if there were no such relationship, the plenary power of Congress over navigable waters would empower it to deny the privilege of constructing an obstruction in those waters.

Id. at 426-27.

Furthermore, in describing the nature of the power held by Congress, the Court could not have been more clear as to the scope of this power when it comes to the flowing waters of the United States:

The Federal Government has domination over the water power inherent in the flowing stream. It is liable to no one for its use or non-use. The flow of a navigable stream is in no sense private property; “that the running water in a great navigable stream is capable of private ownership is inconceivable.”

Id. at 424 (quoting *United States v. Chandler-Dunbar Co.*, 229 U.S. 53, 68 (1913)).

The Supreme Court’s interpretation in *Appalachian Electric Power Co.* was later echoed in *Louisville Gas & Electric Co. v. Federal Power Commission*, 129 F.2d 126 (1942), where the United States Court of Appeals for the Sixth Circuit held:

It was assumed, though without decision, in *United States v. Appalachian Electric Power Co.*, ... 311 U.S. 377, ... that “by compulsion of the method of acquisition provided in section 14 of the Power Act and the tendered license, these riparian rights may pass to the United States for less than their value. In our view *this ‘is the price which (respondents) must pay to secure the right to maintain their dam.’*” This is from the conclusion reached in *Fox River Paper Co. v. Railroad Commission*, 274 U.S. 651, ... which the court now declares is decisive on the issue of confiscation.

129 F.2d at 134 (emphasis supplied).

Thus, there can be no argument as to the right of the Federal Government to condition the award of hydroelectric licenses on the agreement by the licensee to consent to recapture at the end of the license term, and all major hydroelectric licenses are issued subject to this requirement.³⁷ Accordingly, the recapture clause contained in Alcoa’s 1958 license is constitutional and enforceable.

³⁷ In discussing Section 14 of the Federal Power Act, the Commission itself has acknowledged the importance to Congress of the recapture provisions of the Federal Power Act:

When the Federal Water Power Act (FWPA) was enacted in 1920 after several years of consideration and debate, section[] 14... w[as a] key part[] of the legislation. There was a keen interest by some members of Congress in providing the opportunity for eventual Federal takeover of Commission-licensed power projects, and that became reflected in

C.

**The Commission Has the Authority to Recommend
Recapture in this Proceeding.**

It is equally clear that the Commission has the authority to recommend recapture in this proceeding. Section 7(c) of the Federal Power Act provides:

Whenever after notice and opportunity for hearing, the Commission determines that the United States should exercise its right upon or after the expiration of any license to take over any project or projects for public purposes, the Commission shall not issue a new license to the original licensee or to a new licensee but shall submit its recommendation to Congress together with such information as it may consider appropriate.

16 U.S.C. § 800(c).

The Commission has implemented this statute in its regulations. 18 C.F.R. §16.15 states:

Upon receipt of a recommendation from any Federal department or agency, a proposal of any party, or on the Commission's own motion, and after notice and opportunity for hearing, the Commission may determine that a project may be taken over by the United States, issue an order on its findings and recommendations, and forward a copy to Congress.

Thus, the authority of the Commission to independently recommend recapture by the United States is supported by both the Federal Power Act and the Commission's own regulations. This authority is of long standing in federal law. Indeed, in *Lac Courte Oreilles Band of Lake Superior Chippewa Indians v. Federal Power Commission*, 510

section 14. This section was designed as a vehicle that would permit the Federal government to own, maintain, and operate valuable water-power projects under terms which could make such takeover practical when the circumstances warranted.

FERC Policy Statement, *Project Decommissioning at Relicensing*, 60 Fed. Reg. 339, 341 (Jan. 4, 1995), [1991-1996 Regs. Preambles] F.E.R.C. Stat. & Regs. ¶ 31,011, at 31,223 (1994) (footnote omitted), available at eLibrary Accession No. 19941220-0106.

F.2d 198 (D.C. Cir. 1975), the United States Court of Appeals for the District of Columbia Circuit described the effect of the 1968 Act creating Section 7(c) as providing that “the Commission consider recapture and relicensing in a single proceeding.” *Id.* at 201 n.7. Thereafter, the court described the proceeding as a “recapture-relicensing proceeding.”³⁸ *Id.* at 202, 204, 206.

III. ARGUMENT

A.

Alcoa’s License Application Should Be Denied.

Section 15(a)(2) of the Federal Power Act requires that the Commission rigorously scrutinize any application for a new license for an existing hydroelectric project, so that it can determine that the applicant’s proposal is “best adapted to serve the public interest.” This is so even where there is only one applicant and that applicant is the current license holder of the existing project. In addition, the legislative history of the 1986 amendments to the Federal Power Act noted explicitly that a relicensing proceeding “does not include an incumbent preference” and that the “existing licensee will not be ‘rubber stamped,’ but must again prove that its proposal qualifies as ‘best adapted’ on power and non-power grounds [to serve the public interest].” H.R. Rep. Nos. 99-934 at 26 (Conf. Rep.) and 99-507 at 15 (1986), *reprinted in* U.S.C.C.A.N. 2542-43, 2501-02. *See also* H.R. Rep. No. 99-934 at 33-35 (1986) (Conf. Rep.), *reprinted in* U.S.C.C.A.N. 2549-51 (discussing the importance of a rigorous evaluation of all license applications to ensure that each is best adapted to serve the public interest).

³⁸ This case involved competing proposals, in which the Tribes were seeking federal recapture of an existing project in which certain of their lands were included within the project boundary, and the applicant was seeking a renewal of its license.

The denial of Alcoa's relicensing application is appropriate and necessary under the circumstances of this case because its relicensing proposal does not qualify as best adapted on power and non-power grounds to serve the public interest. This is true for a host of reasons.

Alcoa itself argued to the Commission that it needed a 50-year license precisely because of the statutory recapture provision, which it said would enable the Federal Government to recapture the Yadkin Project after the end of the license term. *See* Exh. 3, 1957 Alcoa Brief, at 24. But, after obtaining North Carolina's support and, consequently, the Project license in 1958, Alcoa reneged on its promise of economic benefits. Nevertheless, it now seeks a second half-century of monopoly control over the flows of one of North Carolina's most significant rivers. Its proposal to use the Yadkin River for the next 50 years offers no public benefit comparable to the jobs it originally promised, which have now vanished.

As a result, the issue today is just as it was framed by Alcoa a half-century ago – namely, whether Alcoa continues to be entitled to a 50-year license when it is no longer “an industry which is the life blood of this section of North Carolina.” *Id.* at 12. Fifty years ago, Alcoa itself made the best argument concerning the consequences of failing to act in the public interest when licensing the flows of the Yadkin River. It argued that the River would be a “valuable resource . . . wasted in favor of small and relatively unaffected private interests or private aims and desires.” *Id.*

Furthermore, Section 15(a)(2) of the Federal Power Act specifically requires the Commission to consider the applicant's need for the electricity in the short and long term, as well as the effect on local communities and the applicant's workers of granting a

license to the applicant. Given these standards and the fact that Alcoa has abandoned its Badin smelting plant and devastated the local community economically, there should be no question that Alcoa's application for a new license should be denied.

Moreover, implicit in Alcoa's 1958 acceptance of a license from the United States Government to use a public river for public purposes, as required by the Federal Power Act, was the unspoken promise by Alcoa that it would be a good and responsible steward of the land and the River, and especially of the health and safety of the people who live near the River. But, as discussed above, Alcoa has demonstrated that it has not been a good steward of the land, the River, Badin Lake or, most importantly, the health and safety of the people who live nearby.

Evidence is now emerging that Alcoa's industrial operations contaminated Badin Lake with PCBs, PAHs and other toxic chemical compounds, to say nothing of the pollution it caused to the land surrounding its now defunct smelting plant. When the Division of Public Health announced its intention to issue a fish consumption advisory and to post signs at Badin Lake warning people of the danger of eating the PCB-contaminated fish, its actions threatened to bring unwanted attention to Alcoa's past PCB pollution of Badin Lake, thereby potentially threatening Alcoa's chances of obtaining the Section 401 Certification. Alcoa responded to this public health and safety issue not as a steward or trustee of the public welfare, but rather as a commercial enterprise focused first and foremost on its own economic interests.

In addition, when Alcoa sought in 1999 to amend its Project license so that it could install equipment at the Project that would increase its power generation and was told by the Commission that it could do so, but only if it also installed equipment to

resolve the DO problems that its own operation of the Project was causing, Alcoa balked. Despite its duty to maintain the Project in good working condition and despite its duty to the public and the environment as a Government-licensed trustee and steward, Alcoa's own economic interests dictated its decision to postpone this equipment upgrade project until it could be assured that it would receive a new 50-year license. Alcoa now proposes to install the equipment needed to resolve this environmental problem years *after* the time it hopes to be granted a new license, and it refuses to post a performance bond guaranteeing its ability to complete the work required to resolve this problem, despite DENR's insistence that it do so.

Beyond all this, Alcoa has shown little interest in expediting the actual cleanup of its past substantial environmental damage³⁹ to the area near its old Badin smelting plant or Badin Lake. This Lake, which remains contaminated with Alcoa's chemical wastes, is an important existing reservoir that could help the State's people to avoid the fate that currently faces Atlanta in the wake of the court's decision in *In re: Tri-State Water Rights Litigation*, No. 3:07-md-01, 2009 U.S. Dist. LEXIS 69895 (MDL) (M.D. Fla. July 17, 2009). *See also, e.g.*, Exh. 1 at 4-7 and Attachs. III and V.

It is vital to the people of the State that the waters of Badin Lake be available for the purpose of providing a ready and dependable source of clean drinking water. Only

³⁹ As to the potential scope of its damage to the environment in the area of the Project, Alcoa filed a lawsuit in 1992 in the State of Washington seeking a declaratory judgment that its insurers were required to pay for the environmental damages (including cleanup costs) resulting from Alcoa's Badin smelting plant operations from 1977-1984. *See Aluminum Co. of America v. Aetna Casualty & Surety Co.*, 998 P.2d 856 (Wash. 2000), *reconsideration granted*, No. 67340-3, 2000 Wash. LEXIS 826 (Nov. 1, 2000), *amended*, No. 67340-3, 2000 Wash. LEXIS 827 (Nov. 1, 2000); Second Amended Complaint for Declaratory Judgment of Alcoa, *Aluminum Co. of America v. Aetna Casualty & Surety Co.*, No. 92-2-28065-5 (Apr. 8, 1994), annexed as Attachment D to Stanly County Scoping Comments. In 2003, in case number 92-2-28065-5, Superior Court Judge Sharon Armstrong denied a motion for summary judgment by certain insurers with respect to contamination claims relating to Badin. Stanly County Scoping Comments, Attach. E. Judge Armstrong denied these motions with respect to the Badin pollution because it was one of "only three occurrences that may exceed \$50 million in damages." *Id.* at 5.

good environmental stewardship will assure that the Lake will be cleaned up as soon as practicable, so that the Yadkin River Project resources can provide the public with urgently needed clean water. It would not be appropriate to vest control of the Project and this enormously important natural resource for the next 50 years in a licensee for whom environmental stewardship and responsibility are not priorities.

On all too many occasions, Alcoa has shown by its own conduct that, if relicensed for another 50 years, it will continue to operate the Project for its own narrow economic benefit, not the larger public interest.⁴⁰ Given Alcoa's track record of broken promises, questionable environmental practices and conflicts between its economic interests and its stewardship duties which Alcoa frequently resolves in favor of its own economic interests, the State believes that Alcoa has essentially disqualified itself as a legitimate candidate for a second 50-year license.

Lastly, as discussed more fully above and in the State's 21st Century Plan, the entire socio-economic, demographic and industrial character of North Carolina has fundamentally and dramatically changed since 1958. The State's population is now more than double what it was then, is still growing at a very rapid rate and is becoming heavily urbanized. As a result of these and yet other changing circumstances, the State's communities and industries need access to water as never before, a trend that will only accelerate in the future. Even with the wisest possible water use planning by the State and the most aggressive development of water-related infrastructure, unless the State is given more meaningful control over this section of the Yadkin River and its reservoirs,

⁴⁰ Indeed, absent any real connection to North Carolina other than its use of the peoples' resources for profit, Alcoa has little reason to act in the public interest, unlike other power providers in North Carolina, which are highly integrated into North Carolina's statewide community.

the public interest will almost certainly suffer a serious blow in the future – possibly even the near-term future.

North Carolina will continue to change in these and other ways during the next 50 years. It is precisely because circumstances often do change over the long life of a hydropower license that the Federal Power Act has always provided for and required an independent, *de novo* assessment and reconsideration of where the public interests lie before granting a license. In his now-famous 1908 Rainy River Veto statement, President Theodore Roosevelt spoke directly to this principle:

The public must retain the control of the great waterways. It is essential that any permit to obstruct them for reasons and on conditions that seem good at the moment should be subject to revision when changed conditions demand. The right reserved by Congress to alter, amend, or repeal is based on this principle: but actual experience of what happens with indeterminate public-utility franchises proves that they are in the vast majority of cases practically perpetual. Each right should be issued to expire on a specified day without further legislative, administrative, or judicial action.

* * * * *

Provision should be made for the termination of the grant or privilege at a definite time, leaving to future generations the power or authority to renew or extend the concession in accordance with the conditions which may prevail at that time.

H. R. Rep. No. 99-507 at 11-12 (1986), *reprinted in* U.S.C.C.A.N. 2496, 2498.

Accordingly, Alcoa's relicensing application should be denied.

B.**The Commission Should Grant the State's Recapture Request Under the Circumstances of This Case.**

Given that, by virtue of its own conduct as a licensee and a statutory public steward, Alcoa has effectively disqualified itself as a legitimate candidate for a second 50-year license, the issue is who else is qualified to hold the license and to operate the Project in the public interest?

As demonstrated below, the State's proposed 21st Century Plan is the proposal that is best adapted to serve the public interest, in light of Section 10(a)'s mandate that the Commission apply a broad public interest standard requiring consideration of *all* factors affecting the public interest, H.R. Rep. No. 99-507 at 12 (1986), *reprinted in* U.S.C.C.A.N. 2496, 2497-98, and in light of Sections 4(e)'s and 10(a)'s mandate that the Commission give "equal consideration" to a variety of public-interest factors on a case-by-case basis. *Id.* For the reasons discussed below, the Commission should grant the State's request that it recommend federal recapture in these circumstances, with the subsequent transfer of the license to the State, if Congress consents.

1. Why Recapture and Transfer of the Project License to the State Would Result in Licensing the Best Adapted Plan for Most Comprehensively Developing the Yadkin River's Resources in the Public Interest

The State's position on this issue is explained fully in its 21st Century Plan, Exhibit 1 hereto, to which the State refers the Commission. This Plan was prepared on behalf and at the direction of Governor Perdue by the North Carolina Department of Commerce. The Governor is committed to recommending this Plan and any legislation

necessary to implement it to the North Carolina General Assembly in the event the Commission recommends Project recapture.

North Carolina's 21st Century Plan sets out the reasons that the State proposes to acquire the Project facilities and the license at this time. It is the intent of the State, if Congress agrees with a Commission recommendation for federal transfer of the Project and license, to acquire them from the United States Government at the Government's cost, namely, net investment plus severance damages, if any, as defined in the Federal Power Act. 16 U.S.C. § 807.⁴¹ This would mean that the transfer would not cost the United States Government anything.

Furthermore, as more fully explained in the 21st Century Plan, if the State were to acquire the Project and the license, it intends: (1) to maintain the Yadkin Project consistent with principles of sound stewardship and in a prudent and fiscally sound manner, both as to the water resources of the Yadkin River and the Project, as required by the Commission license necessary to operate the Project; (2) to perform major maintenance of the Project that has been deferred by Alcoa and to make timely capital investment in the Project to modernize the Project facilities in order to produce more renewable energy, and also to improve the quality of the water in the Yadkin River; (3) to allocate a portion of the Yadkin Project's revenues to fund ongoing State programs directed at enhancing the economic development infrastructure of the Project area, especially the community college system; (4) to allocate a portion of the Project's

⁴¹ In its April 2006 license application filed with the Commission, Alcoa stated that its statutorily-defined "net investment" in the Yadkin River Project, as reflected in APGI's Fixed Asset Listing as of 2005, was \$24,158,903.00. Exhibit D to APGI's April 2006 License Application at D-2.

Although Alcoa also claimed in its Statement of Costs and Financing, Exhibit D to its license application, that it "believes" it would sustain "significant" severance damages in the event of recapture, it was apparently unable to quantify or even estimate any such alleged damages. The State believes that Alcoa would sustain little or no severance damages in the event of recapture.

revenues to fund local improvements for environmental, public health and recreational concerns; (5) to engage in comprehensive planning for the Yadkin River Basin that is necessary to provide for the long-term assurance of an adequate water supply for the State's people; and (6) to otherwise provide a model for interactive coordination between local and State needs. Exh. 1 at 11-13. In this regard, the State refers the Commission to Sections IV - VIII of the 21st Century Plan for a full and complete statement of the details of the State's proposal regarding its future use of the Yadkin River Resources in the event that recapture is ordered by Congress.

Consistent with the requirements of Section 10(a) of the Federal Power Act, the State's purpose in seeking to change the license to the Project at the termination of the existing license is to harness the flows of the Yadkin River so as to serve the interests and better meet the needs of its citizens. As explained above, acquiring the Project license would permit the State to engage in the kind of comprehensive and meaningful river basin planning that is essential to ensure that the State's citizens have adequate water supplies despite a growing population, and to ensure ample water supplies for those industries that now provide employment in the State, as well as those new businesses that must be encouraged to settle in the State to provide new employment.

The Yadkin Project revenues would also further necessary State programs, facilitate better and more effective drought management and ensure the funding of important programs. The State believes that this focus on the local Project area and the improvement of the lives of the people living there, especially those who have lost their jobs at the now-closed Badin smelting works, is a particularly desirable and important

public benefit.⁴² These matters are of profound and statutory concern in every relicensing proceeding, and the Commission must address how a relicensing decision and the Project will affect local communities and workers. Federal Power Act § 15(a)(2). Other specific public programs are described at pages 12, 37 and 44-45 of the 21st Century Plan, Exh. 1.⁴³

**2. A Recapture Recommendation Under the
Circumstances of These Proceedings Would be
Reasonable and Appropriate**

Section 7(c) of the Federal Power Act contemplates that, at relicensing, the Commission will simultaneously examine both relicensing to non-federal entities and recapture by the United States Government. *See Lac Courte Oreilles Band of Lake Superior Chippewa Indians v. FPC*, 510 F.2d 198, 201 n.7 (D.C. Cir. 1975).

North Carolina's argument in favor of recapture is based upon the facts and circumstances of this case, the situation as it exists in North Carolina now and Alcoa's own track record of conduct showing that it has failed in its statutory mandate to use this public waterway not only to serve its own private, commercial interests, but also the public interest.

A recapture recommendation under these circumstances would be anything but a radical or controversial measure. It would be based on federal law that goes back to

⁴² In this regard, the State notes that rates of unemployment are higher in the Yadkin River Basin than elsewhere in the State, as are indicators of poor health, low income and general lack of well-being. Exh. 1 at 37-38.

⁴³ Nothing contained in the State's Motion and Comments, the State's 21st Century Plan or in any of the State's other submissions should be construed to state or imply in any way that, by virtue of its Motion filed with the Commission or its requests for relief made herein, the State releases Alcoa, any of Alcoa's related affiliates or any other responsible or potentially responsible party(ies) from its liability for any cleanup costs or any other environmental liabilities of any kind; or that the State releases any party(ies) with respect to any such costs or liabilities. The State releases no one from any such liabilities and does not expressly or impliedly waive any of its rights against any person or entity with respect to, *inter alia*, any environmental or environmentally-related issues or liabilities.

1920. Furthermore, in light of Alcoa's broken promise to create and maintain nearly 1,000 jobs in the Badin area and its failure in its current proposal for the use of the Yadkin River to offer the people of North Carolina any significant job-creation or other economic development benefit, a recapture recommendation in this proceeding would merely be based on the time-honored and traditional concept of fairness which says that "a deal is a deal."

In addition, such a recommendation would not create a precedent of general application for the future. In fact, in these circumstances, if the Commission were to allow a licensee to operate a project as a Government-licensed monopolist for 50 years while the licensee repeatedly ignored its statutory mandate regarding the public interest, to say nothing of its promise to provide a significant socio-economic benefit to the State and the local community, and if the Commission were then to relicense that entity for another 50 years, other privately owned licensees would undoubtedly take the Commission's decision to mean that an incumbent licensee will be relicensed almost no matter what its record is. If the State's recapture request presents a danger of a problematic precedent being established, it is the precedent that would be established if the Commission *failed* to recommend recapture in these circumstances.

Moreover, the State's Motion, Comments and evidence, including the 21st Century Plan, show that the State is capable of operating and owning the Yadkin Project and that it will do so in the public interest. Indeed, the State's 21st Century Plan demonstrates that the benefits of recapture and transfer of the license to the State in this case would be tremendous and would fulfill the purposes of the Federal Power Act. By contrast, Alcoa's past conduct and its past stewardship of the Yadkin Project and the

Yadkin River inspire little confidence that the needs of the State's people regarding, *inter alia*, economic development and water resources can be met under its continued trusteeship.

Under these circumstances, recapture is appropriate and essential to the welfare of the people of the Yadkin River Basin and North Carolina.

IV. THE STATE'S RESPONSE TO THE COMMISSION'S APRIL 2008 FINAL ENVIRONMENTAL IMPACT STATEMENT AND ITS DISCUSSION OF FEDERAL RECAPTURE

The Final EIS for the Yadkin Project, which was prepared in April 2008, includes but one paragraph addressing Federal Government recapture:

1.4.1 Federal Government Takeover

We do not consider federal takeover to be a reasonable alternative for the Projects. Federal takeover of the Projects would require Congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that a federal takeover should be recommended to Congress. No federal agency has suggested that federal takeover would be appropriate, and no federal agency has expressed an interest in operating the Projects.^[44]

This statement is no longer valid in light of the evidence proffered by the State in support of its request that the Commission not issue a new license to Alcoa and that it instead recommend federal recapture of the Yadkin Project to Congress. The State is now a party to this proceeding. Its evidence presents new information and a new alternative, none of which were considered in the April 2008 Final EIS. The Commission is obligated to consider the State's request and to evaluate the State's evidence, consistent

⁴⁴ Final Environmental Impact Statement for the Yadkin and Yadkin-Pee Dee River Projects, Project Nos. 2197-073, 2206-030, at 35 (Apr. 18, 2008), *available at* eLibrary Accession No. 20080418-4000.

with the standards set out in Sections 4(e), 7(c), 10, 14, and 15 of the Federal Power Act, 16 U.S.C. §§ 797(e), 800(c), 803, 807 and 808.

The National Environmental Policy Act, 42 U.S.C. §§ 4321, *et seq.* (“NEPA”), imposes an additional, separate obligation on the Commission to consider North Carolina’s alternative proposal. It does so in its mandate that a federal agency shall “study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.” 42 U.S.C. § 4332(2)(E). Furthermore, supplemental NEPA documentation “is at times necessary to satisfy the Act’s ‘action-forcing’ purpose.” *Marsh v. Oregon Natural Res. Council*, 490 U.S. 360, 371 (1989).

Recognizing NEPA’s goal of focusing government and public attention on the environmental effects of agency action, the Supreme Court has stated that:

It would be incongruous with this approach to environmental protection, and with the Act’s manifest concern with preventing uninformed action, for the blinders to adverse environmental effects, once unequivocally removed, to be restored prior to the completion of agency action simply because the relevant proposal has received initial approval.

Id. Under NEPA, the Commission must continue to take a “hard look” at the effects of and alternatives to granting a new license to Alcoa, and it must supplement its environmental documentation to reflect that scrutiny.

Accordingly, the State respectfully moves that the Commission supplement the Final EIS issued for the Yadkin Project in April 2008, in order to address the State’s evidence and to evaluate the recapture alternative proposed by the State.

V. **REQUEST FOR ORAL ARGUMENT TO THE FULL COMMISSION**

The State of North Carolina requests that the Commission schedule oral argument before the full Commission on the State's recapture request. The provisions of law applicable to recapture, though of long standing in the Federal Power Act, have not been recently interpreted. The State therefore believes that the Commission will benefit from oral argument because of the significant public policy considerations raised in the State's submission regarding the future management of the State's natural resources and the State's urgent concern that the Commission give adequate and proper weight to the importance of water resources to the State, especially the waters of the Yadkin River.

VI. **MOTION FOR ANY NECESSARY WAIVERS**

The State believes that its motions and the relief it seeks are well within the Commission's authority under the Federal Power Act and the Commission's regulations. Indeed, as discussed above, the State's recapture request and the evidence and various motions it has submitted in support of that request are completely consistent with both the Federal Power Act and Section 16.15 of the Commission's regulations, 18 C.F.R. §16.15. Furthermore, the legislative history of the Federal Power Act makes clear that Congress expressly intended the Commission to evaluate these issues fully at relicensing.⁴⁵

To the extent that the Commission believes that the State's requests are inconsistent with the Commission's regulations, however, the State seeks any and all waivers necessary, so that the Commission can accept the State's evidence, which is needed to assure a complete and accurate record in these proceedings, and grant the

⁴⁵ See, e.g., FERC Policy Statement, *Project Decommissioning at Relicensing*, 60 Fed. Reg. 339, 341 (Jan. 4, 1995), [1991-1996 Regs. Preambles] F.E.R.C. Stat. & Regs. ¶ 31,011, at 31,223 (1994) (footnote omitted), available at eLibrary Accession No. 19941220-0106.

State's request that the Commission recommend recapture to Congress and the other relief sought by the State of North Carolina.

VII. CONCLUSION

The entire landscape of North Carolina has fundamentally and dramatically changed since 1958. North Carolina has grown from a State of little more than 4 million people to a State of well over 9 million people – the tenth largest by population in the country. Furthermore, North Carolina is still growing rapidly and is becoming far more urban in its population distribution. The people of North Carolina want what Americans generally want – a higher quality of life for themselves and their children, economic growth and prosperity, good jobs and the benefits that come with economic development, as well as opportunities for enriching recreation and the enjoyment of the natural beauty of their local environment.

In order to ensure that the people of the State have a future in which they can achieve these shared goals, an entity which has the public interest at heart must be licensed and thereby given a meaningful degree of control over one of the State's most valuable natural resources, the Yadkin River and its flows. The Commission's determination of this relicensing matter will decide which entity will be given that control. The Commission's decision will also determine to a very great degree what North Carolina will look like 50 years from now, as well as whether its people are able to achieve their share of the American dream.

What is urgently needed now is a licensee that will make day-to-day decisions about how to use the flows of the Yadkin River for the public benefit, not merely its own narrow economic interests. Alcoa has demonstrated by its past conduct, including its

decision to break its promise to the State to create and then maintain 1,000 high-paying jobs and its decision not to live up to its stewardship obligations under the Federal Power Act, that it is not committed to the interests of the public, but rather is focused on its own narrow economic interests.

As its 21st Century Plan demonstrates, the State is the only party that can and will operate the Project in the public interest. The Plan also demonstrates that the State can and will operate the Project in a capable, open and accountable way, and that it will do so with the primary goal of harnessing this great natural resource for the public interest. Under these circumstances, the Commission should deny Alcoa's relicensing application and should recommend Project recapture to the Congress, so as to protect and further the public interest.

WHEREFORE, for each of the foregoing reasons, the State requests that:

1. the Commission accept, as part of the relicensing record in this proceeding, the State's Motion, Comments and evidence in support of the State's request that the Commission recommend federal recapture in this relicensing proceeding;
2. after consideration of the State's Motion, Comments and evidence, the Commission recommend to the United States Congress that the Yadkin Hydroelectric Project, FERC Project No. 2197, now subject to relicensing, be proposed for recapture by the United States Government, and that it be transferred thereafter, following the enactment of appropriate legislation, to the State of North Carolina for the public purposes described above, upon the terms proposed above for such transfer;
3. in conjunction with the State's request for recommended recapture, the Commission deny Alcoa's new license application;

4. this pleading and the other materials submitted by the State in support of this pleading accompany any recommendation made by the Commission for recapture, pursuant to Section 7(c) of the Federal Power Act;

5. the Commission supplement the Final Environmental Impact Statement issued by the Commission's staff in April 2008 to address the State's evidence and to evaluate the recapture alternative proposed by the State;

6. the Commission schedule the State's recapture request for oral argument before the full Commission; and

7. the Commission grant the State such other and further relief as it may deem just and proper.

Attached to this pleading and submitted herewith are true and correct copies of:

a. the Petition to Intervene of the State of North Carolina in *Carolina Aluminum Co.*, Project Nos. 2197, 2206 (Oct. 8, 1957) (Exh. 2);

b. the Brief of Carolina Aluminum Company in *Carolina Aluminum Co.*, Project Nos. 2197, 2206 (Nov. 18, 1957) (Exh. 3);

c. that document entitled "Characterization of the Toxicity and Bioavailability of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake," prepared for Alcoa by The RETEC Group, Inc. (Feb. 16, 2007) (Exh. 4); and

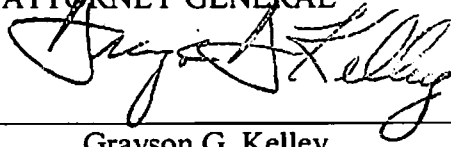
d. the Memorandum from Dexter Matthews, Dir., DENR Waste Mgmt. Div., to Rob McDaniel, DENR Hazardous Waste Section, Re: PCBs in Badin Lake (Feb. 25, 2009) (Exh. 5).

Also submitted along with this pleading as Exhibit 1 is the State of North Carolina's 21st Century Plan for the Use of the Yadkin River Resources, Volume 1, and

the Attachments to the State of North Carolina's 21st Century Plan for the Use of the Yadkin River Resources, Volume 2, which the State requests that the Commission receive for filing along with this pleading and the documents attached to this pleading as Exhibits 2-5.

Respectfully submitted this 18th day of September 2009.

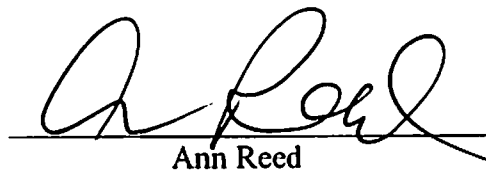
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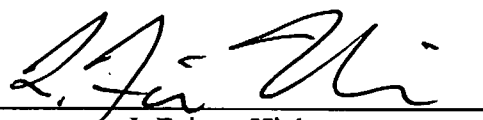
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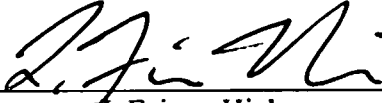
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CERTIFICATE OF SERVICE

This is to certify that, on the 18th day of September 2009, I caused a copy of the foregoing to be duly served on each person designated on the official service list compiled by the Secretary in this proceeding.



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Exhibit 1

Volumes 1 and 2 of
The State of North Carolina's 21st Century Plan for the Use of the Yadkin River Resources
(Sept. 8, 2009)

Enclosed as Separately Bound Volumes

Exhibit 2

Petition to Intervene of the State of North Carolina,
Carolina Aluminum Co., Project Nos. 2197, 2206 (Oct. 8, 1957)

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

THIS DOCUMENT IS NOT
WITHIN THE TIME PERIOD FOR
IT IS ACCEPTED FOR FILING
CONSIDERATION.

6
**FILES
(ORIGINAL)**

In the Matters of

CAROLINA ALUMINUM COMPANY
and
CAROLINA POWER & LIGHT COMPANY

Project No. 2197

and

Project No. 2206

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PETITION TO INTERVENE

THE STATE OF NORTH CAROLINA (North Carolina), by
its Attorney General, represents that it has an interest in the license
applications which are the subject of the above-captioned proceedings
and requests that it may be permitted to intervene and participate in
such proceedings as a party. In support of its petition to intervene,
North Carolina alleges and shows:

DOCKETED	
Smt	
✓	✓

1. The applications relate to the further development for
power purposes, both for industrial and public supply, of the waters
of the Yadkin River. The Yadkin River is one of North Carolina's
important sources of hydroelectric power in the eastern area of the
State and, to the extent that North Carolina has jurisdiction, it has and
does exercise appropriate control over the development of the river.
North Carolina, moreover, is interested in furthering the development
of the State's natural resources for power purposes by public utilities
serving the inhabitants of the State generally and by industries located
within the State for industrial use.

2. Carolina Aluminum Company, a subsidiary of Aluminum

Company of America, has for many years operated aluminum smelting works at Badin, North Carolina. Carolina Aluminum Company is one of the principal industries located in North Carolina and is the dominant industry in the eastern area in and near Badin. It is the principal taxpayer and employer in Stanly County, North Carolina, and it is vital to the economy of the area that Carolina Aluminum Company continue its operations on the existing or an increased scale.

3. North Carolina is advised that Carolina Aluminum Company's principal source of supply of the power essential to the operation of its Badin smelting works is the hydroelectric developments owned by that Company on the Yadkin River. In its application for license for Project No. 2197, Carolina Aluminum Company has indicated its intention to complete the development of the reach of the Yadkin River which it controls by the construction of an additional hydroelectric power development which would provide additional capacity of 40,000 kilowatts. If such additional hydroelectric capacity is installed, Carolina Aluminum Company also plans to modernize and expand its Badin smelting works at an estimated cost of \$21,000,000. North Carolina believes that Carolina Aluminum Company's program would be highly beneficial to its citizens in the Badin area and to the State as a whole.

4. North Carolina, however, is advised that, unless the Federal Power Commission issues to Carolina Aluminum Company a fifty year license for its three existing developments and its proposed new

development on the Yadkin River, its expansion program would be deemed uneconomic, with the result that aluminum production at Badin would, over the years, be reduced and, possibly, ultimately abandoned. Such a result would strike a serious blow to the economy of Stanly County and to the State of North Carolina as a whole. North Carolina, therefore, urges that the Commission issue the fifty year license for which application has been made, in order to permit the continuance and expansion of Carolina Aluminum Company's activities in Stanly County to the benefit of Stanly County and in the public interest of North Carolina.

5. The Carolina Power & Light Company is a public service corporation authorized to do business in the State of North Carolina and is engaged in the generation and distribution of electrical energy to residential, rural, commercial and industrial customers of the State; that said Company is subject to the jurisdiction of and regulated by the North Carolina Utilities Commission. North Carolina is interested in the development of the Yadkin River and in the economical and efficient distribution of electrical energy to the citizens and businesses resident therein. North Carolina, therefore, wishes to intervene in this proceeding in support of the application for license of Carolina Power & Light Company, designated as Project No. 2203. While North Carolina wishes to intervene for the purpose of supporting the application for license of Carolina Power & Light Company, it reserves its position as to any access areas that may be granted to the licensee.

6. Although this petition to intervene is not timely, under the Commission's order of June 20, 1957, North Carolina nevertheless

respectfully requests that it be permitted to intervene and asserts that the facts with respect to these applications only recently came to the attention of officials of North Carolina.

WHEREFORE, The State of North Carolina respectfully requests that it may be permitted to intervene in these proceedings by its Attorney General and act as a party thereto.



Attorney General, State of North Carolina

STATE OF NORTH CAROLINA *
) SS.
 COUNTY OF *

The undersigned, being first duly sworn, states that he is the Attorney General of the State of North Carolina, the applicant in the foregoing petition to intervene; that he has read said application and knows the contents thereof; that all of the statements contained therein are true and correct to the best of his knowledge and belief and that he has been duly authorized to file the foregoing petition to intervene by the Governor of the State of North Carolina.

George B. Patton

Sworn to before me this

8th day of October, 1957.

Lerrain M. Miller

Notary Public

My commission expires 3-21-58.

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 FEDERAL POWER COMMISSION

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

RECEIVED

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FEDERAL POWER COMMISSION

In the Matters of

CAROLINA ALUMINUM COMPANY
and
CAROLINA POWER & LIGHT COMPANY

I
*
I Project No. 2197
* and
I Project No. 2203
*
I
*
I

✓
CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon all parties of record in this proceeding by mailing a copy thereof properly addressed to Carolina Aluminum Company, Badin, North Carolina, and Carolina Power & Light Company, Insurance Building, Raleigh, North Carolina, dated at Raleigh, North Carolina, this 8th day of October, 1957.

George B. Patton
George B. Patton
Attorney General of the State of North
Carolina.

Exhibit 3

Brief of Carolina Aluminum Co.,
Carolina Aluminum Co., Project Nos. 2197, 2206 (Nov. 18, 1957)

FILES (ORIGINAL)

UNITED STATES OF AMERICA
BEFORE THE
Federal Power Commission

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FEDERAL POWER COMMISSION

CAROLINA ALUMINUM COMPANY
and
CAROLINA POWER & LIGHT
COMPANY

Project No. 2197
and
Project No. 2206

BRIEF OF CAROLINA ALUMINUM COMPANY

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New York 5, New York,
Of Counsel.

FILED
NOV 18 1957
OFFICE OF THE SECRETARY
FEDERAL POWER COMMISSION

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Nov 18 4 16 PM '57
FEDERAL POWER COMMISSION

UNITED STATES OF AMERICA
BEFORE THE
Federal Power Commission

CAROLINA ALUMINUM COMPANY
and
CAROLINA POWER & LIGHT
COMPANY

Project No. 2197
and
Project No. 2206

BRIEF OF CAROLINA ALUMINUM COMPANY

Introductory Statement

On February 6, 1956 Carolina Aluminum Company (Carolina Aluminum) filed an application¹ with the Federal Power Commission (the Commission) for a license for its Yadkin Project (Project No. 2197) on the Yadkin River, North Carolina. In its application Carolina Aluminum indicated its willingness to waive all jurisdictional objections if a license should be issued for a single project, to consist of its existing High Rock, Narrows and Falls developments and the proposed Tuckertown development, provided that such license be "for a term of fifty years from the date of issuance and contain provisions satisfactory to" Carolina Aluminum.

On April 3, 1957 the Commission issued an order granting a license for the Yadkin Project, which limited the license term as to the three existing components of the project to a period slightly less than forty years, and granted the requested fifty year term for the Tuckertown development alone.

1. Item C.

As a matter of procedure, the Commission's order of April 3, 1957 presented difficult technical problems. Carolina Aluminum believes that the Commission lacks jurisdiction to require a license for any of the three existing projects on the Yadkin River. It likewise believes that, in spite of a prior decision in DI-135,² in which proceeding the Commission determined that a license would be required for a development proposed by Carolina Aluminum in 1937 at the site of the presently proposed Tuckertown development, no license can legally be required for the Tuckertown development now proposed. It is the position of Carolina Aluminum that the Commission may only issue a license for the completed Yadkin Project upon the application of the prospective licensee and, therefore, that the purported issuance of a license, which is not in accordance with the application on the all-important issue of the license term, is, in effect, a nullity.

On the other hand, Carolina Aluminum agreed with the Commission's conclusion that the Yadkin Project as completed by the construction of the Tuckertown development would comply with the mandate of Section 10(a) of the Federal Power Act (the Act) in that it is best adapted to a comprehensive plan for improving and developing the Yadkin River, Carolina Aluminum would have been willing to accept the license offered in the Commission's order of April 3, 1957 had the term for all four of the components of the project been for the fifty year period requested. It still is willing to accept a license for a term of fifty years from the date of issuance.

In view, however, of the Commission's Rules and Regulations and the requirements of the Act, it seemed obligatory to Carolina Aluminum that it seek a rehearing of the Commission's order of April 3, 1957 (which order was

2. Item A.

not premised upon a hearing but upon Carolina Aluminum's application for license), even though its primary purpose was only to request amendment of the order to provide for a fifty year term for the Yadkin Project as a single entity, rather than to split the term as between existing and proposed developments which the Commission's order required. Carolina Aluminum's petition for rehearing, therefore, requested, in addition, an opportunity to present oral argument to the Commission for the purpose of illustrating the necessity of amending the order to provide for a fifty year term.

Thereafter, the Commission granted Carolina Aluminum's petition, and oral argument was heard on May 27, 1957. Following such argument, the Commission issued a further order on June 20, 1957, setting a hearing on the matters involved in and the issues presented by Carolina Aluminum's application for a license for its Yadkin Project. Presumably, the Commission ordered a hearing so that Carolina Aluminum might present, in evidentiary form, and thus subject to cross-examination and rebuttal testimony, the substance of the facts upon which it relied in its application for license and which, then, had been presented to the Commission only in the application and by argument of counsel.

Now that the hearings have been concluded, it does not appear that the issues confronting the Presiding Examiner are much different in substance from those presented in oral argument last May. Carolina Aluminum is still willing to accept a fifty year license for the Yadkin Project as a whole. As developed at the hearing, however, the economics involved compel the rejection of the split-term license offered by the Commission. The evidence also explains why it is necessary to abandon the construction of the Tuckertown development unless a fifty year license is issued for the Yadkin Project, consisting of the three existing developments and Tuckertown.

Again, for procedural reasons, however, Carolina Aluminum's position must be protected as to jurisdictional and other grounds of objection to the order of April 3, 1957. These factors all influence the scope of this brief.

Scope of Brief

In this brief Carolina Aluminum will illustrate, first, that its Yadkin Project complies with the requirements of Section 10(a) of the Act with respect to the utilization of the water resources of the Yadkin River and for other beneficial public uses. Since this conclusion was not challenged by the Staff at the hearing and has already been affirmed by the Commission in its order of April 3, 1957, the argument on this phase can be summary. There seems little purpose in redeveloping at length the evidence which the Presiding Examiner has recently heard and received. The objections of the intervenor, Miss Eliza Doby, do not, in the opinion of Carolina Aluminum, require extensive reply.

The Commission's order of April 3, 1957, however, does not comply with the requirements of Section 10(a) of the Act because of the split term of the proposed license. It will be illustrated that the economics of the situation and the especial use of the generation of the Yadkin Project for the production of aluminum require a fifty year license for all four of the components of the Yadkin Project.

Second, and most important, therefore, Carolina Aluminum will illustrate in this brief why the Commission should issue a fifty year license covering all four developments to be included in the Yadkin Project and, conversely, why, unless such a fifty year license is granted, the Tuckertown development would be uneconomic. This is the principal purpose of Carolina Aluminum's brief

and, in the event that the decision of the Presiding Examiner should recommend amendment of the license offered by the Commission's order of April 3, 1957 to provide for a fifty year license covering all four components of the Yadkin Project and containing satisfactory terms, Carolina Aluminum will urge that the Presiding Examiner's decision become the decision of the Commission, irrespective of other conclusions at which the Presiding Examiner may arrive on matters relating to jurisdiction.

Carolina Aluminum must, nevertheless, present to the Presiding Examiner its objections, other than as to the license term, to the Commission's order of April 3, 1957 so that the Presiding Examiner may, if necessary, rule thereon and Carolina Aluminum may, if necessary, file appropriate objections to such rulings, if adverse. The third section of this brief will be devoted to such objections.

Since this proceeding does not follow the ordinary pattern where a Presiding Examiner hears a case on first impression, no detailed requests for proposed findings and conclusions of law are made.

Carolina Aluminum's main purpose is that the Presiding Examiner find that, upon the basis of all the evidence presented, compliance with Section 10(a) of the Act requires that a license be issued for the Yadkin Project effective for a fifty year term from the date of issuance.

If such a finding is made, Carolina Aluminum would accept a license on the terms and conditions specified in the Commission's order of April 3, 1957 without objection, although it does not agree with the Commission's conclusions as to licensing jurisdiction. If such a finding is not made, Carolina Aluminum submits that the Commission's order should be annulled because the Commis-

sion lacks jurisdiction to compel a license for the three existing plants and lacks jurisdiction to compel either a license for, or the construction of, the Tuckertown development.

POINT I

The Yadkin Project complies with Section 10(a) of the Act.

The Yadkin River, in the reach where Carolina Aluminum's plants are located, in its natural state was a typical flashy mountain stream, cutting through low parallel mountain ridges in shallow gorges and characterized by a series of rapids and low falls. The terrain was rough and relatively inaccessible. No attempt at navigation in this reach is known. The usefulness of the river, therefore, lies in its potentiality for hydroelectric power development.³

After two prior attempts at development of the river for power purposes had failed, Carolina Aluminum's parent company, Aluminum Company of America, in 1915 commenced the acquisition of properties with a view to developing the power potential of the reach in the river approximately between mile 272 and mile 234.⁴ The output of the proposed power plants was intended to serve the aluminum smelting plant then under construction at Badin, North Carolina.⁵

There is available in this thirty-eight mile reach of the river now controlled by Carolina Aluminum approximately 345 feet of head. The entire head can best be developed by four separate plants operated as a single hydroelectric unit. It has always been the intention of Carolina

3. Fletcher Tr. 97, 102-103; Exhibit 17.

4. Fletcher Tr. 104-106.

5. Fletcher Tr. 105, 283, 284; Magee Tr. 202.

Aluminum to develop the entire 345 feet of head with a single hydroelectric project consisting of four individual developments. This is the Yadkin Project.⁶

The first development was the Narrows. This site was selected because a prior owner had already commenced a development there. The Narrows first produced power in 1917 and, in that same year, construction of Yadkin Falls commenced. Since both the Narrows and Falls developments have limited storage capacity, the next development planned was at the High Rock site where useful storage of 118,410 day second feet has been provided. Due to economic conditions and the state of the aluminum market following the first World War, construction of High Rock, however, was delayed until 1926.⁷

With the completion of High Rock, there remained only the stretch of the river between High Rock dam and the end of the Narrows reservoir for further development. The most promising site was selected at Tuckertown but, again, because of economic conditions, it was not necessary to consider completion of the project until 1937.⁸ At that time Carolina Aluminum filed a declaration of intention to construct a final development at the Tuckertown site⁹ but, after a finding by the Commission that a license would be required, and the ensuing delay occasioned by an inconclusive attempt at court review¹⁰, the economic picture had again changed and the development was not pursued.¹¹

The intervention of World War II and the lack of assured occupancy of the water power sites on the Yadkin River further delayed the completion of the Yadkin

6. Fletcher Tr. 111.

7. Fletcher Tr. 106-111.

8. Fletcher Tr. 111, 112.

9. Fletcher Tr. 111-112; Harper Tr. 214; Item A.

10. *Carolina Aluminum Company v. Federal Power Commission*, 4 Circ., 97 F.2d 435.

11. Fletcher Tr. 112.

Project by the construction of Tuckertown until 1956.¹² Then, Carolina Aluminum filed an application¹³ for a license, believing that it could economically complete the Yadkin Project by constructing Tuckertown if it could be assured of the continued enjoyment of all four of the developments constituting the Yadkin Project for a fifty year term.

There is no question that completion of the Yadkin Project by the construction of Tuckertown will provide the best and most complete utilization of the power resources of the thirty mile reach on the Yadkin River controlled by Carolina Aluminum.¹⁴ The power potential of the undeveloped head between the High Rock dam and the end of the Narrows reservoir is presently wasted.¹⁵ No better plan for the development of this head has been suggested than the construction of Tuckertown.¹⁶ To this, the Staff witnesses have indicated complete agreement.¹⁷

Nor is it suggested anywhere in the record that Tuckertown could operate independently with the same degree of efficiency as it could as a component of the four plant Yadkin Project. In fact, the testimony indicates that Tuckertown alone would be wholly useless for Carolina Aluminum's smelting operations and would be of dubious value to any public utility system.¹⁸

Since a suggestion had been made that the Yadkin Project could be improved by the installation of an additional unit at each of the Narrows and Falls plants, Carolina Aluminum made a serious study of such a proposal.¹⁹ The result indicated that such additional units

12. Fletcher Tr. 112-113; Harper Tr. 215, 219; Magee Tr. 204.

13. Fletcher Tr. 113-114; Harper Tr. 213-214, 215; Magee Tr. 204.

14. Finding (8) Commission's order of April 3, 1957.

15. Fletcher Tr. 111.

16. Price Tr. 561-563; Exhibit 35.

17. Price Tr. 562; 594-595; Ronka Tr. 603-606.

18. Fletcher Tr. 118-120; Harper Tr. 232-233.

19. Fletcher Tr. 123-124.

would not be warranted at this time,²⁰ and this conclusion, again, is supported by the Staff witnesses, who likewise studied the question.²¹

As a matter of economics, the development of Tuckertown at an estimated cost of approximately \$15,000,000 is completely feasible. Both, Mr. Price, the Commission's Regional Engineer, and Dr. Jessel, head of the Commission's Section of Transmission and Coordination of Electric Resources and Requirements, have so found²² and Mr. Harper, General Manager of Alcoa's Smelting Division, testified that the expenditure of \$15,000,000 to complete the Yadkin Project by constructing Tuckertown would produce power for its smelting operations at Badin at a cost that could, assuming a fifty year license for the Yadkin Project, permit operation of the Badin Works in the competitive market.²³ Carolina Aluminum is a wholly-owned subsidiary of Aluminum Company of America and, when necessary, it is financed by the parent company without recourse to public sale of securities. There can be no question of Carolina Aluminum's ability to finance and operate the Yadkin Project.²⁴

The method of operation of the Yadkin Project, if Tuckertown is installed, will not differ materially from the present practice.²⁵ Carolina Aluminum's existing plants are operated in accordance with the operating guide which was explained by the witness Allen, Assistant Chief Power Engineer of Alcoa.²⁶ The purpose of the operating guide is to provide as much energy as possible for the Badin smelting works and to make such energy available in blocks adaptable to the pot lines for the

20. Fletcher Tr. 124-127, 129-130; Exhibits 18, 19 and 20; Magee Tr. 259-260.

21. Price Tr. 561-563.

22. Price Tr. 563-564; Jessel Tr. 594-595.

23. Harper Tr. 224-225.

24. Magee Tr. 204, 206, 208; Exhibit 30.

25. Fletcher Tr. 118; Allen Tr. 183, 193-194, 200, 442.

26. Allen Tr. 152-155, 161, 173; Exhibit 23.

maximum period in each year.²⁷ The result of operating the existing plants pursuant to the operating guide has been beneficial to downstream users, in that it has increased the minimum flow of the river over that which would have prevailed in its natural state and has reduced flood discharges.²⁸ This result will continue if the project is completed by the construction of Tuckertown.²⁹

Since it was understood that objections have been voiced by land owners and prospective real estate developers of properties bordering on the High Rock reservoir to the method of operating the High Rock development insofar as, from time to time, the drawdown reached the full thirty feet allowable for maximum utilization of the useful storage, a study was made by Carolina Aluminum to determine the effect of operating the High Rock development in a manner calculated to preserve more constant lake levels.³⁰ This study indicated that any method of operation of the High Rock development limiting the drawdown of the reservoir would be unfeasible and economically unsound.³¹ In fact, as stated by the witness Allen, this would defeat the purpose for which High Rock was built, namely, to provide sufficient storage to insure maintenance of operations at the Badin smelting works for the maximum period in even the driest water years.³²

The undisputed evidence indicates that any limitation upon the use of the full usable storage at High Rock would be costly and wasteful.³³ Assuming that High Rock were operated as a run-of-the-river plant, the annual energy available for the smelting works at Badin would be reduced nearly 18%. One pot line would have to be

27. Allen Tr. 149-152.

28. Allen Tr. 175-176; Exhibit 24.

29. Allen Tr. 196-199; Exhibit 29.

30. Exhibit 26.

31. Allen Tr. 178-183.

32. Allen Tr. 179; Fletcher Tr. 109.

33. Price Tr. 564-565; Allen Tr. 182-183.

eliminated and the number of pot lines shut down annually would be increased from an average of 2.67 to 5.06. In addition, such method of operation would reduce the beneficial effect provided by the Yadkin Project for river regulation and would reduce the peaking capacity available to the two public utility companies with which Carolina Aluminum presently has mutually satisfactory interchange agreements.³⁴

The loss in operating efficiency would approximately be proportionate to the limitation imposed upon the High Rock drawdown. In dollars, it was estimated by Mr. Price that, if the maximum drawdown at High Rock were limited to ten feet, the energy loss would be in excess of \$150,000 a year, even assuming the very dubious assumption that the additional capacity at High Rock resulting from the limitation in drawdown was marketable at the going rate.³⁵

It should be noted moreover that the objection to the operation of High Rock Reservoir as it has been operated for many past years was not supported by any evidence at the hearing. In fact, Mr. Price, the Commission's witness, testified that any limitation on the use of the full drawdown at High Rock would be uneconomic and should not be required.

The only other objection to the Yadkin Project was advanced by the intervenor, Miss Eliza Doby, and supported by the statement of Miss Julia Doby. The Misses Doby are part owners of certain properties which will be affected by the Tuckertown reservoir. Their objections are general in terms and, in substance, amount to opposition to the development of the Tuckertown site at all.³⁶ Carolina Aluminum has indicated that it will cooperate with interested land owners to reduce its property takings

34. Allen Tr. 183.

35. Price Tr. 565; Allen Tr. 183.

36. Miss E. Doby Tr. 38; Miss J. Doby Tr. 55.

to the minimum.³⁷ It has also indicated that it will cooperate with the North Carolina State Highway Commission in providing and maintaining roads and bridges as may be required for the convenience of the residents of the area.³⁸ Little more can be said in this respect, save to note the overwhelming public support of the project, indicated by the intervention of the State of North Carolina, the strong recommendations of the State's two Senators, interested Congressmen and local governmental officials, and the telegrams, letters, petitions and statements from civic groups, organizations and individuals in North Carolina and, particularly, those directly affected by the economy of the Badin area.³⁹

As to both objections to the Yadkin Project, it is obvious that the answer lies in the proper balancing of interests. The question is whether the full potential of the affected reach of the Yadkin River should be developed to sustain an industry which is the life blood of this section of North Carolina or whether this valuable resource should be wasted in favor of small and relatively unaffected private interests or private aims and desires.

The Company has indicated plainly why it can not accept any provision in a license which would limit the drawdown at High Rock.⁴⁰ It is obvious that no other form of power supply, steam, gas or atomic, is economically feasible for the operation of the smelting works at Badin.⁴¹ Accordingly, the choice is either the completion of the Yadkin Project by the construction of Tuckertown and its continued operation to maintain the maximum power benefits for the Badin smelting works or the abandonment of Carolina Aluminum's \$37,000,000 expansion program.

37. Fletcher Tr. 131-132.

38. Fletcher Tr. 341-342.

39. Moody Tr. 34-45; Alexander Tr. 50-52; Kitchin Tr. 53; Moose Tr. 61-63; Richards Tr. 63; Isenhour Tr. 64; Lincoln Tr. 70; Meekins Tr. 359-360.

40. Magee Tr. 250, 255; Fletcher Tr. 134; Allen Tr. 183, 440.

41. Harper Tr. 224, 429.

The Commission recently considered⁴² a similar weighing of interests where objection was made to the erection of a power dam by Alabama Power Company on the Coosa River. The language of the Commission, it is submitted, states with telling force and clarity the reasons why the Yadkin Project must be completed, operated and maintained for its stated purpose of supplying electric power for Carolina Aluminum's smelting works at Badin.

"It is inevitable in the construction of projects such as power developments, highways, public buildings, and similar works that the interests of individuals in lands and other property and their desire to remain on the lands must give way to the greater public benefits resulting from such construction. Since, under our system of government, individuals and other owners of property are awarded just compensation for their private property taken for public purposes, the opposition in many instances to such a taking is based, as here, upon a desire to remain on the land, because to move would result in the loss of intangibles. It is these intangibles that will be lost which appear to us to be the real basis for the opposition to the Weiss development which has been sincerely and honestly advanced in this case by the Intervenor. Nor could we regard the sentimental attachment of one individual for the land on which he lives as of lesser importance than the desire of another to retain his family homestead.

"Nevertheless we believe that Congress intended the Commission to take such intangibles into consideration in determining whether a particular proposed project meets the criteria established by the Power Act for licensing any particular project and it is those intangibles which cause us serious concern in this case.

⁴². *In the Matter of Alabama Power Company*, Opinion No. 305, Issued Sept. 4, 1957.

"If the same public benefits to be provided by Applicant's proposed Weiss development could be accomplished about as well and at substantially the same cost under some other method of development which would result in the taking of substantially less land with correspondingly less disruption in the lives of citizens of Cherokee County, it would be our duty, as specifically provided in Section 10(a) of the Power Act, to order modification of the proposed project to lessen its adverse impact on the private property in that county. However, as we have already indicated, Applicant's plan for the proposed Weiss development will result in the taking of less private lands than any other feasible alternative scheme of development and since Applicant's proposed project provides public benefits substantially in excess of its cost, or the cost of providing the same benefits by alternative methods, we conclude that the private rights in the lands involved here must be relinquished in the public interest notwithstanding the earnest and sincere desire of the citizens involved to retain their lands without regard to the amount of money which may be paid to them in exchange for their lands and homes."

Mr. Ronka, Hydraulic Engineer of the Federal Power Commission also studied the design and construction of the three existing developments and the proposed design and structures of the Tuckertown development. His conclusions were that the existing developments and Tuckertown were approved as safe and that there was no risk of sliding and overturning.⁴³ Likewise, the transmission system to be used as a part of the project was studied and found adequate by Dr. Jessel.⁴⁴

In order to complete the demonstration that the Yadkin Project satisfies the requirements of Section 10(a) of the

⁴³ Ronka Tr. 604, 605.

⁴⁴ Jessel Tr. 576-586.

Act (except for the duration of the license term), it remains only to comment upon the evidence as to the use of the project for recreational purposes and other beneficial public uses. The Commission has found that the project's adaptability in these respects is abundant.⁴⁵

As Mr. Fletcher, Alcoa's Assistant Chief Engineer and head of the Hydraulic Engineering Department, indicated,⁴⁶ in recent years there has been a marked increase in the recreational use of the existing reservoirs of the Yadkin Project. There has been substantial boating, fishing and bathing and the area is accessible to the public. It is expected that Tuckertown will be even more popular for public use in that the lake levels will not ordinarily fluctuate beyond the three foot drawdown to which Carolina Aluminum is committed and the reservoir is situated in particularly rough and picturesque country. Carolina Aluminum intends to continue its policy of making its reservoirs available for recreational use by the public insofar as the same is consistent with public health, safety and the production of electric power at maximum efficiency.

As to other beneficial uses, the record indicates that three communities and several industries are presently taking water for domestic and industrial purposes. Carolina Aluminum recognizes the importance of ample water for public use and stands ready to cooperate with prospective users for the preservation of public water supply.⁴⁷

More important, however, is the role that the Yadkin Project plays in the economic picture of the Piedmont area of North Carolina. As a taxpayer and employer, Carolina Aluminum is vital to the economy of Stanly County and adjacent counties in North Carolina and, as indicated by the statement of the Attorney General,⁴⁸ to

45. Cf. Opinion and Order issued April 3, 1957.

46. Fletcher Tr. 133-134.

47. Fletcher Tr. 132-133.

48. Moody Tr. 43-44.

the State as a whole. Loss of this industry would be catastrophic to the State and to the communities that look to Carolina Aluminum as a source of revenue and employment.⁴⁹

Yet, since Carolina Aluminum cannot long continue its smelting operations at Badin without modernization and expansion of the smelting works and an increased and continuing power supply,⁵⁰ the Yadkin Project must be completed by the construction of the Tuckertown development, unless Carolina Aluminum's operations in the Piedmont area of North Carolina are to dwindle and ultimately cease.⁵¹

In the following point in this brief, it will be shown that Carolina Aluminum cannot proceed with its plans for the modernization and expansion of the Badin works and the completion of the Yadkin Project by the construction of Tuckertown unless it obtains a license for a term of fifty years from the date of issuance. At this stage, the vital importance of the Yadkin Project to the economy of North Carolina is emphasized only to illustrate that the project, as proposed by Carolina Aluminum and including the all-important fifty year license term, presents the plan for the development of the thirty-eight mile stretch of the Yadkin River controlled by Carolina Aluminum best adapted for the River's development, not only from a hydraulic and engineering standpoint, but also for other beneficial purposes.

The continuance of smelting operations by Carolina Aluminum is essential to the economy of North Carolina. The smelting operation, in turn, is dependent upon power supply. The development of that power supply is, therefore, without question not only a beneficial, but a neces-

49. Moody Tr. 43; Magee Tr. 204; Harper Tr. 226, 229; Moose Tr. 62.

50. Magee Tr. 203; Harper Tr. 216, 219, 221.

51. Magee Tr. 246; Harper Tr. 236.

sary, public use for the people of Stanly County, North Carolina and, indirectly, of the United States.

To conclude, it is submitted that from every standpoint the Yadkin Project is, if licensed for a fifty year term,

“the project . . . best adapted to a comprehensive plan for improving and developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water power development, and for other beneficial public uses, including recreational purposes.”

POINT II

The necessity for a fifty year license for the completed Yadkin Project.

The Yadkin Project by itself involves only the completion of the development of the power potential of the Yadkin River in the reach controlled by Carolina Aluminum by the construction of the Tuckertown development, at an estimated cost of approximately \$15,000,000, to produce an additional 40,000 kilowatts of generating capacity and 15,750 kilowatts of average energy for use at the Badin smelting works.⁵² The Yadkin Project is, however, only a part, although an integral one, of Carolina Aluminum's plans for the modernization and expansion of its smelting operations at Badin, North Carolina. In addition to its plans for increased power supply, Carolina Aluminum plans to modernize and expand its Badin works at an estimated cost of \$22,000,000, increasing the productive capacity of the plant by 46,000,000 pounds.⁵³

The power development and expansion programs are, however, completely interdependent and the one cannot

⁵² Harper Tr. 213, 221, 233; Fletcher Tr. 114-115.

⁵³ Harper Tr. 221.

proceed without the other. Carolina Aluminum cannot economically use additional hydroelectric power which would be available from Tuckertown unless it puts into effect its plan for the modernization and expansion of the Badin works. As a corollary, Carolina Aluminum would not go forward with the expansion of the Badin works unless it is assured of the additional power supply from Tuckertown.⁵⁴

The emphasis which Carolina Aluminum puts upon a fifty year license term for the Yadkin Project is illustrated by the testimony of Mr. Frank L. Magee, President of Aluminum Company of America and of Carolina Aluminum. Mr. Magee asserted firmly that, if a fifty year license is obtained for the Yadkin Project, Carolina Aluminum will proceed with its \$37,000,000 program. He was equally positive that, unless a fifty year license is obtained, the entire program will fail.⁵⁵ The economic factors which make this conclusion inescapable were summarized in Mr. Magee's testimony and developed at further length in the testimony of Mr. Harper, General Manager of Alcoa's Smelting Division.

At the present time the power supply available from the three existing plants on the Yadkin River is adequate for the operation of the existing Badin works. The Badin works, however, are not, under current conditions, susceptible of efficient and competitive operation. The salient deficiencies, as Mr. Magee pointed out, are two-fold: First, the equipment is in part obsolete and, second, the plant has insufficient capacity to be competitive by current standards in the aluminum industry.⁵⁶

Construction of the Badin works commenced in 1915 and, although there have, of course, been additions and replacements to plant equipment during the years, the

54. Harper Tr. 220-221.

55. Magee Tr. 202-203, 206; Harper Tr. 235.

56. Magee Tr. 203; Harper Tr. 216-219; Exhibit 31.

major portion of the facilities are over-age.⁵⁷ Since 1937 all major improvements have been deferred, primarily because of the uncertainty of the status of Carolina Aluminum's power supply, in view of the Commission's decision in DI-135.⁵⁸

In size, the Badin works is the smallest but one of all the aluminum smelting plants in the United States and Canada.⁵⁹ Its capacity of 47,000 tons exceeds only that of the Kaiser Aluminum and Chemical Corporation's Tacoma plant and that plant was purchased by the present operator from the Government at less than one-half of its original cost and without any investment in power supply.⁶⁰

As both Mr. Magee and Mr. Harper testified, the trend of the aluminum industry is towards plants of increasing capacity, well in excess of 100,000 tons.⁶¹ The largest plant now operating has a capacity of 220,000 tons and the average of all plants is in excess of 100,000 tons.⁶²

The factor of size is important in determining the competitive status of a smelting plant because, as Mr. Harper stated, increased capacity can be obtained without a proportionate increase in production costs. In other words, the fact that overhead and auxiliary costs may be allocated to greater capacity reduces the ultimate cost of metal per pound.⁶³ In consequence, Carolina Aluminum has determined that, in order to justify continuance of the Badin operation, Mr. Magee stated, the capacity of the smelting plant must be increased to the utmost practicable extent.⁶⁴

Even with the modernization and expansion that Carolina Aluminum plans for the Badin works, the operation

57. Harper Tr. 219.

58. Harper Tr. 219.

59. Exhibit 31.

60. Harper Tr. 216-218.

61. Magee Tr. 203; Harper Tr. 217.

62. Harper Tr. 217; Exhibit 31.

63. Harper Tr. 217-218.

64. Magee Tr. 203, 205; Harper Tr. 226.

will still be marginal.⁶⁵ Although, with expansion, the Badin works could have a total productive capacity of 57,000 tons, the plant would remain one of the smaller ones in the industry and no further increase of productive capacity is possible because of the limitations on power supply. All blocks of power from the Yadkin Project, and as increased by marketing of peaking capacity, which are available for sufficient time to be economical for aluminum smelting will be utilized by Carolina Aluminum. There are no other large blocks of power available in the area at rates which would permit economic utilization for the purposes of smelting aluminum.⁶⁶

Furthermore, since the Narrows and Falls developments contain 36 cycle generating units of a gross rated capacity of 47,500 kilowatts, it is necessary that the Badin works include 36 cycle frequency changers and conversion units for utilization of this 36 cycle generation.⁶⁷ This equipment compels the operation of part of the Badin pot lines at 500 volts with high attendant losses. Modern pot lines are presently being operated at in excess of 750 volts.⁶⁸

This condition will continue at Badin, even after modernization, because the cost of replacing the 36 cycle facilities, Mr. Harper concluded, would be prohibitive.⁶⁹ The Badin smelting plant will, therefore, continue to suffer from smelting operation at lower voltage and will thus be less efficient than a modern plant, even if Carolina Aluminum's \$37,000,000 program becomes effective.⁷⁰

Finally, the variation of power supply in the Badin area adversely affects the productive capacity of the smelting works. The expected utilization of the installed

65. Magee Tr. 207-208; Harper Tr. 229.

66. Magee Tr. 205, 207; Harper Tr. 222.

67. Harper Tr. 230.

68. Harper Tr. 231.

69. Harper Tr. 231.

70. Harper Tr. 230-231.

capacity at the Badin smelting works, after modernization, is estimated, as Mr. Harper testified, at only 86%.⁷¹

The inevitable periods of low stream flow and consequent diminution of power supply also affects the production costs at the Badin smelting works. Although production is curtailed during dry periods, certain operating functions must continue at Badin. For example, the personnel for office, laboratory, engineering drafting, maintenance and servicing of facilities must be continued at the same level, irrespective of variations in production rates. These fixed expenses must be related at Badin to only 86% utilization of the smelting facilities and, in consequence, as both Mr. Magee and Mr. Harper indicated, the Badin plant is less efficient and less competitive than another plant where full utilization of the smelting facilities would be possible.⁷²

Mr. Magee testified that the unfavorable factors inherent in the Badin operation might well have deterred Carolina Aluminum from deciding upon its \$37,000,000 program.⁷³ It has been estimated that an investment of \$37,000,000 at one of Aluminum Company of America's fuel-powered plants, existing or proposed, would provide 37,000 tons of productive capacity, which is 60% more than that which will be available at Badin.⁷⁴ Capital costs per unit of production would thus be lower at another location and production costs would also favor another site.⁷⁵

From an economic standpoint, the salient factor favoring the modernization and expansion of the Badin smelting works lies in the usefulness of the existing facilities.⁷⁶ The net book value of facilities that will be continued in

71. Harper Tr. 223, 230.

72. Harper Tr. 230.

73. Magee Tr. 203-204.

74. Harper Tr. 223.

75. Harper Tr. 224.

76. Magee Tr. 208; Harper Tr. 224-225.

operation at Badin is approximately \$11,000,000. This, as Mr. Harper pointed out, will reduce substantially the capital cost per unit of production, if the \$37,000,000 expansion program becomes operative.⁷⁷

The compelling reason, however, why Carolina Aluminum decided on the \$37,000,000 program at Badin was its sense of obligation to the Badin community and to the State of North Carolina. Carolina Aluminum has always enjoyed the best of relations in North Carolina and with its citizens. It, and its parent Alcoa, recognize that a great part of the economy of the State, and particularly this area, is dependent upon Carolina Aluminum's continued operation. For that reason, Mr. Magee said, the management of Carolina Aluminum determined to invest an additional \$37,000,000 in an operation that will be marginal at best but will permit Carolina Aluminum to continue as a good citizen, employer and taxpayer in North Carolina.⁷⁸

Carolina Aluminum is the largest employer of labor and the largest taxpayer in the Badin area.⁷⁹

At the beginning of 1957, there were 977 employees on the payroll, all of whom live in the five counties adjacent to Badin. The 1956 payroll was approximately \$5,600,000 and accounted for approximately one-third of the total non-farm income in Stanly County. As of October 1, 1957, 21% of Carolina Aluminum's employees had had twenty-five or more years of continuous service. The annual turnover is less than 1%.⁸⁰

Carolina Aluminum's tax levy was 86.4% of the total levy for Badin township in 1956. In the same year, Carolina Aluminum was responsible for 12.7% of the total property tax levy for Stanly County. It is esti-

77. Harper Tr. 225.

78. Magee Tr. 205.

79. Harper Tr. 226.

80. Harper Tr. 226-227.

mated that these percentages will be increased in 1957 to 87.9% and 14.8%, respectively.⁸¹

With its history of friendly relations in North Carolina over the years and its awareness of its importance to the economy of the area in which it operates, as to which Mr. Magee testified, Carolina Aluminum would be most reluctant to abandon its activities in the State. Yet, curtailment and ultimate abandonment of those operations is inevitable unless the Commission grants a fifty year license for the Yadkin Project.⁸²

As Mr. Magee indicated, the Badin operation is a marginal one. The proposed investment, \$37,000,000, is very large and, to be economically justifiable at all, must depend upon an extended period of service. After a careful weighing of all the factors, the management of Carolina Aluminum has determined that an investment of \$37,000,000, in the modernization and expansion of the Badin works and the completion of the Yadkin Project, can be economical if the period of enjoyment shall be for at least fifty years. If the period of enjoyment were to be curtailed to any lesser span, Carolina Aluminum's \$37,000,000 program would not be economically justified and will not be effectuated.⁸³

The evidence is clear that whether or not Carolina Aluminum proceeds with its \$37,000,000 program depends entirely upon the term of the license that may be obtained for the Yadkin Project. Since the operation of the Badin smelting works is dependent upon the availability of power supply, Carolina Aluminum must regard its smelting activities at Badin to be limited to the term of the license of the Yadkin Project, which is its source of power supply. In formulating its plans, and weighing the advisability of the \$37,000,000 program, the manage-

81. Harper Tr. 227.

82. Magee Tr. 206-208; Harper Tr. 232, 236.

83. Magee Tr. 207-208; Harper Tr. 236.

ment of Carolina Aluminum had to assume, therefore, that power would be available from the Yadkin Project at economically feasible rates only during the original license term.

Under Section 14 of the Act, any project may be "recaptured" at the expiration of the license term. In formulating its plans, therefore, the management of Carolina Aluminum could not rely upon any assured source of power supply after the expiration of its license for the Yadkin Project.⁸⁴

In concluding that a fifty year term of continued operation at Badin would be the minimum required to justify the \$37,000,000 investment, Carolina Aluminum, of course, took into account the unfavorable aspects of operation at Badin previously noted. In addition, it considered the expected useful life of the facilities to be installed.

Mr. Harper stated that the average age for six pot lines originally installed at Badin, when rebuilt or modernized, was just under twenty-five years. With the emphasis that, he testified, is being given today to research and development in the aluminum industry, it is unlikely, in the judgment of his company, that the expected economic life of new smelting facilities would exceed twenty-five years before obsolescence would require substantial investment to take advantage of technical improvements.⁸⁵ This is a factor which must be considered in weighing the significance of the license term.

Assuming one replacement of the production units at the Badin smelting plant during a license term of fifty years, the useful life of both the original installation and the replacement of such production units would be recognized in the accrued depreciation. Any reduction in the license term would require either accelerated depreciation

⁸⁴. Harper Tr. 232; Fletcher Tr. 118-120, 145-146.

⁸⁵. Harper Tr. 233, 234.

or the facilities would not be fully depreciated on Carolina Aluminum's books at the time when their period of service would end.

It should be noted that, even if a fifty year license for the Yadkin Project is granted, Carolina Aluminum will not enjoy the fruits of its modernization and expansion program for a full fifty year period. Since the construction of Tuckertown will require three years, Carolina Aluminum will only have a forty-seven year period of enjoyment and, under the Commission's order of April 3, 1957, this period would be reduced to thirty-seven years. Under such circumstances, and assuming the original installation of production facilities has a useful life of twenty-five years, there would be only a twelve year period of useful life after its replacement.⁸⁶

Furthermore, if the license were for forty, rather than fifty years, the period of utilization would be reduced by ten years, which thereby would accelerate by ten years the time in which Alcoa would have to provide, at some other location, the smelting capacity then available at the Badin works. Mr. Harper made an estimate as to the increased cost in interest and depreciation charges by reason of such ten year reduction in the license period, assuming for the purpose of that estimate, that the cost of installing substitute capacity would be at present construction rates. To provide the 114,000,000 pounds of capacity which could be made available at Badin, would, on this basis, it is estimated, cost \$57,000,000. Mr. Harper, therefore, estimated that the difference between a forty year and a fifty year license represents an additional cost to the Company in interest and depreciation charges for the ten year period of \$35,000,000.⁸⁷

The economics are governed by the license term for the entire Yadkin Project. The situation is not alleviated by

86. Harper Tr. 234.

87. Harper Tr. 234, 235.

the fact that the Commission's order proposes a fifty year license for the Tuckertown development because Tuckertown alone would be of no value for the production of aluminum.

Tuckertown is to be located between two of the existing plants on the Yadkin River and is, therefore, subject to the river's variable stream flow and it lacks sufficient storage to generate more than a token amount of firm power. Operated independently, there would be periods of time when generation at Tuckertown would be impossible for lack of water. Aluminum smelting is a continuous process and, if power is interrupted for only a few hours, full production cannot be restored for several weeks. Furthermore, since the median power available from Tuckertown is only 15,750 kilowatts, it could not supply a single modern pot line.⁸⁸

For all practical purposes, therefore, the license proposed by the Commission must be regarded by Carolina Aluminum as one that would permit continuance of the smelting operations at Badin for only thirty-seven years. As Mr. Magee indicated this period is too short to justify the expenditure of \$37,000,000 and, therefore, unless the Commission's order is amended to provide a fifty year license for the completed Yadkin Project, consisting of three existing developments and Tuckertown, Carolina Aluminum will be forced to refuse the license and its \$37,000,000 expansion and construction program will be abandoned.⁸⁹

Furthermore, the term of license offered by the Commission is wholly unacceptable from an engineering standpoint. In view of the provisions of the Act, it must be assumed that ownership of the three existing plants might shift after forty years. As Mr. Fletcher pointed out, since the four plants together constitute a single inte-

⁸⁸. Harper Tr. 232-233; Fletcher Tr. 118-119.

⁸⁹. Magee Tr. 207; Harper Tr. 232; Fletcher Tr. 118-119.

grated hydraulic project designed and operated to supply a single market, the separation of ownership of the component parts of the project would destroy the utility value of the project for the purpose for which it was created.⁹⁰ As an engineering matter, in Mr. Fletcher's opinion, Tuckertown, located as it is between two of the three existing projects, could not be operated efficiently under separate ownerships, in view of its small storage and dependency upon the operation of the High Rock development upstream.

Since, as has been indicated in Point I above, there is no serious dispute that the Yadkin Project fully meets all the requirements of Section 10(a) of the Act, except for the limitation on the license term proposed by the Commission's order of April 3, 1957, it would be disastrous if the project is not completed. Completion of the project would accomplish the full development of the power potential of the reach in the Yadkin River controlled by Carolina Aluminum. It would settle, without the expense of delay and litigation, all legal questions relating to the Commission's jurisdiction over Carolina Aluminum's Yadkin River plants. Finally, it would permit continuance of smelting operations at Badin for at least fifty years with its attendant benefit to the people in the area affected in providing employment and tax revenues.⁹¹

All these benefits, however, can be achieved only if the license offered by the Commission in its order of April 3, 1957 is amended to provide for a fifty year term. Carolina Aluminum's decision in this regard is reluctant but absolutely dictated by its appraisal of the economic factors.⁹² The evidence, it is submitted, clearly supports the necessity and desirability of a fifty year term for Carolina's Yadkin Project.

90. Fletcher Tr. 118-120, 145-146.

91. Harper Tr. 237, 239-240; Fletcher Tr. 144-146.

92. Magee Tr. 207; Fletcher Tr. 236.

POINT III

Other objections to the Commission's order.

As indicated in the introductory statement, if the Commission's order of April 3, 1957 is amended to provide for a fifty year license from the date of issuance for the entire Yadkin Project, containing satisfactory provisions, Carolina Aluminum will not challenge the order and will not assert any of the errors it believes to appear therein. Nevertheless, the Act requires that Carolina Aluminum bring such asserted errors of law to the attention of the Presiding Examiner at this time in order to protect its position for any possible court review. Carolina Aluminum's contentions will be designated in this Point as briefly as possible.

A. The Commission's order of April 3, 1957, may be read as a direction to Carolina Aluminum to proceed with the construction of the Tuckertown development. If so construed, the order is invalid, because the Act confers no authority whatever upon the Commission to order the construction of any development. In its application for license, Carolina Aluminum indicated its desire to construct the Tuckertown development if a fifty year license for the entire Yadkin Project were issued on satisfactory terms. For the reasons set forth in the evidence if such a fifty year license is not issued, Carolina Aluminum cannot proceed with its plans to construct Tuckertown and expand and modernize its Badin smelting works. The Commission has no authority to order Carolina Aluminum to do so.

B. The Commission's order of April 3, 1957, purports to require a license for the existing plants on the Yadkin River which would be for a fifty year term from January

1, 1947. It will be demonstrated below that the Commission has no jurisdiction to require a license for the existing developments, but in addition, it is submitted that the Commission's order is without justification, in fact or law, in attempting to limit the license term to an effective period of less than forty years. The order in this respect constitutes an abuse of discretion on the part of the Commission.

C. Presumably acting in accordance with the unjustifiable postdating of the proposed license for the existing plants to January 1, 1947, the Commission also attempted to subject Carolina Aluminum to annual charges pursuant to Section 10(e) of the Act for the cost of administration since January 1, 1947. Again, the Commission is without power or authority to issue any such order. The Commission is not authorized to exact payment of administration charges for a period of ten years when, in fact, no expenses of administration were incurred and no license was effective.

D. Ordering Clause (c) of the license makes the license subject to the terms and conditions set forth in Form L-4, Articles 1-18, except for Articles 14 and 15. If the license is amended to provide for the fifty year term, which is a condition of Carolina Aluminum's acceptance, it should also be amended to eliminate the applicability of Articles 10, 11 and 12 of Form L-4. These articles contain provisions relative to the maintenance of navigational facilities in the Yadkin River and are, therefore, wholly inappropriate in any license for the Yadkin Project, since the River, in the thirty-eight mile reach controlled by Carolina Aluminum, is clearly not navigable for any type of craft.⁹³

93. Item A Commission's Opinion No. 29 R pages 244-245; cf. House Document No. 68 73rd Cong. 1st Sess.; House Document No. 652 78th Cong. 2nd Sess.

E. As a matter of law, the Commission has no jurisdiction to require a license for the existing High Rock, Narrows and Falls developments. These three developments are located in the reach of the Yadkin River which the Commission has at no time found to fall within the definition of "navigable waters of the United States". Accordingly, since the plants have been constructed and are in operation, the Commission has no licensing authority over them.

The Act nowhere authorizes the Commission to require licenses for existing projects located in waters other than those defined as navigable. The Act contains only two prohibitions against the construction, operation and maintenance of hydroelectric developments. Both are contained in Section 23(b).

There it is declared, first, that it shall be unlawful to construct, operate or maintain a hydroelectric development *in any of the navigable waters of the United States*. Second, it is provided that if the Commission should find that the interests of interstate or foreign commerce would be affected by any project *proposed to be constructed*, such project shall not be constructed until a license therefor shall have been obtained.⁹⁴

Inasmuch as the High Rock, Narrows and Falls developments are constructed and are not proposed or contemplated developments, and since they do not occupy navigable waters of the United States, it is clear that

94. All three of Carolina Aluminum's existing developments on the Yadkin River were constructed prior to the amendments to the Federal Power Act enacted in 1935. At the time of the construction of the three developments, the filing of a declaration of intention to construct a project in waters other than those defined as navigable waters of the United States was not mandatory but voluntary. Accordingly, anyone contemplating such construction might file a declaration of intention with the Federal Power Commission and, if a favorable finding were issued that the interests of interstate or foreign commerce would not be affected by the project, permission was automatically granted to construct the project. On the other hand, if no declaration of intention were filed, the Commission had no jurisdiction over the project but, to the extent that the project might adversely affect navigation, the provisions of the Rivers and Harbors Act of 1899 would prevail.

their operation and maintenance does not violate either of the two prohibitions of the Act. The Commission is therefore without statutory authority to require a license for their continued operation and maintenance.

F. The Commission has found, in its order of April 3, 1957, that the Tuckertown development would affect the interests of interstate or foreign commerce and that the Yadkin Project, consisting of the three existing developments and Tuckertown, would affect the navigable capacity of the Pee Dee River, which is held to be a navigable waterway of the United States, at least up to Cheraw, South Carolina. These findings are not supported by substantial evidence and are contrary to the evidence of record.

Although the 308 Reports of 1937 and 1944⁹⁵ refer to a project for a navigational channel on the Pee Dee River up to Cheraw, there is no evidence of record to indicate that such a channel actually exists. There is, moreover, undisputed evidence of record that there is no navigation on the Pee Dee River anywhere near Cheraw. In this connection the Commission noted in its order of April 3, 1957 that the Assistant Chief of Engineers for Civil Works, Office of the Chief of Engineers, Department of the Army, in reporting on Carolina Aluminum's application, stated that the constructed and proposed developments would not affect the interests of navigation in the foreseeable future.⁹⁶ The Commission's determination that Carolina Aluminum's existing plants and Tuckertown would, or do, affect the interests of interstate commerce or the navigable capacity of the Pee Dee River at Cheraw is, therefore, without foundation or support, since, in fact, there is no interstate or foreign commerce to be

95. Cf. House Document No. 68 73rd Cong. 1st Sess.; House Document No. 652 78th Cong. 2nd Sess.

96. Exhibit 8.

affected and no navigable capacity of the River at Cheraw has been established.

The Staff witness Marlatt testified and presented supporting exhibits to the effect that the operation of the existing developments is reflected in the water levels of the Pee Dee River at Cheraw.⁹⁷ This evidence, however, is meaningless, since Mr. Marlatt made no study of the flow of the Yadkin-Pee Dee River in its natural state.⁹⁸ It is, therefore, impossible to determine, on the basis of Mr. Marlatt's testimony and exhibits, what the effect of the operation of Carolina Aluminum's power plants has been and to what extent such operations altered the river stages from those that would have prevailed in a state of nature.⁹⁹

Furthermore, the witness Marlatt could not relate variations in the river stage to any particular upstream power development. He merely ascribed the variations which he found to the operation of the power plants upstream.¹⁰⁰ This would include, of course, the two Carolina Power & Light Company's plants below the Falls development, and Mr. Marlatt's testimony is, therefore, inconclusive with respect to the operation of any or all of Carolina Aluminum's plants.

In addition, Mr. Marlatt's studies were premised upon records of operation in recent years. Since Tuckertown has not been constructed, the bulk of Mr. Marlatt's testimony is unrelated to the proposed Tuckertown development¹⁰¹, and there is, therefore, no support for the conclusion that Tuckertown would affect either the interests of interstate or foreign commerce or the navigable capacity of the Pee Dee River.

97. Marlatt Tr. 642-645; Exhibits 38, 39.

98. Marlatt Tr. 662, 663.

99. Marlatt Tr. 663, 665.

100. Marlatt Tr. 666.

101. Marlatt Tr. 666.

In its order of April 3, 1957, the Commission apparently relied upon the evidence in DI-135, on the assumption that the Tuckertown development proposed in 1937 was substantially identical with that now proposed to complete the Yadkin Project. This assumption is unwarranted.

The Tuckertown development now proposed differs in several important respects from the one that was the subject of the 1937 proceeding. The number of units has been increased from two to three and the individual units reduced in capacity to give greater flexibility and to parallel the operation of High Rock. The number, size and type of the spillway gates have been changed, resulting in a greater spillway discharge capacity at full reservoir level.¹⁰²

Most important is the change in full reservoir elevation. The development planned in 1937 would have provided full reservoir elevation at 600.5. The present development would attain only elevation of 596.0, and the maximum drawdown has been reduced from the fifteen feet contemplated in 1937 to only three feet. This results in a reduction in the surface area of the full reservoir of about 15½%, and a reduction in usable storage from about 11,600 day second feet to about 3,480 day second feet, or approximately 70%.¹⁰³

On cross-examination, it was suggested that if Tuckertown were drawn down in excess of the contemplated three feet, its ability to affect stream flow below would be increased. Carolina Aluminum's witnesses have explained that there would be no purpose in operating Tuckertown so as to exceed the stated three foot drawdown limit and Carolina Aluminum has stated, through counsel, that it would accept as a provision of the license a prohibition against a drawdown of Tuckertown in excess

102. Fletcher Tr. 115-116.

103. Fletcher Tr. 116.

of three feet, except under emergency conditions or for maintenance.¹⁰⁴

The Commission's determination as to alleged downstream effect of the Tuckertown development is erroneous, not only because it is premised upon the Commission's former findings as to a development that is dissimilar from the one now proposed, but because it is contrary to the facts which are now of record.

Carolina Aluminum's engineers have made a study of the natural flow of the Yadkin River as contrasted with the results of regulation by the existing plants. The result of these studies indicates that the operation of Carolina Aluminum's plants has had a beneficial effect upon stream flow in that it has increased minimum discharges and held back flood flows.¹⁰⁵

Although Carolina Aluminum's engineers made no study of the navigable capacity of the Pee Dee River, since no navigation exists, Mr. Allen testified that the 308 Reports indicate that to maintain the theoretical navigation project of three and one-half feet depth, the flow of the River at Pee Dee, South Carolina, would have to be about 2,300 cubic feet per second. The operation of Carolina Aluminum's existing plants has increased the time in which such flows amounting to 2,300 cubic feet per second or more would exist.¹⁰⁶ In other words, to the extent that the Pee Dee River has navigable capacity at or near Cheraw, the operation of Carolina Aluminum's existing plants has lengthened the duration of such navigable capacity.

Likewise, there is affirmative proof that in view of its limited storage capacity and considering the method of operation that Carolina Aluminum will follow, Tuckertown

104. LeBocuf Tr. 687.

105. Allen Tr. 175, 176; Exhibit 24.

106. Allen Tr. 176-178, 456; Exhibit 25.

could have only a negligible effect on stream flow below the Narrows development.¹⁰⁷ In consequence, the Yadkin Project as a whole, and as completed by the construction of Tuckertown, would not adversely affect the navigable capacity of the Pee Dee River at Cheraw, assuming such navigable capacity to exist.¹⁰⁸

As a matter of law, therefore, the Commission's findings, as set forth in its order of April 3, 1957, as to the asserted effect of the Tuckertown development on the interests of interstate or foreign commerce and the asserted effect of the Yadkin Project on the navigable capacity of the Pee Dee River are not supported by evidence and should be annulled. The Commission lacks jurisdiction to require a license or licenses for any of the three existing developments or for the Tuckertown development or for the Yadkin Project, if completed by the construction of Tuckertown.

107. Allen Tr. 199.

108. Allen Tr. 193, 196; Exhibit 29.

Conclusion

It is obvious that the public interest demands that Carolina Aluminum be permitted to put into effect its \$37,000,000 expansion program and to continue operations in North Carolina. Effectuation of this program, however, is entirely dependent upon the issuance of a fifty year license for the completed Yadkin Project. Carolina Aluminum urgently prays that the Commission's order of April 3, 1957, be amended to provide for such a fifty year license, thus permitting this \$37,000,000 expansion program to become effective. If the Commission's order of April 3, 1957, is not so amended, Carolina Aluminum submits that the order should be revoked for all the reasons set forth herein.

Respectfully submitted,

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Dated November 18, 1957.

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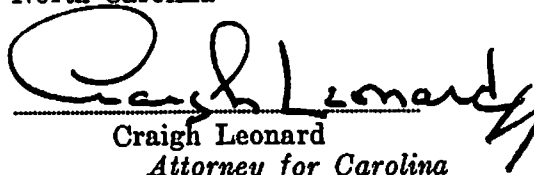
I hereby certify that I have this day served the foregoing Brief of Carolina Aluminum Company upon all parties of record in this proceeding by depositing in the mail a copy thereof, properly addressed with postage prepaid, to each of the following:

Joseph B. Hobbs, Attorney
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Craig Leonard
Attorney for Carolina
Aluminum Company.

Dated at New York, N. Y..
this 18th day of November, 1957.

Exhibit 4

**Characterization of the Toxicity and Bioavailability
of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake,
prepared for Alcoa by The RETEC Group, Inc. (Feb. 16, 2007)**



Characterization of the Toxicity and Bioavailability of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake

Badin, North Carolina

Prepared by:

**The RETEC Group, Inc.
1001 W. Seneca St., Suite 204
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RETEC Project Number: ALCO2-18801-400

Prepared for:

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February 16, 2007

Characterization of the Toxicity and Bioavailability of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake

Badin, North Carolina

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RETEC Project Number: ALCO2-18801-400

Prepared for:

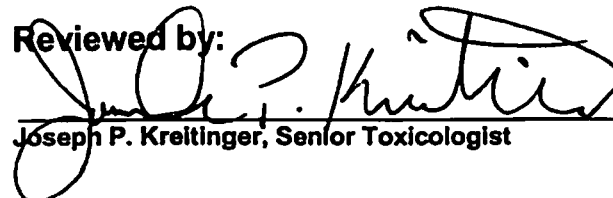
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Executive Summary

Alcoa, Inc. sponsored a voluntary research project to assess the bioavailability and toxicity of polycyclic aromatic hydrocarbons (PAHs) in sediments of Badin Lake, North Carolina adjacent to the Alcoa Badin Works (an aluminum smelter). An investigation of Badin Lake sediment quality had previously determined that a small embayment at the south end of the lake adjacent to the smelter had been impacted with PAHs from historic smelter operations. The goals of this research project were two-fold. The first goal was to determine if the PAHs in the sediments are bioavailable and toxic to benthic aquatic organisms, and the second goal was to evaluate whether the measurement of PAHs in sediment pore water using solid phase microextraction (SPME) or rapidly released PAHs in sediment using supercritical fluid extraction (SFE) could be used to predict PAH bioavailability and toxicity. The project was designed to build upon the information and database for PAH bioavailability and toxicity in freshwater sediments that has been initiated by Alcoa, National Grid, and the Northeast Gas Association.

For this project, a set of sediment samples was collected from the Badin Works site and analyzed for various biological, chemical, and physical properties. Mean concentrations of total extractable EPA priority pollutant parent PAHs (PAH₁₆) ranged from 0.23 to 1,690 mg/kg in the sediment samples tested. The concentrations of 18 parent PAH compounds plus 16 groups of alkylated PAHs were also measured (PAH₃₄). Sediment samples having concentrations of total extractable PAH₁₆ greater than 1.0 mg/kg were determined to have only modest concentrations of alkylated PAHs indicating that the primary source of PAHs in sediments was pyrogenic in origin, consistent with emissions from former smelting and carbon plant operations. The ratio of total extractable parent PAHs (PAH₁₆) to the parent plus alkylated PAH compounds (PAH₁₆/PAH₃₄) was very consistent ranging from 0.46 to 0.65.

Some of the sediment samples tested were found to have high concentrations of total organic carbon (TOC) with one sample having a carbon content of 42%. The carbon present in sediment samples having TOC content greater than 4% or PAH concentration greater than 10 mg/kg PAH₁₆ consisted primarily of heat stable carbon. These samples were measured to have a heat stable carbon/TOC ratio greater than 50%. These data suggest that the primary form of carbon in the samples has an anthropogenic origin consistent with emissions from the smelter and associated carbon plant and the use of anthracite coal, coal based coke, and coal tar paste at the smelter.

The mean concentration of PAH₃₄ in sediment pore water determined by SPME ranged from less than detection to 76.7 µg/L. When expressed in terms of toxic units to characterize PAH bioavailability, these samples ranged in pore water concentrations of PAHs from 0 to 11 TU₃₄. The mean concentration of SFE rapidly released PAHs (PAH₃₄) ranged from 0.05 to 5.48 mg/kg. When expressed in terms of toxic units, the concentration of rapidly released PAHs ranged from 0.0 to 0.7 TU₃₄.

Measurement of bioavailable PAHs using SPME and SFE in sediment samples collected from other aluminum smelter and manufactured gas plant (MGP) sites

Executive Summary

indicate that toxic effects to the benthic aquatic invertebrate *Hyaella azteca* in 28-day laboratory tests are not expected in samples having less than 6.7 and 0.6 TU₃₄, respectively. These data from other sites also demonstrate that sediments samples having more than 32 and 19 TU₃₄ as determined by using the SPME and SFE methods, respectively, are expected to result in reduced *H. azteca* survival. None of the sediment samples collected from Badin Works exceeded the concentrations at which *H. azteca* would be expected to have reduced survival.

The bioavailability and toxicity of PAHs was determined directly in sediment samples from Badin Lake by measuring survival and growth of the aquatic amphipod *H. azteca* and the aquatic midge *Chironomus tentans*. The survival and growth of *H. azteca* were measured in 28-day chronic toxicity tests and the survival and growth of *C. tentans* were measured in 10-day acute toxicity tests. Survival of *H. azteca* and *C. tentans* in the control sediment was 95 ± 8.4 and $92.9 \pm 11.1\%$, respectively. No significant reduction in the survival of amphipods (*H. azteca*) was observed for animals exposed to any of the sediments tested. This included exposures to sediment BL06 which had 1,690 mg/kg total PAH₁₆. The survival of animals exposed to sediment BL06 was $75\% \pm 19\%$. Significantly reduced growth of *H. azteca* was observed in animals exposed to one sediment sample, BL09 (0.13 ± 0.02 mg/organism), compared to the fine-grained field reference sediment, BL21 (0.24 ± 0.07). However, growth of animals exposed to sediment BL09 was not significantly different than the growth observed in animals exposed to the laboratory control sediment (0.19 ± 0.04), and there was no dose-response observed between the concentration of PAHs (total extractable, SPME, or SFE) and organism growth.

No significant reduction in survival of *C. tentans* was observed in 10-day acute toxicity tests compared to the survival of animals exposed to the laboratory control sediment ($92.9 \pm 11\%$). However, a significant reduction in survival was observed for animals exposed to sediment BL11 (62.9 ± 28.1) when compared to the fine-grained field reference sediment BL21 (100 ± 0). No dose response was observed between the concentration of PAHs (total extractable, SPME, or SFE) and organism survival. There were no statistically significant differences in the growth of *C. tentans* exposed to the test sediments during the 10-day acute toxicity test.

This characterization of toxicity and bioavailability of PAHs in aquatic sediments from Badin Lake indicate that the PAHs present in sediment samples do not represent a significant source of toxicity to benthic aquatic organisms. The two analytical methods (SFE and SPME) currently being developed to screen sediment samples for the concentration of bioavailable PAHs accurately predicted the absence of toxicity to both the aquatic amphipod *H. azteca* and aquatic midge *C. tentans*. Sediment samples which have the highest concentrations of TOC are also the same samples which have the highest concentration of heat-stable carbon and highest concentration of total extractable PAHs. The high carbon content present in these sediment samples appears to greatly reduce the bioavailable concentration of PAHs and prevent potential toxicity resulting from PAHs to aquatic life.

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1 Introduction

Alcoa, Inc. sponsored this voluntary research project to assess the bioavailability and toxicity of polycyclic aromatic hydrocarbons (PAHs) associated with Alcoa's Badin Works (an aluminum smelting facility) in sediments of Badin Lake, North Carolina. Previous investigations had determined a small embayment at the south end of the lake contained sediments impacted with PAHs from historical operations at the smelter. The goals of this project were two-fold. First, to determine if the PAHs in the sediments may be bioavailable and toxic to benthic organisms within the sediment, and second, to evaluate whether the measurement of PAHs in sediment pore water using solid phase micro extraction (SPME) or rapidly released PAHs in sediment using supercritical fluid extraction (SFE) could be used to predict PAH bioavailability and toxicity. The project was designed to build upon the information and database for PAH bioavailability and toxicity in freshwater sediments that has been initiated by Alcoa, National Grid, and the Northeast Gas Association.

This assessment of PAH bioavailability and toxicity was conducted following the Project Work Plan (RETEC, 2005) with support by the following principle contractors:

- **Dr. Steven B. Hawthorne – Sediment PAH Availability Chemistry**
Energy and Environment Research Center, University of North Dakota
Grand Forks, ND
- **Dr. Todd Bridges/ Mr. J. Daniel Farr – Aquatic Toxicity Testing**
US Army Engineer Research and Development Center
Vicksburg, MS
- **Dr. Eleanor Hopke – Sediment Cyanide Analysis**
Clarkson University
Potsdam, NY
- **Mr. Dave Dunlap – General Sediment Chemistry**
Severn Trent Laboratories (STL)
Pittsburgh, PA

A description of the field activities performed at the site, the results of the analytical work performed, and interpretation of the data are presented in this report.

2 Field Activities

Twenty-two sediment samples were collected on April 27-28, 2005, from locations having PAH concentrations ranging from 10 to 2,100 mg/kg total PAHs as identified during previous investigation activities conducted by Woodward-Clyde Consultants (WCC) [Woodward-Clyde 1997]. Unless otherwise noted below, the field work was performed using the methods and procedures provided in the project work plans Sediment Sample Collection and Analysis Work Plan for Evaluating PAH Bioavailability (RETEC, 2005) and were consistent with methods specified by the United States Environmental Protection Agency (U.S. EPA, 2001) and the American Society for Testing Materials (ASTM, 2000a; ASTM 2000b).

2.1 Sample Station Location

Figure 2-1 shows the location of each sampling station. Table 2-1 provides the latitude and longitude coordinates of each sampling station and water depth at the time of sample collection. Water depth was measured with a weighted tape measure with an accuracy of 0.1 feet.

Three samples, BL20, BL21, and BL22, were collected as potential far field reference sediment samples for toxicity testing. These samples were located approximately 3 miles northeast of the Badin Smelter site (Figure 2-1). Samples BL20 and BL21 were selected as coarse- and fine-grained field reference samples, respectively.

Field personnel recorded observations of the physical characteristics of the sediment encountered at each sampling station, and also important observations regarding the physical characteristics of the study area. Information recorded included the presence of fill materials at the shoreline; apparent depositional and erosional environment at the station; presence or absence of aquatic vegetation; sediment color, texture and particle size; and odor and presence of sheens or non-aqueous phase liquids (NAPL) [Table 2-1].

2.2 Field Measurements

Water quality was measured in the field at each sample station location (Table 2-2). Two sets of water quality measurements were taken at each station. One measurement was taken near the water surface, approximately 0.5 meter below the water depth, and a second measurement was taken near the bottom, approximately 0.5 meter above the top of the sediment surface. The water quality parameters measured in the field were temperature, salinity, dissolved oxygen (DO), conductivity, and pH.

2.3 Sediment Sample Collection and Processing

Approximately 4 gallons of surface sediment (top 6 inches) were collected from each sample station using a Ponar grab sampler or a trowel/shovel where the water depth above the sediment was less than 2 feet deep and near the shoreline.

At each station, sediments were initially screened with a #3/8-mesh (9.5-cm openings) screen to remove large objects such as cobbles, sticks, or shells. The screened sediments were then placed into a clean, 5-gallon, plastic bucket. The buckets were labeled with the sample station designation and transported to an on-shore sample preparation area where the samples were homogenized by screening to < 4 mm and mixed to ensure the consistency of subsamples sent to each laboratory.

3 Sediment Analyses

3.1 Sample Screening and Selection for Detailed Characterization

Twenty-two sediment samples were collected from the site, including a coarse- and a fine-grained field reference sample. Sediment samples were initially screened for their PAH concentration, total organic carbon (TOC), and heat stable organic carbon (SOC) content. This preliminary data on PAH concentration and the TOC and SOC content was used to guide the selection of a subset of 12 samples for detailed characterization of PAH bioavailability.

The preliminary analysis of the total concentration of sixteen EPA priority pollutant PAHs (PAH₁₆) showed that the samples collected ranged from approximately 0.1 to 901 mg/kg (wet weight), and the concentration of TOC ranged from 0.3% to 42.4%. For samples having total concentrations of PAH₁₆ more than 1.0 mg/kg wet wt, the ratio of parent to total PAH compounds (PAH₁₆/PAH₃₄) was very consistent ranging from 0.63 to 0.84. The ratio of heat stable carbon/TOC varied from 0.19 to 1.00, respectively (Table 3-1).

In addition to a coarse- and fine-grained field reference sample for toxicity testing, BL18 was selected as a near-field reference sediment based on its low concentration total PAH₁₆ (1.8 mg/kg wet wt, Table 3-1) measured by the preliminary analysis of PAHs.

3.2 Analyses and Testing Methods

Table 3-2 provides method references for the testing and the laboratories conducting the analysis. A detailed description of the test methods and rationale is provided in the project work plan.

4 Results and Interpretation

Chain of custody (COC) documents, laboratory results, and field data sheets are included in Appendix A as electronic portable data files (pdf) on compact disc (CD).

4.1 PAH Analyses

Based on the preliminary analysis for PAHs, 12 samples were selected for characterization of PAH bioavailability and toxicity. These samples were selected to have a wide range in total extractable PAHs and were measured to have 0.23 to 1,690 mg/kg total PAH₁₆ (dry wt., Table 4-1a). Samples BL20 and BL21, selected as coarse- and fine-grained field reference samples for toxicity testing, were determined to have 0.23 and 0.76 mg/kg PAH₁₆, respectively. Sample BL18, the sample selected as a near field reference sample, was determined to have 5.2 mg/kg PAH₁₆.

In addition to measuring the concentration of 16 EPA priority pollutant PAHs, samples were analyzed for the concentration of 34 NOAA PAHs (U.S. EPA, 2000) which consist of 18 parent PAHs and 16 groups of alkylated PAHs (PAH₃₄). For sediment samples having concentrations of PAH₁₆ greater than 1.0 mg/kg, the ratio of 16 EPA PAHs to 34 NOAA PAHs (PAH₁₆/PAH₃₄) was low and very consistent ranging from 0.46 to 0.65 (Table 4-1a). These data indicate that the primary source of PAHs in sediments was pyrogenic in origin (i.e. resulting from combustion processes) and consistent with emissions from the smelter and associated carbon plant.

Field observations of NAPL sheens and the presence m/z ions, characteristic of alkanes in the mass spectral analysis of PAHs, indicated that a petrogenic source of hydrocarbons (i.e. resulting from petroleum) may also be present in several sediment samples collected from Badin Lake. However, the NAPL present in some samples did not appear to contribute significantly to the concentration of alkylated PAHs or the toxicity of the sediment (see section 4.6).

The concentration of dissolved PAHs in sediment pore water, measured using SPME, was used as a predictor of PAH bioavailability and toxicity. The mean pore water concentration of PAH₃₄ ranged from below detection to 76.7 µg/L (Table 4-1b). In addition to expressing the dissolved concentration of PAHs in pore in terms of µg/L, the pore water PAH concentration is also expressed in terms of toxic units (TU₃₄) which is the sum of each measured pore water PAH concentration divided by its EPA-derived final chronic value (FCV). A toxic unit (TU) is a hazard quotient that normalizes the measured concentration of PAHs in sediment or pore water to the concentration of PAH expected to result in toxicity to sensitive macroinvertebrates. For a mixture of PAHs, the TUs for individual parent and groups of alkylated PAHs are summed. The total TUs (sum of the TUs for the mixture of 34 PAHs)

measured in pore water by SPME ranged from <0.1 to 11 TU₃₄ (Table 4-1b). Data developed from multiple aluminum industry and manufactured gas plant (MGP) sites indicates that pore water samples having less than approximately 6.7 TU₃₄ are not anticipated to result in significantly reduced survival (> 85% survival) of *H. azteca* and samples having more than 32 TU₃₄ are expected to have near 100% mortality (<15% survival). Additional discussion on the concentration of PAHs measured in sediment pore water and the results of toxicity tests are presented in Section 4.6.

The mean concentration of SFE rapidly released PAHs (PAH₃₄) ranged from 0.05 to 5.48 mg/kg (Table 4-1c). When expressed in terms of toxic units, these samples had SFE rapidly released PAH concentrations ranging from <0.1 to 0.7 TU₃₄ (Table 4-1b). Sediment samples having less than approximately 0.6 TU₃₄, as determined by SFE, are not anticipated to result in significantly reduced survival of *H. azteca* and sediment samples having more than 19 TU₃₄ are expected to have near 100% mortality (<15% survival). Additional discussion on the concentration of rapidly released PAHs measured by SFE and the results of toxicity tests are presented in Section 4.6.

4.2 TOC and Soot Carbon Analyses

TOC and SOC were measured using a CHN elemental analyzer. Heat stable organic carbon is defined as the TOC remaining following pretreatment at 375 °C in a muffle furnace under oxidizing conditions (Table 4-2). Many of the samples had high concentrations of TOC with one sample having a carbon content of 42%. The carbon present in sediment samples having a high TOC content (> 4.0%) or high PAH concentration (> 10 mg/kg PAH₁₆) consisted primarily of heat stable carbon (SOC/TOC ratio > 0.50).

Samples BL20 and BL21, selected as coarse- and fine-grained field reference samples, were determined to have 0.3 and 2.3% TOC, respectively. Sample BL18, the near field reference sample, was determined to have 3.7% TOC.

4.3 General Sediment Characteristics

Additional analyses of sediment grain size, pH, ammonia, and percent solids were also performed (Table 4-2). The complete digital laboratory report from STL is provided in Appendix A.

Sediment grain size varied from predominantly sand with 10-20% silt to silts and clays with less than 10% sand. Samples BL20 and BL21, selected as a coarse- and fine-grained field reference samples were determined to have 88 and 1.1% sand, respectively. Sample BL18, the sample selected as a near field reference sample, was determined to have 51% sand.

The pH of all sediment samples was circum-neutral, between 6.5 and 6.9. Concentrations of ammonia varied from 13 to 109 mg/kg (Table 4-2).

4.4 Cyanide

Total, free, and iron-complexed cyanide was measured in the sediment samples used for toxicity testing. Cyanide is a potential by-product from aluminum smelting operations, and free cyanide is a potential toxicant and confounding factor in the interpretation of toxicity testing results. The complete digital laboratory report from Clarkson University is provided in Appendix A.

The concentration of free cyanide was less than 0.25 mg/kg in all of the sediment samples tested (Table 4-3). The highest concentration of free cyanide (0.50 mg/kg) was measured in the field reference sample, BL21, collected from an unimpacted area of Badin Lake. The aquatic life criterion for free cyanide in water is 5.2 µg/L (U.S. EPA, 1996). The concentration of total cyanide and iron cyanide ranged from <0.05 to 6.6 and <0.006 to 3.8 mg/kg, respectively. Based on these data, no toxicity to aquatic invertebrates was anticipated in laboratory toxicity test.

4.5 Characterization of Sediment Toxicity

The bioavailability and toxicity of PAHs was determined directly by measuring the toxicity of sediment to aquatic amphipods and midges. The survival and growth of the amphipod *H. azteca* was measured in 28-day chronic toxicity tests (Table 4-4a) and the survival and growth of the midge *C. tentans* was measured in 10-day acute toxicity tests (Table 4-4b). The survival and growth of animals exposed to the test sediments was compared to a corresponding coarse-grained (BL20) or fine-grained (BL21) field reference sediment. In addition, a near-field reference sediment (BL18) was used to expose animals to a sediment sample collected from the site which had a low concentration of PAH₁₆ (5.24 mg/kg). All toxicity testing was performed by the U.S. Army Engineer Research and Development Center (ERDC). The complete digital laboratory report from ERDC is provided in Appendix A.

Survival of *H. azteca* and *C. tentans* in the uncontaminated laboratory control sediment (negative control sediment) was 95 ± 8.4 and $92.9 \pm 11.1\%$, respectively. No significant reduction in the survival of amphipods (*H. Azteca*) was observed for animals exposed to any of the test sediments. This included exposure to sediment BL06 which had 1,690 mg/kg total PAH₁₆. The survival of animals exposed to BL06 was $75 \pm 19\%$. Significantly reduced growth of *H. azteca* was observed in animals exposed to one sediment sample, BL09 (0.13 ± 0.02 mg/organism), compared to the fine-grained field reference sediment, BL21 (0.24 ± 0.07). However, growth of animals exposed to sediment BL09 was not significantly different than the growth observed in animals exposed to the laboratory control sediment (0.19

Characterization of the Toxicity and Bioavailability of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake - Badin, North Carolina

± 0.04 , Table 4-4a). The concentration of total PAH₁₆ in sediment sample BL09 was 109 ± 102 mg/kg and the concentration of SFE rapidly available PAH and pore water PAH concentration in BL09 was less than 0.1 TU₃₄ (Tables 4-1b and 4-1c).

No significant reduction in survival of *C. tentans* was observed in 10-day acute toxicity tests compared to the survival of animals exposed to the laboratory control sediment ($92.9 \pm 11\%$). However, a significant reduction in survival was observed for animals exposed to sediment BL11 ($62.9 \pm 28.1\%$) when compared to the fine-grained field reference sediment BL21 ($100 \pm 0\%$). The concentration of total PAH₁₆ in sediment sample BL11 was 80.0 ± 3.2 mg/kg and the concentration of SFE rapidly available PAH and pore water PAH concentration was 0.1 ± 0.1 and 2.2 ± 0.1 TU₃₄, respectively (Tables 4-1b and 4-1c). There were no statistically significant differences in the growth of *C. tentans* exposed to the test sediments during the 10-day acute toxicity test (Table 4-4b).

To evaluate the toxicity of bioavailable PAHs similar to the PAH mixture observed in field collected sediments, a positive control treatment was prepared by adding either a coal tar pitch (Pitch) or fresh coal tar (Tar) solution prepared in acetone to the laboratory control sediment. The final concentration of total extractable PAH₁₆ was 55.6 and 44.3 mg/kg for the pitch- and tar-spiked positive control treatments, respectively (Table 4-5). Upon examination of the distribution of low molecular weight to high molecular weight PAHs, it was apparent that the pitch-spiked positive control sediment was more similar to the contaminated Badin Lake sediment samples (i.e. samples with > 100 mg/kg PAH₁₆) than the distribution of PAHs in the fresh tar-spiked control sediment (Figure 4-1). The tar-spiked control sediment had higher relative concentrations of low molecular weight PAHs (i.e. naphthalenes, acenaphthylene, acenaphthene, and fluorenes) when compared to the field collected sediments.

The survival of amphipods in the pitch-spiked sample was greatly reduced ($6.7 \pm 16.3\%$), while the survival of amphipods was unaffected in the tar-spiked sample (93.3 ± 12.1) (Table 4-4b). In contrast, the survival of chironomids was significantly reduced in both pitch-spiked and tar-spiked control sediments compared to the laboratory control and field reference samples (Table 4-4b).

The lack of toxicity to amphipods in the tar-spiked control sediment was unexpected; however, other researchers have reported an unexpected lack of toxicity to *H. azteca* in sediment samples that were spiked with hydrophobic organic compounds (Call et al. 2001). This lack of toxicity has been attributed to avoidance behavior of *H. azteca* which is an epibenthic species that is able to swim in the water column above the sediments thus potentially reducing its exposure during the toxicity test. In addition, the lack of toxicity

has also been attributed to a loss of the test chemical from dissolution and the daily renewal of the overlying water, as well as volatilization. Low molecular weight PAHs (naphthalenes, acenaphthylene, acenaphthene, and fluorenes) have higher solubility and vapor pressure compared to higher molecular weight PAHs and would be more subject to these losses than higher molecular weight PAHs.

Observations of *H. azteca* swimming above the sediment surface during the tests were noted for the tar-spiked sediment but not the pitch-spiked treatment. Thus it appears that a lack of toxicity in the tar-spiked control sediment may have occurred as a result of the reduced exposure to *H. azteca* and potential loss of the low molecular weight PAHs from volatilization and renewal of the overlying water during the test. The Badin Lake sediment samples were similar in PAH composition to the pitch-spiked control sediment and thus this confounding effect on the interpretation of sediment toxicity test results was not a concern for the test samples. It is also interesting to note that the animals surviving exposure to the tar-spiked sediment were observed to have the highest dry weight (not statistically significant) compared to the other treatments and laboratory control sediments. The increased growth may have resulted from an increase in microbial populations in the tar-spiked sediment samples and a subsequent increase in the nutritional quality of the tar spiked-sediment.

Based on these data, it is recommended that results from *H. azteca* toxicity tests be reviewed with caution when using sediments that have a high concentration of naphthalene and other low molecular weight PAHs. The sediment samples collected from the Badin Lake did not have high concentrations of naphthalene and other low molecular weight PAHs. In addition, avoidance behavior was not observed in the toxicity tests using sediments collected from Badin Lake.

4.6 PAH Concentrations vs. Toxicity

Despite a wide range in concentration of total extractable PAHs and a maximum observed PAH₁₆ concentration of 1,690 mg/kg there was no relationship between the concentration of PAHs and the survival and growth of amphipods or chironomids exposed to Badin Lake sediments (Figures 4-2 and 4-3). No dose response was observed between the concentration of PAHs (total extractable, SPME or SFE) and organism survival or growth. In contrast, sediment spiked with coal tar pitch elicited a toxic response to both amphipods and chironomids at a concentration of only 55.6 mg/kg PAH₁₆.

Amphipods survived exposure to sediment samples having a dissolved concentration of pore water PAHs up to 11 TU₃₄. Previous assessments on the bioavailability of PAHs in sediments collected from other sites have demonstrated that reduced survival of *H. azteca* is not observed in sediment samples having dissolved PAH concentrations in pore water less than

Characterization of the Toxicity and Bioavailability of Polycyclic Aromatic Hydrocarbons in Aquatic Sediments from Badin Lake - Badin, North Carolina

approximately 6.7 TU₃₄ (Figure 4-2b). The concentration of SFE rapidly released PAHs in Badin Lake sediment samples did not exceed 0.7 TU₃₄. Toxicity has not been observed in sediment samples from other sites having less than approximately 0.6 SFE TU₃₄ (Figure 4-2c). These results showing a lack of toxicity in Badin Lake sediment samples are consistent with the previous observations from other MGP and aluminum industry sites.

It appears that anthropogenic sources of carbon are responsible for the low bioavailability and toxicity of PAHs observed in Badin Lake sediments. Sediment samples collected from the site having high concentrations of PAHs were also observed to have the high concentrations of TOC (Figure 4-4). In addition, sediment samples having high concentrations of TOC were also associated with high concentrations of SOC. These data suggest that PAHs in sediments at the site tend to be associated with anthropogenic carbon which has higher sorption capacities compared to natural organic carbon and thus limiting PAH bioavailability and toxicity.

It is interesting to note that alkylated PAHs contribute the majority of toxic units in the calculation of SPME TU₃₄ and SFE TU₃₄. In samples having more than 100 mg/kg total extractable PAH₃₄ (BL05, BL06, BL08, BL09, BL10, BL11, BL12), the alkylated PAHs contribute 53 to 99% of the toxic units in sediment pore water (SPME TU₃₄) and 35 to 95% of the rapidly released toxic units (SFE TU₃₄). This suggests that alkylated PAHs are likely to be the primary contributor to the potential toxicity of sediment samples at primary aluminum smelter sites, despite the dominance of a pyrogenic PAH source signature (PAH₁₆/PAH₃₄ ratio 0.46-0.65; Table 4-1a).

5 Conclusions

This characterization of toxicity and bioavailability of PAHs in aquatic sediments from Badin Lake indicates that the PAHs present in sediment samples do not represent a significant source of toxicity to benthic aquatic organisms. The two analytical methods (SFE and SPME) currently being developed to screen sediment samples for the concentration of bioavailable PAHs accurately predicted the absence of toxicity to both the aquatic amphipod *H. azteca* and aquatic midge *C. tentans*. Sediment samples which have the highest concentrations of TOC are also the same samples which have the highest concentration of heat-stable carbon and highest concentration of total extractable PAHs. The high carbon content present in these sediment samples appears to greatly reduce the bioavailable fraction of PAHs and prevent potential toxicity resulting from the PAHs to aquatic life.

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Tables

TABLE 2-1

**Sediment Contaminant Bioavailability Assessment
Sediment Sample Locations
Alcoa Badin Works Site**

Sample ID	Selected for Detailed Chemical Analysis	GPS Latitude ⁽¹⁾	GPS Longitude ⁽¹⁾	Water Depth (ft)	Field Description
BL01	√	35 24 5223	80 6 8765	19.6	BROWN SILT, some fine-medium gravel and shells, little fine sand and sticks. Trace sheen. No odor.
BL02		35 24 7094	80 6 8918	0.8-1.9	GRAY fine-coarse GRAVEL and organic material, some silt and sand. No sheen. Strong septic-like odor.
BL03		35 24 5189	80 6 8579	24.6	BROWN SILT, trace shells and twigs. No sheen or odor.
BL05	√	35 24 7239	80 6 8410	28.6	GRAYISH-BROWN SILT, trace shells. No sheen or odor.
BL06	√	35 24 7194	80 6 8594	20.9	GRAY and BROWN SILT and fine sand, trace shells. NAPL blebs and sheen. Faint odor.
BL08	√	35 24 5033	80 6 8750	21.2	BROWN SILT, some shells, little fine sand, trace twigs. No sheen or odor.
BL09	√	35 24 8382	80 6 9520	8.0	BROWN SILT, some gravel, trace shells. No sheen or odor.
BL10	√	35 24 7234	80 6 8545	24.8	GRAYISH-BROWN SILT, trace sand and shells. No sheen or odor.
BL11	√	35 24 7401	80 6 8742	23.3	BROWN SILT, some shells, trace fine sand. No sheen or odor.
BL12	√	35 24 7398	80 6 8339	29.3	GRAYISH-BROWN SILT, trace shells. NAPL blebs and sheen. No odor.
BL14	√	35 24 8323	80 6 9254	14.8	BROWN and GRAY SILT, trace gravel and shells. No sheen or odor.
BL15		35 24 8217	80 6 8940	20.1	BROWN SILT, some shells, wood and sticks. No sheen or odor.
BL16		35 24 8392	80 6 8938	17.8	BROWN SAND and Silt, some gravel and shells. No sheen or odor.
BL17		35 24 9056	80 6 8954	3.2	BROWN and GRAY fine-medium GRAVEL, some shells, little medium-coarse sand. No sheen or odor.
BL18	√	35 24 9044	80 6 9027	5.1	BROWN GRAVEL, some shells, little silt and sticks. No sheen or odor.
BL19		35 24 8884	80 6 8801	12.7	BROWN coarse-fine GRAVEL, little sand, silt and shells. No sheen or odor.
BL20	√	35 26 0087	80 5 0461	0.0	REDDISH-BROWN fine-medium GRAVEL, some fine-coarse sand, little wood and shells, trace black organic material. No sheen or odor.
BL21	√	35 26 2671	80 5 0169	36.8	BROWN SILT. No sheen. Organic odor.
BL22		35 26 7644	80 5 2386	2.8	BROWN SAND and SILT, some shells and sticks, little gravel. No sheen. Organic odor.

⁽¹⁾GPS coordinates are in WGS 1984 Degrees, Minutes, Decimal-Seconds.

TABLE 2-2

**Sediment Contaminant Bioavailability Assessment
Water Quality Measurements
Alcoa Badin Works Site**

Sample Station Designation	Water Column Position	Temperature Degrees Celcius	Salinity (ppt)	Dissolved Oxygen (mg/L)	Conductivity (umhos)	pH
BL01	near surface	17.2	0.0	8.6	0.6	6.8
	near bottom	16.6	0.0	8.2	0.6	6.8
BL02	near surface	17.8	0.0	7.9	0.1	6.7
BL03	near surface	17.2	0.0	8.9	0.1	6.9
	near bottom	16.3	0.0	8.1	0.1	6.8
BL05	near surface	16.7	0.0	7.8	0.1	6.5
	near bottom	15.7	0.0	6.7	0.1	6.5
BL06	near surface	17.1	0.0	8.6	0.1	6.9
	near bottom	16.1	0.0	8.1	0.1	6.8
BL08	near surface	17.6	0.0	9.0	0.1	6.8
	near bottom	16.7	0.0	8.4	0.1	6.8
BL09	near surface	16.2	0.0	8.2	0.1	6.3
	near bottom	15.8	0.0	7.9	0.1	6.3
BL10	near surface	16.7	0.0	8.6	0.1	6.9
	near bottom	16.0	0.0	7.7	0.1	6.7
BL11	near surface	17.1	0.0	8.5	0.1	6.9
	near bottom	16.0	0.0	7.9	0.1	6.7
BL12	near surface	16.6	0.0	8.0	0.1	6.8
	near bottom	16.0	0.0	7.8	0.1	6.7
BL14	near surface	16.0	0.0	7.8	0.1	6.1
	near bottom	15.6	0.0	7.5	0.1	6.2
BL15	near surface	16.2	0.0	8.0	0.1	6.3
	near bottom	15.9	0.0	7.7	0.1	6.4
BL16	near surface	16.2	0.0	8.1	0.1	6.5
	near bottom	16.0	0.0	7.7	0.1	6.5
BL17	near surface	16.2	0.0	8.5	0.1	6.6
BL18	near surface	15.8	0.0	8.0	0.1	6.3
	near bottom	15.8	0.0	7.9	0.1	6.3
BL19	near surface	16.2	0.0	8.4	0.1	6.6
	near bottom	16.0	0.0	8.2	0.1	6.6
BL20	near surface	NA	NA	NA	NA	NA
BL21	near surface	16.4	0.0	8.0	0.1	6.2
	near bottom	15.8	0.0	7.3	0.1	6.2
BL22	near surface	16.3	0.0	8.0	0.1	6.4

NA - Insufficient amount of water present to obtain measurements.

TABLE 3-1

**Sediment Contaminant Bioavailability Assessment
Sediment Screening Data
Alcoa Badin Works Site**

Sample ID	Selected For Detailed Chemical Analysis	Total PAH ₁₆ ⁽¹⁾	Total PAH ₃₄ ⁽²⁾	Ratio PAH ₁₆ /PAH ₃₄	Total Organic Carbon	Soot Carbon	Ratio Soot/Total Carbon
		mg/kg Wet Wt.	mg/kg Wet Wt.		Dry Wt. %	Dry Wt. %	Soot/TOC
BL01	√	33.5	49.6	0.68	6.0	5.2	0.87
BL02		117	160	0.73	15.2	9.9	0.65
BL03		40.4	58.5	0.69	9.6	8.1	0.84
BL05	√	83.1	143	0.58	9.0	7.3	0.81
BL06	√	901	1390	0.65	42.4	39.7	0.94
BL08	√	352	475	0.74	32.2	32.1	1.00
BL09	√	27.9	37.8	0.74	10.9	12.0	1.10
BL10	√	152	223	0.68	12.2	10.3	0.84
BL11	√	54.3	85.5	0.63	4.8	3.3	0.69
BL12	√	44.8	66.6	0.67	4.4	2.9	0.65
BL14	√	16.3	21.7	0.75	5.0	2.6	0.52
BL15		9.3	12.5	0.74	3.0	1.1	0.35
BL16		4.0	6.2	0.64	1.4	0.3	0.19
BL17		1.7	2.0	0.84	0.7	0.2	0.31
BL18	√	1.2	1.5	0.81	3.7	0.7	0.18
BL19		3.5	4.3	0.81	3.5	0.7	0.19
BL20	√	0.1	0.1	1.00	0.3	0.2	0.50
BL21	√	0.3	0.4	0.72	2.3	0.2	0.09
BL22		0.1	0.2	0.53	2.2	0.1	0.03

⁽¹⁾ Sum of 16 EPA priority pollutant PAHs noted below with an asterisk. ⁽²⁾ Sum of 34 PAHs includes 18 parent and 16 groups of alkylated PAHs: naphthalene*, C1 naphthalenes, C2 naphthalenes, C3 naphthalenes, C4 naphthalenes, acenaphthylene*, acenaphthene*, fluorene*, C1 fluorenes, C2 fluorenes, C3 fluorenes, phenanthrene*, anthracene*, C1 phenanthrenes/anthracenes, C2 phenanthrenes/anthracenes, C3 phenanthrenes/anthracenes, C4 phenanthrenes/anthracenes, fluoranthene*, pyrene*, C1 fluoranthenes/pyrenes, benz[a]anthracene*, chrysene*, C1 chrysenes, C2 chrysenes, C3 chrysenes, C4 chrysenes, benzo[b+k]fluoranthene*, benzo[e]pyrene, benzo[a]pyrene*, perylene, indeno[1,2,3-cd]pyrene*, dibenz[ah]anthracene*, benzo[ghi]perylene*.

TABLE 3-2
Sediment Contaminant Bioavailability Assessment
Analytical Testing Program
Alcoa Badin Works Site

Sample Type	Matrix	Parameter	Purpose	Quantity	Laboratory ¹
Initial Characterization	Sediment	PAH Screen - PAHs parent & alkylated (34 compounds) Total Organic Carbon Soot Carbon	Data to be used to select samples for detailed characterization	22	EERC
Bioavailability Characterization	Sediment	Amphipod toxicity (<i>Hyalella azteca</i>) 28-day chronic test	Direct Measurement of PAH bioavailability	13: 10 field samples, 2 reference samples, 1 positive control	ERDC
		Midge toxicity (<i>Chironomus tentans</i>) 10-day chronic test			
Chemical/Physical Characterization	Sediment	Total and rapidly available PAHs (parent & alkylated 34 compounds)	Chemical test for estimating bioavailability	12	EERC
		Total Solids	General sediment characteristics potential confounding factors affecting interpretation of toxicity data	12	STL
		Grain size			
		pH			
		Ammonia			
	Pore Water	Cyanide - total, free, and iron (Fe)-complexed	Potential confounding factors	12	CLKU
		Dissolved Organic Carbon (DOC)	Chemical test for estimating bioavailability	12	EERC
Field Measurement	Surface Water	Freely dissolved PAHs (parent compounds and estimate of alkylated)	General environmental quality parameters	22	YSI 6820 Field Meter
		Temperature			
		pH			
		Dissolved oxygen			
		Conductivity			
		Salinity			
		Turbidity			

Note 1. EERC - Energy & Environment Research Center
ERDC - Army Engineering Research and Development Center
STL - Severn Trent Laboratories, Inc., Burlington, VT
CLKU - Clarkson University

TABLE 4-1a

Sediment Contaminant Bioavailability Alliance
Total PAH Concentrations
Alcoa Badin Works Site

Sediment PAHs (mg/kg)	BL01			BL06			BL06			BL08			BL09			BL10		
	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N
naphthalene	0.14	0.02	4	0.26	0.04	4	2.64	0.38	4	0.58	0.10	4	0.72	0.49	4	0.40	0.03	4
2-methylnaphthalene	0.12	0.02	4	0.19	0.01	4	1.91	0.29	4	0.37	0.11	4	0.45	0.27	4	0.35	0.02	4
1-methylnaphthalene	0.07	0.01	4	0.15	0.01	4	1.30	0.19	4	0.23	0.07	4	0.26	0.22	4	0.21	0.01	4
C2 naphthalenes	0.56	0.05	4	3.38	0.69	4	10.0	1.69	4	1.32	0.17	4	1.08	0.76	4	1.99	0.09	4
C3 naphthalenes	0.29	0.04	4	4.42	0.65	4	8.84	1.83	4	0.79	0.07	4	0.48	0.34	4	2.00	0.11	4
C4 naphthalenes	0.22	0.02	4	2.20	0.57	4	3.89	0.75	4	0.44	0.02	4	0.19	0.07	4	1.00	0.10	4
acenaphthylene	0.08	0.02	4	0.12	0.01	4	0.50	0.04	4	0.29	0.01	4	0.11	0.07	4	0.15	0.01	4
acenaphthene	0.20	0.05	4	0.84	0.08	4	10.2	0.75	4	2.21	0.20	4	0.80	0.76	4	1.59	0.03	4
fluorene	0.17	0.03	4	0.59	0.06	4	8.07	0.89	4	1.71	0.15	4	0.70	0.68	4	1.26	0.02	4
C1 fluorines	0.41	0.09	4	1.35	0.22	4	8.88	0.91	4	2.08	0.24	4	0.82	0.77	4	1.47	0.11	4
C2 fluorines	0.31	0.05	4	2.60	0.70	4	7.12	0.74	4	1.34	0.12	4	0.40	0.28	4	1.46	0.09	4
C3 fluorines	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
phenanthrene	1.90	0.30	4	7.41	0.55	4	84.9	9.21	4	29.1	3.10	4	8.58	7.48	4	13.3	0.14	4
anthracene	0.98	0.11	4	2.69	0.25	4	34.0	3.80	4	11.2	1.39	4	2.81	2.38	4	5.89	0.22	4
C1 phenanthrenes/anthracenes	2.33	0.38	4	7.55	1.12	4	62.7	5.81	4	19.3	1.88	4	7.25	5.68	4	11.6	0.32	4
C2 phenanthrenes/anthracenes	1.46	0.19	4	22.0	5.62	4	56.1	5.27	4	19.6	1.89	4	5.86	3.95	4	33.8	2.24	4
C3 phenanthrenes/anthracenes	1.85	0.43	4	33.7	9.68	4	60.6	8.37	4	9.96	0.85	4	2.28	1.62	4	41.3	6.27	4
C4 phenanthrenes/anthracenes	1.05	0.23	4	19.2	6.30	4	66.9	15.5	4	6.61	0.23	4	0.71	0.48	4	13.0	2.51	4
fluoranthene	4.83	0.73	4	22.0	1.30	4	187	18.2	4	84.0	11.0	4	12.4	11.0	4	37.5	0.48	4
pyrene	4.25	0.67	4	20.6	1.21	4	169	14.5	4	83.3	9.54	4	9.73	8.70	4	33.9	0.55	4
C1 fluoranthenes/pyrenes	3.34	0.32	4	22.5	2.59	4	214	16.7	4	82.6	9.58	4	47.0	50.0	4	48.0	1.59	4
benz[a]anthracene	3.06	0.34	4	16.2	0.94	4	133	13.0	4	66.1	7.88	4	8.25	8.00	4	26.4	0.53	4
chrysene	6.56	1.54	4	20.3	0.86	4	161	13.9	4	75.8	9.26	4	10.3	8.80	4	33.3	0.72	4
C1 chrysenes	7.90	1.96	4	42.9	2.32	4	319	23.1	4	119	12.7	4	23.1	19.7	4	72.0	3.10	4
C2 chrysenes	4.67	1.66	4	33.7	5.40	4	212	24.0	4	47.3	7.51	4	11.0	8.89	4	43.6	4.61	4
C3 chrysenes	4.89	2.53	4	27.3	3.73	4	178	34.3	4	24.0	2.23	4	ND	ND	4	30.4	3.68	4
C4 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[b]fluoranthene	9.18	1.59	4	33.6	1.98	4	263	14.6	4	123	14.5	4	16.9	15.8	4	50.8	1.15	4
benzo[e]pyrene	2.87	0.93	4	11.2	0.74	4	104	6.29	4	49.3	5.82	4	5.38	4.24	4	12.7	0.52	4
benzo[a]pyrene	5.80	0.48	4	20.4	1.34	4	158	8.05	4	68.1	7.33	4	12.1	13.4	4	35.2	1.49	4
perylene	2.74	0.39	4	8.84	0.46	4	52.4	3.78	4	23.9	2.24	4	3.74	3.82	4	10.7	0.26	4
indeno[1,2,3-cd]pyrene	4.17	0.47	4	36.4	4.03	4	289	22.6	4	111	13.5	4	13.9	17.1	4	53.4	4.57	4
dibenz[ah]anthracene	3.23	0.33	4	9.96	1.33	4	65.1	5.96	4	25.2	3.27	4	4.14	4.73	4	14.7	1.67	4
benzo[ghi]perylene	3.26	0.40	4	16.4	1.10	4	135	9.93	4	51.7	6.00	4	7.46	8.06	4	27.0	0.73	4
Total PAH ₁₆ (mg/kg)	47.6	5.88	4	208	13.7	4	1690	129	4	743	85.8	4	109	102	4	335	6.91	4
Total PAH ₁₄ (mg/kg)	82.7	14.7	4	451	46.7	4	3060	207	4	1150	129	4	219	189	4	681	16.2	4
Ratio PAH ₁₆ /PAH ₁₄	0.58	0.03	4	0.46	0.03	4	0.55	0.02	4	0.65	0.00	4	0.48	0.03	4	0.51	0.02	4
Toxic Units (TU ₁₄)	1.7	0.3	4	6.2	0.8	4	8.9	0.6	4	4.5	0.5	4	2.6	2.3	4	6.7	0.1	4

ND - Non detected

TABLE 4-1a

Sediment Contaminant Bioavailability Alliance
Total PAH Concentrations
Alcoa Badin Works Site

Sediment PAH's (mg/kg)	BL11			BL12			BL14			BL18			BL20			BL21		
	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N	Mean	Std Dev.	N
naphthalene	0.12	0.01	3	1.05	1.75	4	0.35	0.31	4	0.03	0.01	4	0.02	0.00	4	0.06	0.00	4
2-methylnaphthalene	0.11	0.01	3	0.73	1.25	4	0.19	0.08	4	0.01	0.00	4	0.01	0.00	4	0.02	0.00	4
1-methylnaphthalene	0.06	0.01	3	0.41	0.70	4	0.10	0.05	4	0.01	0.00	4	0.00	0.00	4	0.01	0.00	4
C2 naphthalenes	1.01	0.05	3	1.65	2.23	4	0.81	0.13	4	0.18	0.04	4	0.08	0.01	4	0.64	0.13	4
C3 naphthalenes	0.81	0.26	3	0.77	0.96	4	0.38	0.05	4	0.09	0.02	4	0.05	0.01	4	0.20	0.07	4
C4 naphthalenes	0.84	0.25	3	0.30	0.23	4	0.23	0.09	4	0.10	0.02	4	0.05	0.01	4	0.18	0.03	4
acenaphthylene	0.09	0.03	3	0.11	0.08	4	0.16	0.01	4	0.02	0.01	4	0.01	0.00	4	0.13	0.11	4
acenaphthene	0.32	0.01	3	5.45	10.2	4	0.25	0.21	4	0.03	0.03	4	0.01	0.00	4	0.02	0.01	4
fluorene	0.23	0.03	3	4.45	8.34	4	0.20	0.14	4	0.03	0.03	4	0.01	0.00	4	0.02	0.00	4
C1 fluorenes	1.17	0.02	3	2.04	3.29	4	0.41	0.08	4	0.13	0.01	4	0.09	0.01	4	0.24	0.00	4
C2 fluorenes	1.24	0.25	3	0.91	1.15	4	0.27	0.07	4	0.21	0.03	4	0.22	0.04	4	0.87	0.26	4
C3 fluorenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
phenanthrene	2.89	0.10	3	30.4	54.1	4	2.12	1.21	4	0.28	0.27	4	0.05	0.01	4	0.11	0.01	4
anthracene	1.35	0.07	3	22.5	41.4	4	0.64	0.26	4	0.11	0.10	4	0.01	0.00	4	0.04	0.01	4
C1 phenanthrenes/anthracenes	3.21	0.03	3	19.5	32.4	4	1.53	0.43	4	0.25	0.12	4	0.12	0.02	4	0.22	0.03	4
C2 phenanthrenes/anthracenes	3.73	0.57	3	8.37	12.0	4	1.13	0.31	4	0.42	0.13	4	2.87	0.08	4	4.18	0.06	4
C3 phenanthrenes/anthracenes	6.63	1.51	3	6.72	6.56	4	0.76	0.16	4	0.33	0.06	4	0.23	0.01	4	0.44	0.10	4
C4 phenanthrenes/anthracenes	3.31	1.03	3	3.21	2.04	4	0.36	0.17	4	0.08	0.01	4	0.14	0.02	4	0.49	0.32	4
fluoranthene	8.40	0.17	3	42.0	67.7	4	3.71	1.45	4	0.55	0.45	4	0.03	0.01	4	0.05	0.01	4
pyrene	7.52	0.21	3	39.4	64.1	4	3.21	1.18	4	0.48	0.40	4	0.02	0.00	4	0.06	0.03	4
C1 fluoranthenes/pyrenes	6.67	0.38	3	40.8	68.2	4	2.39	0.69	4	0.38	0.30	4	0.03	0.01	4	0.09	0.03	4
benzofluoranthene	6.30	0.20	3	31.8	52.2	4	2.32	0.70	4	0.39	0.33	4	0.00	0.00	4	0.02	0.00	4
chrysene	8.52	0.21	3	42.3	67.7	4	3.15	0.79	4	0.53	0.39	4	0.01	0.00	4	0.04	0.01	4
C1 chrysenes	15.2	1.35	3	41.5	57.3	4	4.51	1.12	4	0.76	0.63	4	0.02	0.00	4	0.10	0.00	4
C2 chrysenes	10.8	1.54	3	20.4	18.7	4	2.18	0.53	4	0.40	0.32	4	ND	ND	ND	0.06	0.04	4
C3 chrysenes	13.9	7.30	3	14.6	10.2	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[b+k]fluoranthene	14.6	0.61	3	54.4	78.3	4	6.75	1.41	4	1.16	0.82	4	0.02	0.01	4	0.08	0.01	4
benzofluoranthene	5.25	0.36	3	12.2	16.0	4	2.92	0.55	4	0.51	0.34	4	0.01	0.00	4	0.03	0.01	4
benzofluoranthene	8.99	0.54	3	56.7	89.4	4	2.67	0.69	4	0.63	0.54	4	0.01	0.01	4	0.04	0.00	4
perylene	5.76	0.24	3	19.8	26.3	4	1.81	0.26	4	0.33	0.19	4	0.00	0.00	4	2.58	0.05	4
indeno[1,2,3-cd]pyrene	11.1	1.24	3	96.2	165	4	2.68	0.70	4	0.48	0.39	4	0.01	0.00	4	0.04	0.01	4
dibenz[ah]anthracene	3.76	0.23	3	33.0	57.5	4	0.70	0.15	4	0.11	0.09	4	0.00	0.00	4	0.01	0.00	4
benzo[ghi]perylene	5.82	0.32	3	30.9	50.2	4	2.19	0.53	4	0.42	0.33	4	0.01	0.00	4	0.03	0.00	4
Total PAH ₁₆ (mg/kg)	80.0	3.21	3	491	809	4	31.1	9.62	4	5.24	4.00	4	0.23	0.05	4	0.76	0.16	4
Total PAH ₁₈ (mg/kg)	160	6.27	3	685	1060	4	51.1	14.0	4	9.43	6.09	4	4.15	0.19	4	11.1	0.68	4
Ratio PAH ₁₆ /PAH ₁₈	0.50	0.03	3	0.61	0.14	4	0.61	0.02	4	0.51	0.10	4	0.05	0.01	4	0.07	0.01	4
Toxic Units (TU ₁₆)	4.1	0.1	3	20.1	31.5	4	1.3	0.4	4	0.3	0.2	4	2.1	0.1	4	0.8	0.0	4

ND - Non detected

TABLE 4-1b

Sediment Contaminant Bioavailability Alliance
 Porewater PAH Concentrations
 Alcoa Badin Works Site

Sediment SPME Porewater PAHs (pp/L)	BL01			BL05			BL06			BL08			BL09			BL10		
	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N
naphthalene	0.096	0.045	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.064	0.049	4
2-methylnaphthalene	0.014	0.003	4	0.043	0.001	4	0.031	0.003	4	0.009	0.002	4	ND	ND	ND	0.015	0.007	4
1-methylnaphthalene	0.012	0.003	4	0.415	0.008	4	0.260	0.007	4	0.014	0.002	4	ND	ND	ND	0.016	0.010	4
C2 naphthalenes	ND	ND	ND	20.48	1.189	4	8.380	0.647	4	0.654	0.153	4	ND	ND	ND	2.927	0.325	4
C3 naphthalenes	ND	ND	ND	28.08	1.794	4	10.80	1.158	4	0.244	0.010	4	ND	ND	ND	1.919	0.342	4
C4 naphthalenes	ND	ND	ND	12.18	1.016	4	6.177	0.949	4	0.008	0.001	4	ND	ND	ND	1.565	0.335	4
acenaphthylene	0.006	0.003	4	0.145	0.012	4	0.075	0.006	4	0.008	0.001	4	ND	ND	ND	0.023	0.003	4
acenaphthene	0.057	0.002	4	0.340	0.007	4	0.342	0.017	4	0.276	0.016	4	ND	ND	ND	0.201	0.029	4
fluorene	0.014	0.004	4	0.145	0.003	4	0.122	0.003	4	0.039	0.005	4	ND	ND	ND	0.027	0.004	4
C1 fluorenes	ND	ND	ND	1.469	0.031	4	0.653	0.050	4	0.128	0.012	4	ND	ND	ND	0.248	0.031	4
C2 fluorenes	ND	ND	ND	3.617	0.345	4	1.871	0.248	4	ND	ND	ND	ND	ND	ND	0.895	0.037	4
C3 fluorenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
phenanthrene	0.031	0.002	4	0.379	0.004	4	0.531	0.018	4	0.119	0.003	4	ND	ND	ND	0.119	0.021	4
anthracene	0.010	0.001	4	0.099	0.003	4	0.128	0.007	4	0.045	0.002	4	ND	ND	ND	0.058	0.011	4
C1 phenanthrenes/anthracenes	ND	ND	ND	2.012	0.047	4	1.246	0.063	4	0.139	0.014	4	ND	ND	ND	0.212	0.034	4
C2 phenanthrenes/anthracenes	ND	ND	ND	3.176	0.112	4	1.798	0.200	4	0.103	0.012	4	ND	ND	ND	0.376	0.049	4
C3 phenanthrenes/anthracenes	ND	ND	ND	1.841	0.084	4	1.135	0.159	4	ND	ND	ND	ND	ND	ND	0.374	0.067	4
C4 phenanthrenes/anthracenes	ND	ND	ND	0.840	0.072	4	0.394	0.069	4	ND	ND	ND	ND	ND	ND	0.393	0.044	4
fluoranthene	0.064	0.004	4	0.274	0.003	4	0.501	0.015	4	0.510	0.049	4	ND	ND	ND	0.305	0.053	4
pyrene	0.066	0.002	4	0.311	0.004	4	0.457	0.012	4	0.428	0.035	4	ND	ND	ND	0.293	0.051	4
C1 fluoranthenes/pyrenes	ND	ND	ND	0.774	0.022	4	0.783	0.024	4	0.595	0.018	4	ND	ND	ND	0.561	0.038	4
benz[a]anthracene	0.003	0.001	4	0.019	0.001	4	0.036	0.002	4	0.031	0.004	4	ND	ND	ND	0.016	0.005	4
chrysene	0.013	0.001	4	0.037	0.001	4	0.067	0.002	4	0.055	0.005	4	ND	ND	ND	0.035	0.008	4
C1 chrysenes	ND	ND	ND	0.034	0.001	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.021	0.007	4
C2 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[b-k]fluoranthene	ND	ND	ND	0.006	0.002	4	0.014	0.002	4	0.021	0.003	4	ND	ND	ND	0.007	0.002	4
benzo[e]pyrene	ND	ND	ND	0.008	0.002	4	0.020	0.004	4	0.015	0.002	4	ND	ND	ND	0.007	0.002	4
benzo[a]pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012	0.002	4	ND	ND	ND	ND	ND	ND
perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
indeno[1,2,3-cd]pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibenz[ah]anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benz[ghi]perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SPME PAH ₁₄ (mg/kg)	0.35	0.05	4	1.71	0.01	4	2.27	0.06	4	1.543	0.124	4	ND	ND	ND	1.17	0.15	4
SPME PAH ₁₆ (mg/kg)	0.38	0.05	4	76.7	4.51	4	35.6	3.22	4	3.445	0.260	4	ND	ND	ND	10.7	1.32	4
SPME Toxic Units (TU ₁₄)	0.02	0.00	4	0.14	0.00	4	0.23	0.00	4	0.214	0.019	4	ND	ND	ND	0.12	0.02	4
SPME Toxic Units (TU ₁₆)	0.03	0.00	4	11.28	0.70	4	5.91	0.61	4	0.457	0.029	4	ND	ND	ND	2.26	0.27	4
SPME TU ₁₄ /SPME TU ₁₆	0.99	0.00	4	0.01	0.00	4	0.04	0.00	4	0.469	0.013	4	ND	ND	ND	0.05	0.01	4

ND - Not detected

TABLE 4-1b
Sediment Contaminant Bioavailability Alliance
Porewater PAH Concentrations
Alcoa Badin Works Site

Sediment SPME Porewater PAHs (µg/L)	BL11			BL12			BL14			BL18			BL20			BL21		
	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N
naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-methylnaphthalene	0.011	0.003	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-methylnaphthalene	0.014	0.005	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015	0.003	4	ND	ND	ND
C2 naphthalenes	0.702	0.117	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 naphthalenes	2.650	0.067	4	0.115	0.021	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 naphthalenes	2.211	0.114	4	0.230	0.056	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
acenaphthylene	0.017	0.006	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.011	0.002	4	ND	ND	ND
acenaphthene	0.083	0.009	4	0.010	0.003	4	ND	ND	ND	ND	ND	ND	0.029	0.008	4	ND	ND	ND
fluorene	0.008	0.003	4	ND	ND	ND	ND	ND	ND	0.012	0.004	4	0.018	0.006	4	ND	0.006	4
C1 fluorines	0.246	0.031	4	0.059	0.013	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2 fluorines	0.988	0.097	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 fluorines	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
phenanthrene	0.103	0.007	4	0.009	0.002	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
anthracene	0.040	0.004	4	0.004	0.001	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	0.000	4
C1 phenanthrenes/anthracenes	0.425	0.041	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2 phenanthrenes/anthracenes	0.709	0.082	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 phenanthrenes/anthracenes	0.434	0.022	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 phenanthrenes/anthracenes	0.178	0.037	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
fluoranthene	0.255	0.024	4	0.060	0.002	4	0.012	0.001	4	0.002	0.001	4	0.004	0.002	4	ND	ND	ND
pyrene	0.240	0.020	4	0.069	0.003	4	0.011	0.001	4	0.001	0.001	4	0.003	0.002	4	ND	ND	ND
C1 fluoranthenes/pyrenes	0.589	0.029	4	0.048	0.004	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[a]anthracene	0.015	0.003	4	0.004	0.000	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
chrysene	0.036	0.004	4	0.011	0.000	4	ND	ND	ND	0.000	0.000	4	ND	ND	ND	ND	ND	ND
C1 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C2 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C3 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[b+k]fluoranthene	0.010	0.001	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[e]pyrene	0.009	0.002	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[a]pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
indeno[1,2,3-cd]pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
dibenz[ah]anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[ghi]perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SPME PAH ₁₆ (mg/kg)	0.81	0.07	4	0.17	0.01	4	0.02	0.00	4	0.02	0.01	4	0.07	0.02	4	0.03	0.01	4
SPME PAH ₁₆ (mg/kg)	9.97	0.57	4	0.62	0.07	4	0.02	0.00	4	0.02	0.01	4	0.08	0.02	4	0.03	0.01	4
SPME Toxic Units (TU ₁₆)	0.11	0.01	4	0.02	0.00	4	0.00	0.00	4	0.00	0.00	4	0.00	0.00	4	0.00	0.00	4
SPME Toxic Units (TU ₁₆)	2.19	0.10	4	0.10	0.02	4	0.00	0.00	4	0.00	0.00	4	0.00	0.00	4	0.00	0.00	4
SPME TU ₁₆ /SPME TU ₁₆	0.05	0.00	4	0.23	0.04	4	1.00	0.00	4	1.00	0.00	4	0.90	0.03	4	1.00	0.00	4

ND - Non detected

TABLE 4-1c
Sediment Contaminant Bioavailability Alliance
SFE PAH Concentrations
Alcoa Badin Works Site

Sediment SFE PAHs (mg/kg)	BL01			BL05			BL06			BL08			BL09			BL10		
	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N
naphthalene	0.007	0.002	4	0.005	0.002	4	0.031	0.023	4	0.008	0.005	4	0.007	0.002	4	0.009	0.002	4
2-methylnaphthalene	0.003	0.001	4	0.002	0.001	4	0.026	0.013	4	0.004	0.000	4	0.003	0.001	4	0.004	0.002	4
1-methylnaphthalene	0.003	0.001	4	0.004	0.002	4	0.031	0.014	4	0.003	0.001	4	0.002	0.001	4	0.003	0.001	4
C2 naphthalenes	0.052	0.001	4	0.213	0.119	4	0.719	0.404	4	0.037	0.005	4	ND	ND	ND	0.086	0.028	4
C3 naphthalenes	0.016	0.003	4	0.407	0.222	4	0.873	0.588	4	0.019	0.004	4	ND	ND	ND	0.127	0.054	4
C4 naphthalenes	0.010	0.003	4	0.242	0.146	4	0.383	0.264	4	ND	ND	ND	ND	ND	ND	0.072	0.048	4
acenaphthylene	0.002	0.000	4	0.001	0.001	4	0.006	0.002	4	0.002	0.001	4	0.001	0.000	4	0.003	0.002	4
acenaphthene	0.004	0.001	4	0.006	0.003	4	0.084	0.039	4	0.024	0.014	4	0.004	0.001	4	0.013	0.004	4
fluorene	0.004	0.001	4	0.005	0.003	4	0.056	0.031	4	0.017	0.009	4	0.003	0.001	4	0.008	0.002	4
C1 fluorines	0.009	0.005	4	0.072	0.046	4	0.193	0.109	4	0.020	0.009	4	ND	ND	ND	0.032	0.019	4
C2 fluorines	0.019	0.009	4	0.249	0.158	4	0.375	0.237	4	ND	ND	ND	ND	ND	ND	0.066	0.042	4
C3 fluorines	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
phenanthrene	0.026	0.012	4	0.033	0.022	4	0.465	0.247	4	0.181	0.117	4	0.024	0.011	4	0.065	0.032	4
anthracene	0.010	0.002	4	0.012	0.008	4	0.179	0.091	4	0.059	0.040	4	0.008	0.004	4	0.030	0.013	4
C1 phenanthrenes/anthracenes	0.041	0.009	4	0.310	0.190	4	0.792	0.513	4	0.088	0.049	4	0.021	0.009	4	0.099	0.059	4
C2 phenanthrenes/anthracenes	0.026	0.010	4	2.053	1.327	4	2.084	1.422	4	0.090	0.041	4	0.019	0.007	4	0.999	0.741	4
C3 phenanthrenes/anthracenes	0.034	0.013	4	3.453	2.383	4	3.457	2.086	4	0.066	0.036	4	ND	ND	ND	2.189	1.414	4
C4 phenanthrenes/anthracenes	0.057	0.035	4	1.939	1.388	4	4.267	2.300	4	0.062	0.026	4	0.001	0.000	3	0.872	0.450	4
fluoranthene	0.039	0.019	4	0.092	0.066	4	0.924	0.425	4	0.467	0.297	4	0.024	0.013	4	0.190	0.081	4
pyrene	0.037	0.017	4	0.114	0.078	4	0.815	0.374	4	0.374	0.240	4	0.020	0.010	4	0.165	0.067	4
C1 fluoranthenes/pyrenes	0.022	0.007	4	0.374	0.260	4	1.377	0.694	4	0.282	0.192	4	0.058	0.034	4	0.228	0.105	4
benz[a]anthracene	0.025	0.019	4	0.058	0.041	4	0.442	0.200	4	0.221	0.152	4	0.013	0.007	4	0.102	0.029	4
chrysene	0.080	0.049	4	0.114	0.078	4	0.662	0.290	4	0.284	0.189	4	0.023	0.013	4	0.189	0.071	4
C1 chysenes	0.127	0.034	4	0.751	0.522	4	1.974	0.943	4	0.289	0.190	4	0.038	0.022	4	0.575	0.213	4
C2 chysenes	ND	ND	ND	1.398	1.086	4	3.395	1.633	4	ND	ND	ND	ND	ND	ND	0.726	0.327	4
C3 chysenes	ND	ND	ND	1.525	1.145	4	4.425	2.072	4	ND	ND	ND	ND	ND	ND	ND	ND	ND
C4 chysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzo[b,k]fluoranthene	0.059	0.041	4	0.085	0.056	4	0.823	0.332	4	0.341	0.201	4	0.028	0.018	4	0.186	0.053	4
benzofluoranthene	0.026	0.017	4	0.043	0.027	4	0.349	0.144	4	0.110	0.067	4	0.011	0.006	4	0.071	0.018	4
benzofluoranthene	0.037	0.026	4	0.040	0.024	4	0.357	0.147	4	0.128	0.081	4	0.029	0.012	4	0.087	0.022	4
perylene	0.023	0.014	4	0.022	0.013	4	0.119	0.052	4	0.037	0.023	4	0.009	0.007	4	0.039	0.010	4
indeno[1,2,3-cd]pyrene	ND	ND	ND	0.015	0.013	4	0.378	0.168	4	0.083	0.062	4	0.008	0.006	4	0.043	0.010	4
dibenz[ah]anthracene	ND	ND	ND	0.013	0.008	4	0.093	0.039	4	0.019	0.012	4	0.007	0.005	3	0.034	0.006	4
benzofluoranthene	ND	ND	ND	0.017	0.010	4	0.170	0.072	4	0.043	0.027	4	0.005	0.003	4	0.033	0.007	4
SFE PAH ₁₆ (mg/kg)	0.33	0.18	4	0.61	0.41	4	5.48	2.43	4	2.25	1.44	4	0.20	0.10	4	1.16	0.38	4
SFE PAH ₁₄ (mg/kg)	0.80	0.23	4	13.66	9.38	4	30.3	15.6	4	3.37	2.07	4	0.37	0.18	4	7.35	3.67	4
SFE Toxic Units (TU ₁₆)	0.01	0.00	4	0.01	0.01	4	0.02	0.01	4	0.01	0.01	4	0.00	0.00	4	0.01	0.00	4
SFE Toxic Units (TU ₁₄)	0.02	0.00	4	0.18	0.12	4	0.09	0.04	4	0.01	0.01	4	0.00	0.00	4	0.07	0.04	4
SFE TU ₁₆ /SFE TU ₁₄	0.39	0.09	4	0.05	0.01	4	0.21	0.04	4	0.85	0.07	4	0.56	0.02	4	0.19	0.07	4

ND - Non detected

TABLE 4-1c
Sediment Contaminant Bioavailability Alliance
SFE PAH Concentrations
Alcoa Badin Works Site

Sediment SFE PAHs (mg/kg)	BL11		BL12		BL14		BL18		BL20		BL21	
	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N
naphthalene	0.003	0.001	3	0.015	0.020	4	0.003	0.001	4	0.003	0.001	3
2-methylnaphthalene	0.002	0.000	3	0.010	0.015	4	0.002	0.000	4	0.001	0.000	3
1-methylnaphthalene	0.002	0.000	3	0.006	0.009	4	0.002	0.000	4	0.001	0.000	3
C2 naphthalenes	0.055	0.005	3	0.163		1	0.041	0.009	4	0.015	0.004	3
C3 naphthalenes	0.102	0.056	3	0.074		1	0.007	0.003	4	0.008	0.004	3
C4 naphthalenes	0.130	0.030	3	0.025		1	0.004	0.004	3	0.003	0.002	3
acenaphthylene	0.005	0.005	3	0.002	0.002	4	0.001	0.000	4	0.001	0.000	3
acenaphthene	0.007	0.004	3	0.023	0.039	4	0.002	0.000	4	0.002	0.001	3
fluorene	0.004	0.002	3	0.019	0.033	4	0.003	0.001	4	0.004	0.002	3
C1 fluorenes	0.204	0.186	3	0.032		1	ND	ND	ND	0.005	0.002	3
C2 fluorenes	0.146	0.086	3	0.030		1	0.005	0.001	4	0.006	0.002	3
C3 fluorenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
phenanthrene	0.034	0.022	3	0.110	0.182	4	0.011	0.005	4	0.016	0.009	3
anthracene	0.019	0.007	3	0.054	0.090	4	0.003	0.001	4	0.004	0.003	3
C1 phenanthrenes/anthracenes	0.173	0.061	3	0.073	0.097	4	0.009	0.004	4	0.010	0.006	3
C2 phenanthrenes/anthracenes	0.340	0.206	3	0.055	0.060	4	0.007	0.004	4	0.014	0.003	3
C3 phenanthrenes/anthracenes	0.860	0.487	3	0.187	0.155	4	ND	ND	ND	0.008	0.002	4
C4 phenanthrenes/anthracenes	0.503	0.451	3	0.217	0.160	4	ND	ND	ND	0.011	0.004	3
fluoranthene	0.103	0.085	3	0.107	0.151	4	0.014	0.009	4	0.010	0.004	3
pyrene	0.094	0.072	3	0.092	0.121	4	0.011	0.007	4	0.008	0.001	3
C1 fluoranthenes/pyrenes	0.144	0.110	3	0.063	0.074	4	0.009	0.004	4	0.005	0.002	3
benz[a]anthracene	0.070	0.065	3	0.059	0.079	4	0.005	0.004	4	0.002	0.001	3
chrysene	0.173	0.165	3	0.117	0.153	4	0.009	0.006	4	0.003	0.001	3
C1 chrysenes	0.499	0.232	3	0.258	0.240	4	ND	ND	ND	0.005	0.000	3
C2 chrysenes	0.876	0.785	3	0.762		1	ND	ND	ND	ND	ND	ND
C3 chrysenes	1.070	0.782	3	1.056		1	ND	ND	ND	ND	ND	ND
C4 chrysenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benz[a+b]fluoranthene	0.134	0.095	3	0.141	0.129	4	0.014	0.010	4	0.005	0.001	3
benz[a]pyrene	0.059	0.043	3	0.050	0.040	4	0.005	0.004	4	0.001	0.000	3
benz[b]pyrene	0.053	0.028	3	0.081	0.060	4	0.005	0.003	4	0.002	0.000	3
perylene	0.049	0.028	3	0.059	0.036	4	0.006	0.005	4	0.001	0.000	3
indeno[1,2,3-cd]pyrene	0.024	0.014	3	0.021	0.019	4	0.003	0.002	4	0.002	0.001	3
dibenz[ah]anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.000	0.000	3
benz[ghi]perylene	0.017	0.011	3	0.015	0.012	4	0.003	0.003	4	0.002	0.001	3
SFE PAH ₁₄ (mg/Kg)	0.74	0.56	3	0.66	1.08	4	0.09	0.05	4	0.06	0.02	3
SFE PAH ₁₆ (mg/Kg)	5.95	3.59	3	2.37	3.01	4	0.18	0.07	4	1.41	0.07	3
SFE Toxic Units (TU ₁₄)	0.02	0.01	3	0.03	0.04	4	0.00	0.00	4	0.04	0.01	3
SFE Toxic Units (TU ₁₆)	0.15	0.08	3	0.07	0.09	4	0.01	0.00	4	0.71	0.04	3
SFE TU ₁₄ /SFE TU ₁₆	0.13	0.03	3	0.36	0.02	4	0.40	0.10	4	0.05	0.01	3

ND - Non detected

TABLE 4-2
Sediment Contaminant Bioavailability Assessment
Chemical and Physical Characteristics
Alcoa Badin Works Site

Sample	BL01	BL05	BL06	BL08	BL09	BL10	BL11	BL12	BL14	BL18	BL20	BL21
Grain Size Data												
Sand (%)	44.7	6.4	54.0	35.8	77.1	8.2	16.2	21.0	33.0	50.8	88.3	1.1
Silt (%)	27.7	29.8	18.6	36.0	14.3	37.4	33.8	27.3	40.4	26.6	10.2	36.7
Clay (%)	27.6	63.8	27.4	28.3	8.6	54.4	50.0	51.7	26.6	22.6	1.6	62.2
Percent Solids												
Solids (%)	51.8	35.3	46.4	48	71.2	38.7	44.9	45.6	51.5	47.1	70.3	26.2
Organic Carbon												
DOC (mg/L)	6.30	2.00	2.40	1.90	2.20	2.70	3.00	2.70	2.10	2.40	1.90	2.60
Sediment TOC (wt. %)	6.00	8.97	42.4	32.2	10.9	12.2	4.83	4.42	4.99	3.65	0.27	2.34
Sediment Soot C (wt. %)	5.22	7.29	39.7	32.1	12.0	10.3	3.30	2.85	2.61	0.65	0.07	0.20
Basic Chemistry						q						
Ammonia (mg/Kg)	34.1	64.7	58	56	13.0	67	103	58	46	93	10	109
pH	6.9	6.8	6.9	6.7	6.8	6.8	6.9	6.8	6.8	6.9	6.9	6.5

NA - Not analyzed

Table 4-2

TABLE 4-3

**Sediment Contaminant Bioavailability Assessment
Cyanide Analysis
Alcoa Badin Works Site**

Sample ID	Total Cyanide* (mg/kg)	Free Cyanide** (mg/kg)	Iron Cyanide*** (mg/kg)
BL01	0.66	0.10	0.36 J/UJ
BL05	2.12	0.22	1.49 J/UJ
BL06	1.75	0.13	1.09 J/UJ
BL08	0.66	0.10	0.41 J/UJ
BL09	4.53	0.04	2.88 J/UJ
BL10	6.66	0.20	3.86 J/UJ
BL11	3.67	0.14	2.19 J/UJ
BL12	1.09	0.16	0.69 J/UJ
BL14	3.59	0.15	1.04 J/UJ
BL18	0.17	0.09	<0.006 J/UJ
BL20	<0.05	<0.041	0.02 J/UJ
BL21	0.62	0.50	0.49 J/UJ

*Total Cyanide determined by *APHA Standard Methods 4500-CN C*. "Total Cyanide after Distillation" and *APHA Standard Methods 4500-CN E*., "Colorimetric Method."

**Free Cyanide determined by *ASTM D4282-95*. "Standard Test Method for Determination of Free Cyanide in Water and Wastewater by Microdiffusion."

***Iron Cyanide determined by *SW-846 Method 9015*. "Metal Cyanide Complexes by Anion Exchange Chromatography and UV Detection."

J/UJ values are estimates because of imprecision due to significant matrix interference.

TABLE 4-4a

**Sediment Contaminant Bioavailability Assessment
H. azteca Toxicity Test Data – Survival and Growth
 Alcoa Badin Works Site**

Sample Type	Sample ID	Survival (%)			Growth (mg dry wt./organism)		
		Mean ^a	Standard Deviation ^b	n ^c	Mean	Standard Deviation	n
Lab Control		95.0	8.4	6	0.19	0.04	6
Positive Control	DNAPL	93.3	12.1	6	0.26	0.09	6
Positive Control	Pitch	6.7 ^{e,f}	16.3	6	0.26 ^d	NA	1
Test	BL01	96.7	8.2	6	0.21	0.04	6
Test	BL05	81.7	11.7	6	0.21	0.04	6
Test	BL06	75.0	18.7	6	0.21	0.06	6
Test	BL08	76.7	16.3	6	0.20	0.08	6
Test	BL09	93.3	8.2	6	0.13 ^f	0.02	6
Test	BL10	90.0	12.6	6	0.15	0.06	6
Test	BL11	96.7	5.2	6	0.18	0.06	6
Test	BL12	93.3	5.2	6	0.19	0.08	6
Test	BL14	86.7	20.7	6	0.19	0.04	6
Field Reference	BL18	85.0	10.5	6	0.17	0.04	6
Field Coarse-grain Reference	BL20	88.3	7.5	6	0.24	0.03	6
Field Reference	BL21	88.3	20.4	6	0.24	0.07	6

^a Arithmetic mean

^b Standard deviation

^c Number of replicate analyses

^d Excluded from the Tukey method of multiple comparisons for growth due to significant mortality in the replicate.

^e Significantly different from BL18 reference

^f Significantly different from BL21 reference

Comparisons of survival among treatments were conducted with arc sine (square root) transformed values subjected to either the parametric Dunnett's Test or non-parametric Steel's Many-One Rank Test procedures. Dry weight among treatments was analyzed using the Tukey Method of Multiple Comparisons.

TABLE 4-4b

**Sediment Contaminant Bioavailability Assessment
C. tentans Toxicity Test Data – Survival and Growth
 Alcoa Badin Works Site**

Sample Type	Sample ID	Survival (%)			Growth (mg dry wt./organism)		
		Mean ^a	Standard Deviation ^b	N ^c	Mean	Standard Deviation	N
Lab Control		92.9	11.1	7	2.3	0.3	7
Positive Control	DNAPL	61.4 ^d	10.7	7	2.6	0.6	7
Positive Control	Pitch	60.0 ^d	8.2	7	1.8	0.3	7
Test	BL01	94.3	7.9	7	2.0	0.3	7
Test	BL05	95.7	7.9	7	2.4	0.7	7
Test	BL06	84.3	19.0	7	2.4	0.6	7
Test	BL08	94.3	9.8	7	2.2	0.4	7
Test	BL09	82.9	17.0	7	2.3	0.4	7
Test	BL10	77.1	26.3	7	2.7	0.8	7
Test	BL11	62.9 ^e	28.1	7	2.8	0.6	7
Test	BL12	87.1	9.5	7	2.5	0.5	7
Test	BL14	84.3	22.3	7	2.5	0.5	7
Field Reference	BL18	88.6	10.7	7	2.3	0.4	7
Field Coarse-grain Reference	BL20	87.1	19.8	7	2.1	0.7	7
Field Reference	BL21	100.0	0.0	7	2.1	0.4	7

^a Arithmetic mean

^b Standard deviation

^c Number of replicate analyses

^d No growth data collected in test sample due to 100% mortality

^e Significantly different from BL18 reference

^f Significantly different from BL21 reference

Comparisons of survival among treatments were conducted with arc sine (square root) transformed values subjected to either the parametric Dunnett's Test or non-parametric Steel's Many-One Rank Test procedures. Dry weight among treatments was analyzed using the Tukey Method of Multiple Comparisons.

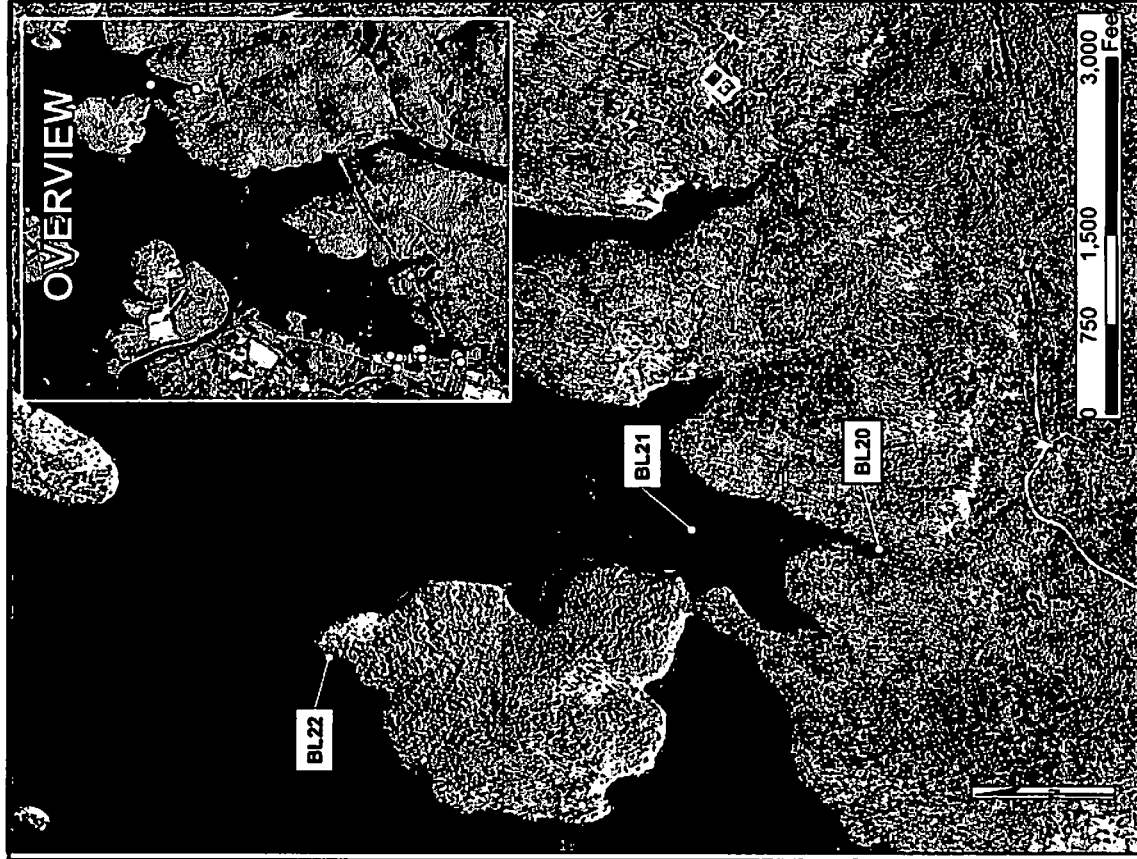
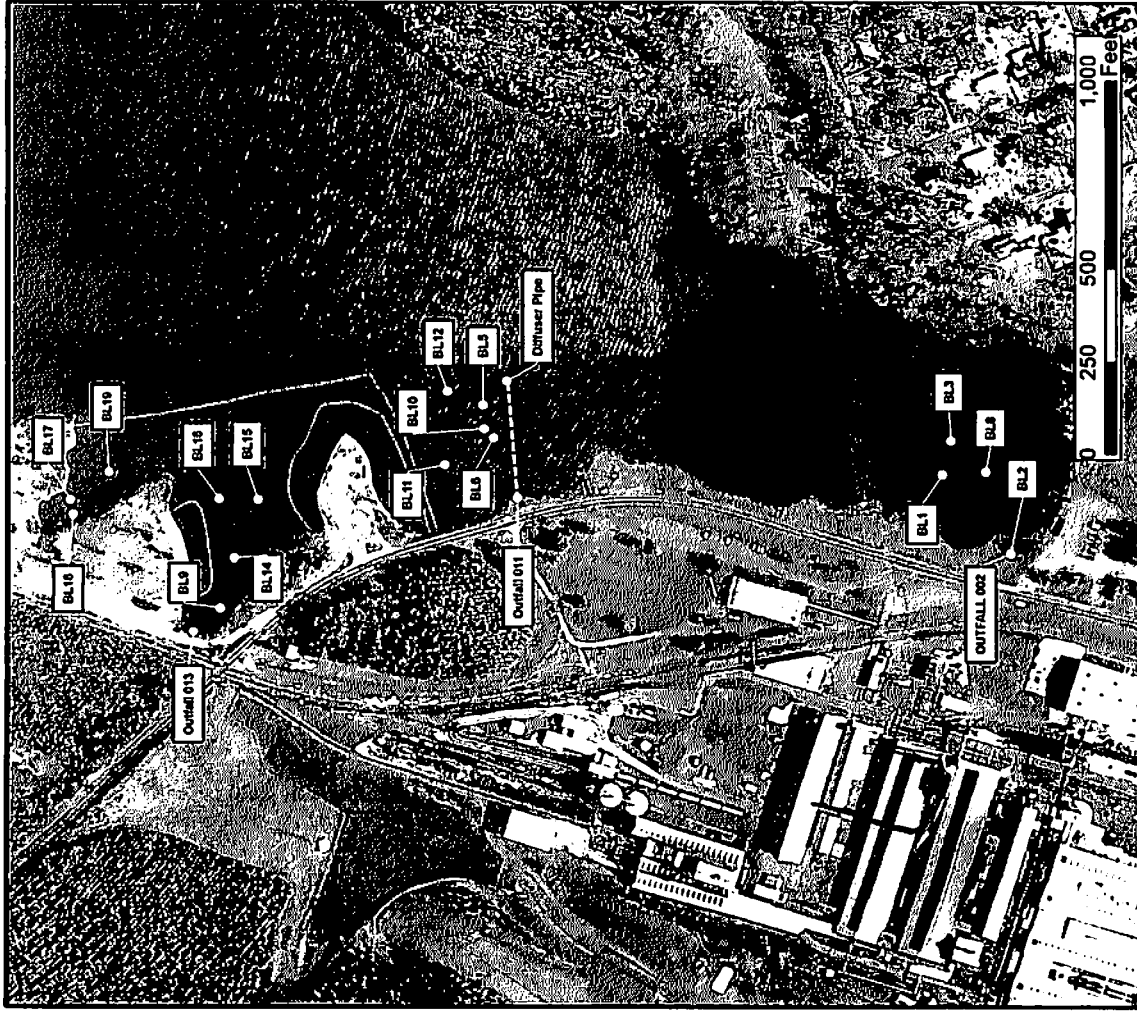
TABLE 4-5

**Sediment Contaminant Bioavailability Assessment
Spiked Pitch and DNAPL Total PAH Concentrations
Alcoa Badin Works Site**

Sediment PAH (mg/kg)	Pitch	NAPL
naphthalene	0.06	13.03
2-methylnaphthalene	0.06	6.22
1-methylnaphthalene	0.05	3.91
C2 naphthalenes	0.32	6.76
C3 naphthalenes	0.29	2.28
C4 naphthalenes	0.14	0.71
acenaphthylene	0.02	1.00
acenaphthene	0.73	3.04
fluorene	0.44	1.77
C1 fluorenes	0.40	2.49
C2 fluorenes	0.28	1.17
C3 fluorenes	ND	ND
phenanthrene	4.75	7.80
anthracene	1.14	3.08
C1 phenanthrenes/anthracenes	2.98	10.42
C2 phenanthrenes/anthracenes	4.37	11.08
C3 phenanthrenes/anthracenes	1.56	3.20
C4 phenanthrenes/anthracenes	0.59	0.78
fluoranthene	6.61	2.38
pyrene	7.16	4.79
C1 fluoranthenes/pyrenes	8.75	7.55
benz[a]anthracene	5.93	2.12
chrysene	6.16	1.61
C1 chrysenes	14.17	6.36
C2 chrysenes	9.59	2.88
C3 chrysenes	3.23	0.69
C4 chrysenes	ND	ND
benzo[b+k]fluoranthene	8.45	1.25
benzo[e]pyrene	2.71	0.57
benzo[a]pyrene	6.13	1.45
perylene	1.40	0.24
indeno[1,2,3-cd]pyrene	4.66	0.47
dibenz[ah]anthracene	1.32	0.16
benzo[ghi]perylene	2.03	0.28
Total PAH ₁₆ (mg/kg)	55.6	44.3
Total PAH ₃₄ (mg/kg)	106.4	111.6

ND - Non detected

Figures



ALCOA		SEDIMENT SAMPLE LOCATIONS	
ACL02-18801-400		BADIN, NC	
DATE: 10/05	DWN BY: NA00TH	FILE: T:\ALCOA_BADIN\PROJECTS\SampleLoc.mxd	

FIGURE 2-1

Figure 4-2 PAH concentrations compared to survival of *H. azteca* and *C. tentans* in Badin Works sediment compared to other aluminum industry and MGP sites.

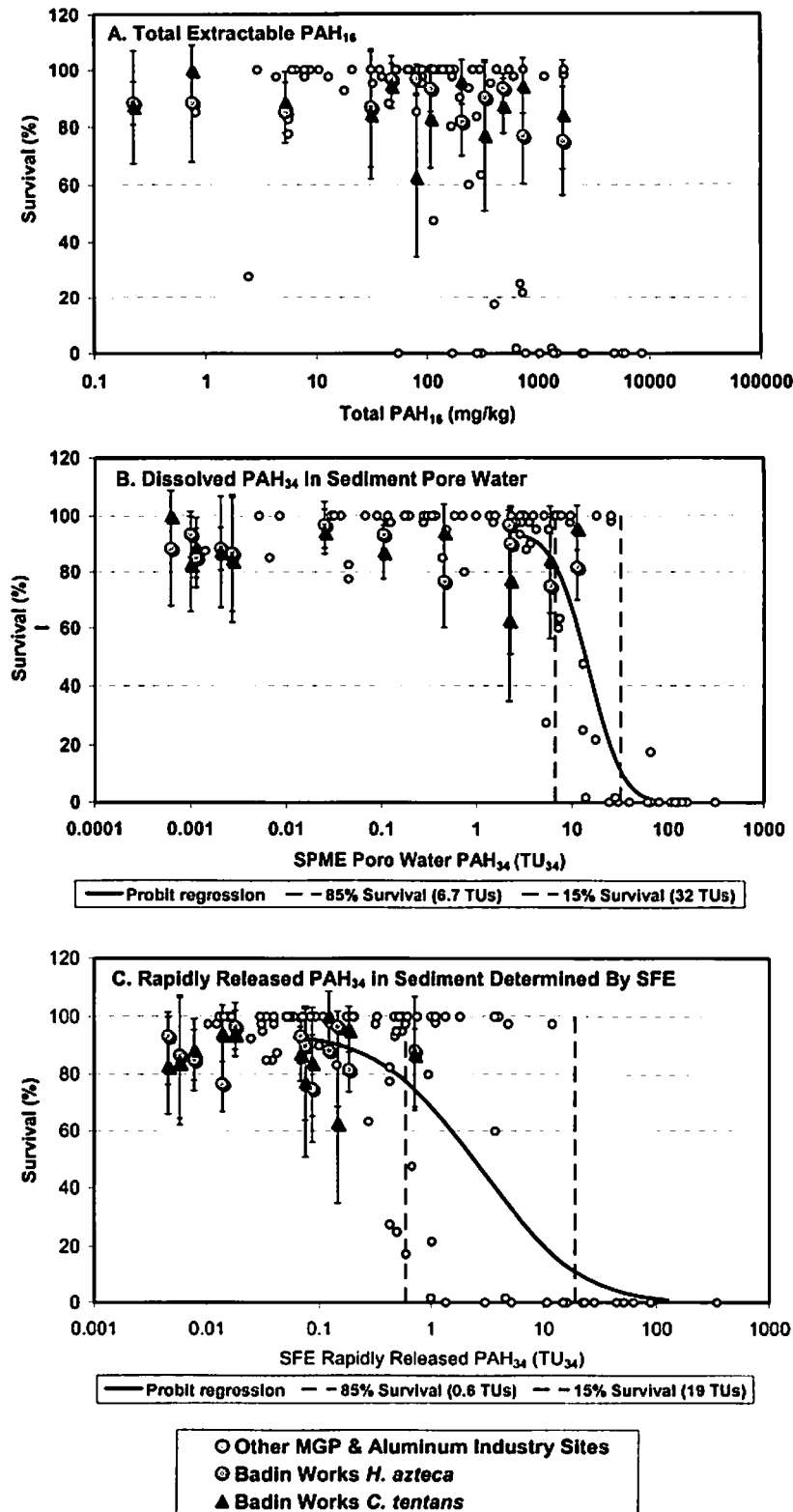


Figure 4-3 PAH concentrations compared to growth of *H. azteca* and *C. tentans* expressed as a percent change in weight compared to laboratory control sediment

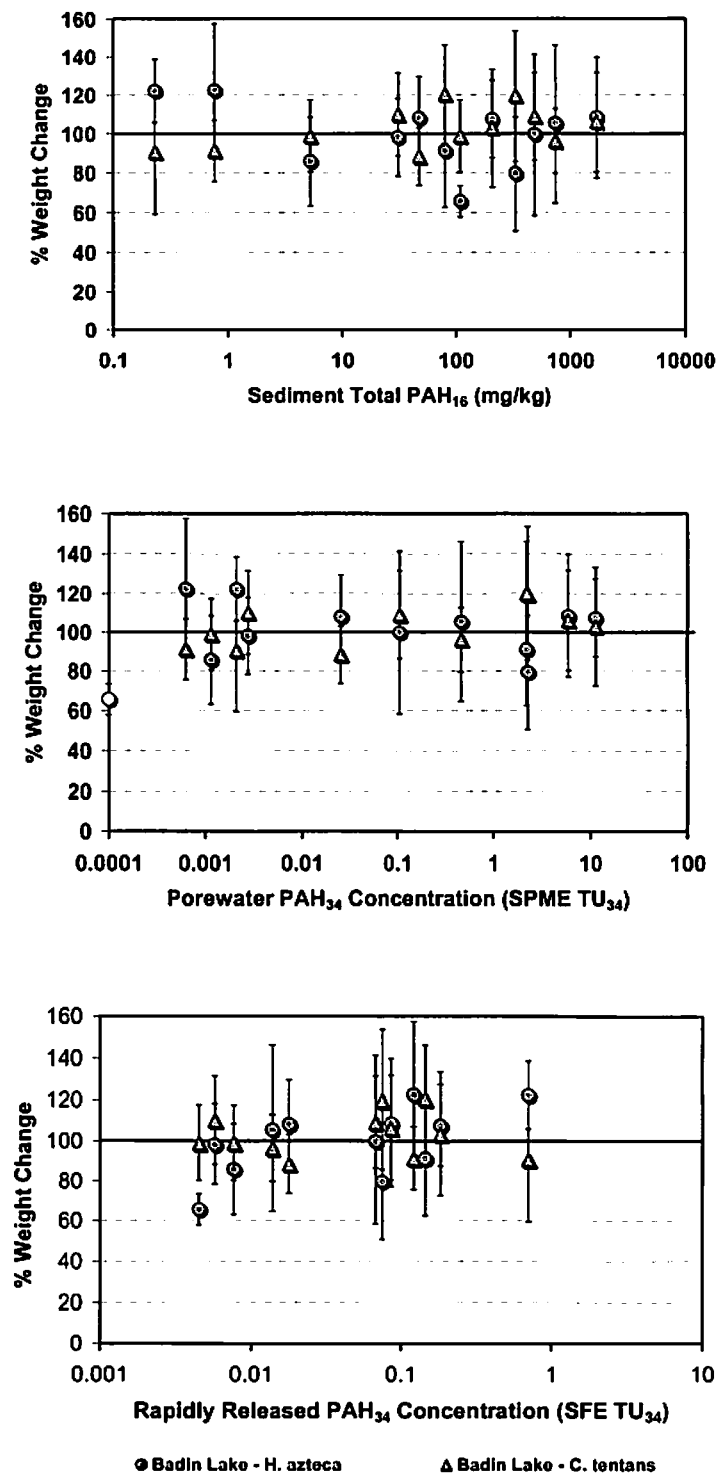


Figure 4-4 Relationship between total organic carbon content and heat stable carbon content in Badin Lake sediments

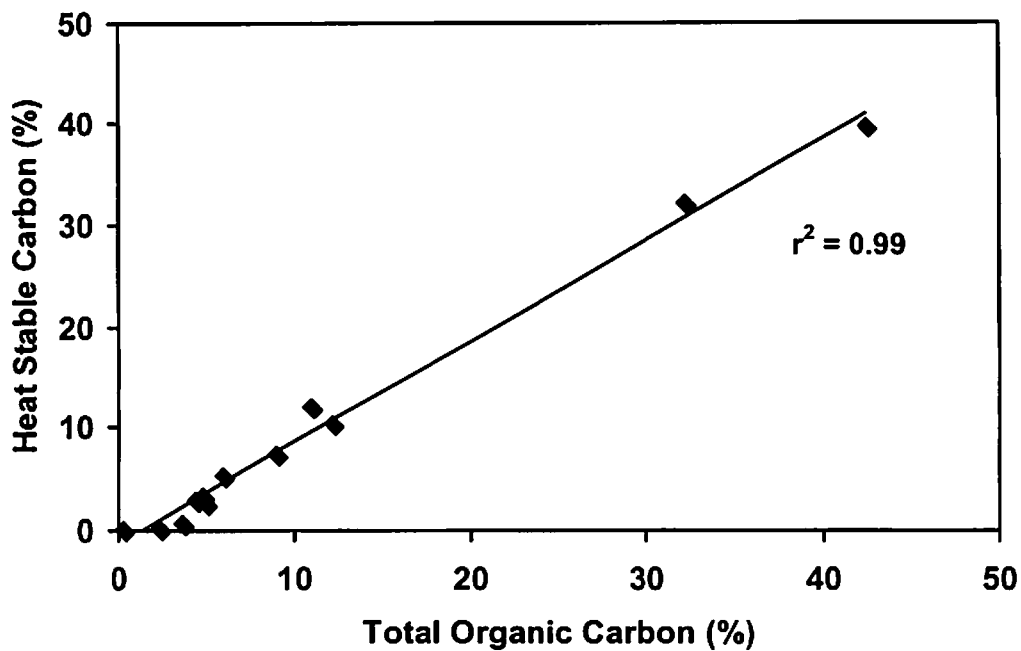
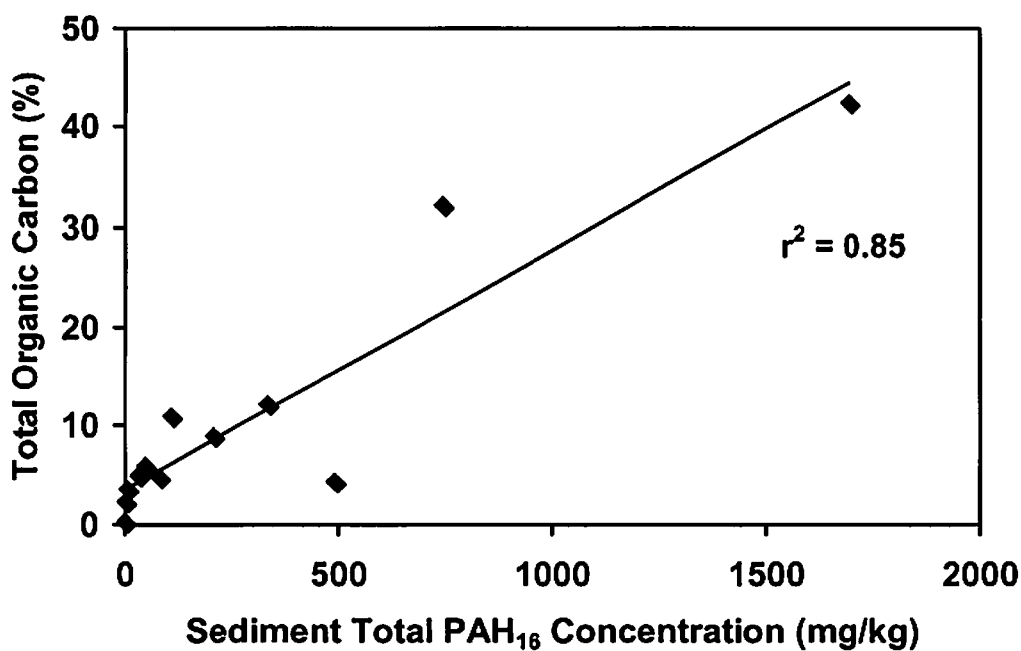


Figure 4-5 Relationship between total extractable PAH₁₆ concentration and total organic carbon content in Badin Lake sediments



Appendix A
Digital Laboratory Data
(CD-ROM)

Appendix B

U.S. Army Corps ERDC Acute and Chronic Sediment Toxicity Final Report for Badin Lake Sediment Exposed *Chironomus tentans* and *Hyalella azteca*

CERDC-EP-R

23 September 2005

MEMORANDUM FOR: Mr. Joe Kreitinger/RETEC

SUBJECT: Acute and Chronic Sediment Toxicity Data for Badin Lake Sediment Exposed
Chironomus tentans and *Hyaella azteca*

1. The following is an abbreviated summary of the results from the 10-d *Chironomus tentans* and 28-d *Hyaella azteca* studies. All data has passed QA/QC review and are considered final.

Please contact us if you have any questions regarding the data or methods utilized in conducting the studies.

Daniel J. Farrar, M.S.
Research Biologist

Todd S. Bridges, Ph.D.
Research Biologist

Study Summary

Methods

The *C. tentans* 10-d and *H. azteca* 28-d studies were conducted following the methods described in "Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates" (EPA/600/R-99/064, 2000).

Deviations from test method. Method deviations for the *C. tentans* study include a reduction of the number of replicates per treatment from 8 to 7 and the use of dry weights rather than ash-free dry weight measurements for biomass. The reduction in the number of replicates was necessary in order to facilitate automated water change on the large number of sediment samples tested. The test method suggests using ash-free fry dry weight to avoid the influence of the grain size of ingested sediment on mass measurements. This is important when the reference and test sediment have different grain size profiles. Since the sediment samples in this study were compared to a reference with similar grain size, the influence of grain size on mass measurements is minimal and the use of simple dry weight measurements is adequate.

Initial water quality for both tests was measured on 1 replicate per sediment sample at test initiation rather than on all replicates as suggested in the test method. Experience has demonstrated that when test setup occurs on day -1, water quality measurements on individual replicates of a given sediment treatment on day 0 are essentially identical therefore measurement on all replicates is not necessary. The method suggests measuring dissolved oxygen daily for both tests since the method doesn't require aeration unless dissolved oxygen measurements drops below 2.5 mg/L. Since the tests were aerated from test initiation to avoid issues related to depleted oxygen, dissolved oxygen was only measured during the course of the test if aeration was interrupted.

Statistical analyses. Statistical analyses were conducted for both studies following the methods described in "Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates" and in "Evaluation of Dredged material proposed for Discharge in the Waters of the U.S. -Testing Manual" (EPA/823/B-98/004, 1998).

C. tentans survival. For each reference, all treatments that were not greater than 10% different from the reference were removed from the data set prior to analysis. In addition, the performance control and additional reference data were also removed. Analyses were conducted using ANOVA on Ranks (Kruskal-Wallis) followed by Dunnett's mean comparison to the reference.

C. tentans mass. The performance control and additional reference were removed from the data set prior to analysis. Analyses were conducted using ANOVA on Ranks (Kruskal-Wallis) for the BT-21 reference data set and one-way ANOVA for the BT-18 reference data set.

H. azteca survival. For each reference, all treatments that were not greater than 10% different from the reference were removed from the data set prior to analysis. In addition, the performance control and additional reference data were also removed. Analyses were conducted using one-way ANOVA followed by Dunnett's mean comparison to the reference.

H. azteca mass. The performance control and additional reference were removed from the data set prior to analysis. Analyses were conducted using one-way ANOVA followed by Dunnett's mean comparison to the reference.

Results

C. tentans 10-d experiment. Performance metrics were met with mean control survival exceeding 92% (table 5). Water quality parameters fell within required ranges (tables 1-3). Survival for the DNAPL and PITCH spiked sediments were significantly less than survival observed in the BL18 and BL21 references (table 5). Survival in sediment BL11 was significantly lower than survival observed in reference BL21. No effects on biomass were observed for any of the sediments tested (table 6). Individual replicate survival and biomass data are provided in table 4.

H.azteca 28-d experiment. Performance metrics were met with mean control survival equaling 90% (table 12). Water quality parameters fell within required ranges (tables 7-10). Survival for the PITCH spiked sediment was significantly less than survival observed in the BL18 and BL21 references (table 12). Sediment BL9 biomass was significantly lower than biomass observed for reference BL21 (table 13). Individual replicate survival and biomass data are provided in table 11.

Table 1. *C. tentans* day 0 water quality

Sediment	Replicate	pH	D.O. (mg/L)	Hardness (PPM Ca CO ₃)	Alkalinity (PPM Ca CO ₃)	Conductivity (µS)	Ammonia (mg/L)
Control	A	8.28	8.59	90	120	340	1
DNAPL	A	8.30	8.55	80	90	320	1
PITCH	A	8.22	8.50	90	120	300	1
BL1	A	7.70	8.60	75	90	290	1
BL5	A	7.95	8.15	60	80	260	1
BL6	A	8.02	8.30	80	95	280	1
BL8	A	8.03	8.54	65	90	270	1
BL9	A	8.15	8.55	80	80	300	1
BL10	A	7.90	8.47	90	80	260	1
BL11	A	8.01	8.61	65	70	270	1
BL12	A	8.10	8.40	65	90	260	1
BL14	A	8.12	8.59	70	95	330	1
BL18	A	8.26	8.51	100	100	360	1
BL20	A	8.30	8.51	80	100	330	1
BL21	A	7.97	8.42	65	80	280	1
	Min	7.70	8.15	60	70	260	1
	Max	8.30	8.61	100	120	360	1

Table 2. *C. tentans* day 10 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
Control	A	8.03	7.85	110	100	370	1
Control	B	8.03	7.65				
Control	C	8.15	7.77				
Control	D	8.08	7.27				
Control	E	8.09	7.02				
Control	F	8.12	7.62				
Control	G	8.11	7.64				
DNAPL	A	8.23	8.19	110	130	340	2
DNAPL	B	8.14	7.79				
DNAPL	C	8.30	8.05				
DNAPL	D	8.26	7.96				
DNAPL	E	8.29	7.83				
DNAPL	F	8.06	5.97				
DNAPL	G	8.22	8.01				
PITCH	A	8.04	7.10	80	110	333	2
PITCH	B	8.17	8.21				
PITCH	C	8.21	8.82				
PITCH	D	8.25	8.23				
PITCH	E	8.22	7.80				
PITCH	F	8.22	8.16				
PITCH	G	8.31	8.00				

¹Replicate composite measurement

Table 2 (continued). *C. tentans* day 10 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
BL1	A	8.07	7.37	80	110	290	1
BL1	B	7.93	7.18				
BL1	C	7.95	7.66				
BL1	D	7.98	7.87				
BL1	E	7.93	7.58				
BL1	F	7.75	5.00				
BL1	G	7.73	6.87				
BL5	A	7.80	7.18	75	100	270	1
BL5	B	7.88	7.89				
BL5	C	7.87	7.83				
BL5	D	7.88	7.67				
BL5	E	7.70	4.77				
BL5	F	7.77	7.70				
BL5	G	7.81	7.75				
BL6	A	7.88	7.85	75	90	290	1
BL6	B	7.92	7.99				
BL6	C	7.93	7.58				
BL6	D	7.94	7.58				
BL6	E	7.97	7.92				
BL6	F	7.99	7.56				
BL6	G	8.01	7.87				

¹Replicate composite measurement

Table 2 (continued). *C. tentans* day 10 water quality

Sediment	Replicate	pH	D.O. (mg/L)	Hardness (PPM Ca CO ₃)	Alkalinity (PPM Ca CO ₃)	Conductivity (μS)	Ammonia (mg/L)
BL8	A	7.99	7.91	65	90	280	1
BL8	B	7.92	7.44				
BL8	C	7.91	7.79				
BL8	D	7.92	7.84				
BL8	E	7.88	7.46				
BL8	F	7.88	7.61				
BL8	G	7.82	7.01				
BL9	A	7.88	7.87	85	90	310	1
BL9	B	7.90	7.18				
BL9	C	7.87	7.38				
BL9	D	7.68	5.00				
BL9	E	7.84	7.83				
BL9	F	7.98	7.70				
BL9	G	7.98	7.72				
BL10	A	7.97	7.84	60	80	270	1
BL10	B	7.94	7.71				
BL10	C	7.82	6.03				
BL10	D	7.88	7.96				
BL10	E	7.89	7.68				
BL10	F	7.86	7.46				
BL10	G	7.87	7.66				

¹Replicate composite measurement

Table 2 (continued). *C. tentans* day 10 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
BL11	A	7.85	7.58	75	80	260	1
BL11	B	7.86	7.73				
BL11	C	7.90	7.91				
BL11	D	7.88	7.61				
BL11	E	7.92	7.91				
BL11	F	7.81	6.60				
BL11	G	7.83	7.70				
BL12	A	7.78	5.28	65	70	270	1
BL12	B	7.80	7.39				
BL12	C	7.85	7.75				
BL12	D	7.81	7.06				
BL12	E	7.82	7.29				
BL12	F	7.87	7.35				
BL12	G	7.86	7.51				
BL14	A	7.81	6.88	70	90	290	1
BL14	B	7.78	7.06				
BL14	C	7.90	7.79				
BL14	D	7.93	7.51				
BL14	E	7.92	7.64				
BL14	F	7.80	6.40				
BL14	G	7.84	7.50				

¹Replicate composite measurement

Table 2 (continued). *C. tentans* day 10 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
BL18	A	7.91	7.76	85	100	310	1
BL18	B	7.93	7.60				
BL18	C	7.95	7.46				
BL18	D	7.85	4.07				
BL18	E	7.94	7.77				
BL18	F	8.05	7.75				
BL18	G	8.07	7.43				
BL20	A	8.08	7.98	80	70	300	1
BL20	B	8.10	8.11				
BL20	C	8.12	7.99				
BL20	D	8.14	7.82				
BL20	E	8.12	7.84				
BL20	F	8.10	7.50				
BL20	G	8.12	7.85				
BL21	A	8.12	7.85	65	90	260	1
BL21	B	8.01	4.97				
BL21	C	7.96	7.80				
BL21	D	7.92	7.70				
BL21	E	7.92	7.37				
BL21	F	7.85	7.14				
BL21	G	7.83	7.73				
	Min	7.68	4.07	60	70	260	1
	Max	8.31	8.82	110	130	370	2

¹Replicate composite measurement

Table 3. *C. tentans* Daily Temperatures

Sediment	Day										Statistics				
	0	1	2	3	4	5	6	7	8	9	10	Mean	Std. Dev.	Min	Max
Control	21.5	21.8	21.9	21.8	21.9	22.5	22.6	20.6	22.1	22.3	23.4	22.0	0.7	20.6	23.4
DNAPL	21.8	22.0	22.0	21.9	22.0	22.4	22.6	20.6	23.1	22.3	23.2	22.2	0.7	20.6	23.2
PITCH	21.8	21.9	21.9	22.0	22.0	22.4	22.5	20.5	23.2	22.3	23.2	22.2	0.7	20.5	23.2
BL1	21.5	21.9	22.0	21.8	21.9	22.4	22.5	20.9	23.1	22.3	23.4	22.2	0.7	20.9	23.4
BL5	21.7	22.0	21.9	21.9	22.0	22.3	22.6	21.3	23.1	22.3	23.4	22.2	0.6	21.3	23.4
BL6	21.5	21.6	21.8	21.8	22.0	22.4	22.5	20.6	23.2	22.3	23.5	22.1	0.8	20.6	23.5
BL8	21.6	22.0	22.0	22.0	21.9	22.4	22.5	21.0	23.2	22.3	23.4	22.2	0.7	21.0	23.4
BL9	21.7	21.8	21.8	21.9	22.0	22.4	22.5	21.1	23.1	22.3	23.5	22.2	0.7	21.1	23.5
BL10	21.9	22.0	22.0	21.9	21.9	22.4	22.5	21.1	23.2	22.3	23.4	22.2	0.6	21.1	23.4
BL11	21.2	22.0	22.0	21.9	22.0	22.3	22.5	21.2	23.1	22.3	23.2	22.2	0.6	21.2	23.2
BL12	21.8	21.8	22.0	21.8	21.9	22.4	22.5	21.2	23.2	22.3	23.2	22.2	0.6	21.2	23.2
BL14	21.7	21.9	21.9	21.9	21.9	22.4	22.5	21.4	23.1	22.3	23.4	22.2	0.6	21.4	23.4
BL18	21.8	21.9	21.8	21.9	22.0	22.3	22.4	21.2	23.2	22.3	23.2	22.2	0.6	21.2	23.2
BL20	21.8	21.9	21.8	21.9	22.0	22.4	22.5	20.5	23.1	22.3	23.2	22.1	0.7	20.5	23.2
BL21	21.8	22.0	21.8	21.8	21.9	22.4	22.5	20.5	23.2	22.3	23.2	22.1	0.7	20.5	23.2

Table 4. *C. tentans* 10-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
Control	A	9	90.0%	9	0.0950	0.1157	2.30
Control	B	10	100.0%	10	0.0942	0.1142	2.00
Control	C	10	100.0%	10	0.0967	0.1153	1.86
Control	D	9	90.0%	9	0.0855	0.1107	2.80
Control	E	10	100.0%	10	0.1023	0.1263	2.40
Control	F	10	100.0%	10	0.0905	0.1115	2.10
Control	G	7	70.0%	7	0.0897	0.1079	2.60
DNAPL	A	5	50.0%	5	0.0977	0.1076	1.98
DNAPL	B	5	50.0%	5	0.0978	0.1073	1.90
DNAPL	C	6	60.0%	6	0.0965	0.1147	3.03
DNAPL	D	8	80.0%	8	0.0924	0.1214	3.63
DNAPL	E	6	60.0%	6	0.1013	0.1143	2.17
DNAPL	F	6	60.0%	6	0.0913	0.1086	2.88
DNAPL	G	7	70.0%	7	0.0923	0.1097	2.49
PITCH	A	6	60.0%	6	0.0888	0.0973	1.42
PITCH	B	6	60.0%	6	0.0883	0.1019	2.27
PITCH	C	6	60.0%	6	0.1024	0.1130	1.77
PITCH	D	7	70.0%	7	0.0941	0.1050	1.56
PITCH	E	5	50.0%	5	0.0992	0.1084	1.84
PITCH	F	7	70.0%	7	0.0946	0.1071	1.79
PITCH	G	5	50.0%	5	0.0917	0.1011	1.88

Table 4 (continued). *C. tentans* 10-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL-1	A	8	80.0%	8	0.0919	0.1083	2.05
BL-1	B	9	90.0%	9	0.0982	0.1202	2.44
BL-1	C	10	100.0%	10	0.1010	0.1234	2.24
BL-1	D	10	100.0%	10	0.0857	0.1050	1.93
BL-1	E	10	100.0%	10	0.0937	0.1163	2.26
BL-1	F	10	100.0%	10	0.0909	0.1096	1.87
BL-1	G	9	90.0%	9	0.1036	0.1163	1.41
BL5	A	9	90.0%	9	0.0960	0.1159	2.21
BL5	B	10	100.0%	10	0.0838	0.1056	2.18
BL5	C	8	80.0%	8	0.0754	0.0936	2.28
BL5	D	10	100.0%	10	0.0954	0.1167	2.13
BL5	E	10	100.0%	10	0.0847	0.0976	1.29
BL5	F	10	100.0%	10	0.0905	0.1205	3.00
BL5	G	10	100.0%	8	0.1005	0.1283	3.48
BL6	A	5	50.0%	5	0.0915	0.1068	3.06
BL6	B	8	80.0%	8	0.1871	0.2032	2.01
BL6	C	10	100.0%	10	0.1917	0.2121	2.04
BL6	D	10	100.0%	10	0.0998	0.1230	2.32
BL6	E	7	70.0%	7	0.0874	0.0996	1.74
BL6	F	10	100.0%	9	0.0949	0.1252	3.37
BL6	G	9	90.0%	6	0.0800	0.0950	2.50

Table 4 (continued). *C. tentans* 10-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL8	A	10	100.0%	10	0.0972	0.1163	1.91
BL8	B	8	80.0%	8	0.0907	0.1109	2.53
BL8	C	8	80.0%	8	0.0933	0.1052	1.49
BL8	D	10	100.0%	10	0.0891	0.1133	2.42
BL8	E	10	100.0%	10	0.0885	0.1136	2.51
BL8	F	10	100.0%	10	0.0986	0.1215	2.29
BL8	G	10	100.0%	10	0.0895	0.1127	2.32
BL9	A	9	90.0%	9	0.0879	0.1073	2.16
BL9	B	8	80.0%	8	0.0944	0.1065	1.51
BL9	C	9	90.0%	8	0.0914	0.1143	2.86
BL9	D	10	100.0%	10	0.0948	0.1181	2.33
BL9	E	6	60.0%	6	0.0933	0.1081	2.47
BL9	F	6	60.0%	6	0.0951	0.1102	2.52
BL9	G	10	100.0%	10	0.1020	0.1223	2.03
BL10	A	10	100.0%	10	0.1050	0.1296	2.46
BL10	B	9	90.0%	9	0.0890	0.1091	2.23
BL10	C	10	100.0%	10	0.0998	0.1219	2.21
BL10	D	6	60.0%	6	0.0803	0.0932	2.15
BL10	E	5	50.0%	5	0.0948	0.1113	3.30
BL10	F	4	40.0%	4	0.0913	0.1084	4.28
BL10	G	10	100.0%	10	0.0832	0.1092	2.60

Table 4 (continued). *C. tentans* 10-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL11	A	10	100.0%	10	0.0911	0.1135	2.24
BL11	B	8	80.0%	8	0.0938	0.1125	2.34
BL11	C	6	60.0%	6	0.0986	0.1167	3.02
BL11	D	1	10.0%	1	0.0955	0.0980	2.50
BL11	E	5	50.0%	5	0.0866	0.1065	3.98
BL11	F	7	70.0%	7	0.0906	0.1092	2.66
BL11	G	7	70.0%	7	0.0956	0.1139	2.61
BL12	A	8	80.0%	8	0.0924	0.1085	2.01
BL12	B	7	70.0%	7	0.0908	0.1112	2.91
BL12	C	9	90.0%	9	0.0903	0.1137	2.60
BL12	D	9	90.0%	9	0.0998	0.1224	2.51
BL12	E	10	100.0%	10	0.0872	0.1182	3.10
BL12	F	9	90.0%	9	0.0982	0.1128	1.62
BL12	G	9	90.0%	9	0.0973	0.1220	2.74
BL14	A	7	70.0%	7	0.0953	0.1124	2.44
BL14	B	4	40.0%	4	0.0995	0.1092	2.43
BL14	C	10	100.0%	10	0.0994	0.1179	1.85
BL14	D	9	90.0%	9	0.0979	0.1250	3.01
BL14	E	9	90.0%	9	0.0936	0.1123	2.08
BL14	F	10	100.0%	10	0.0955	0.1282	3.27
BL14	G	10	100.0%	10	0.0863	0.1122	2.59

Table 4 (continued). *C. tentans* 10-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL18	A	8	80.0%	8	0.0924	0.1131	2.59
BL18	B	10	100.0%	10	0.0940	0.1133	1.93
BL18	C	8	80.0%	8	0.0931	0.1153	2.78
BL18	D	8	80.0%	8	0.0962	0.1142	2.25
BL18	E	10	100.0%	10	0.0939	0.1117	1.78
BL18	F	10	100.0%	10	0.0929	0.1114	1.85
BL18	G	8	80.0%	8	0.0897	0.1114	2.71
BL20	A	10	100.0%	10	0.0890	0.1036	1.46
BL20	B	10	100.0%	10	0.0851	0.0997	1.46
BL20	C	9	90.0%	9	0.0892	0.1069	1.97
BL20	D	7	70.0%	7	0.0890	0.1085	2.79
BL20	E	10	100.0%	10	0.0910	0.1094	1.84
BL20	F	5	50.0%	5	0.0870	0.1037	3.34
BL20	G	10	100.0%	10	0.0896	0.1066	1.70
BL21	A	10	100.0%	10	0.0901	0.1081	1.80
BL21	B	10	100.0%	10	0.0959	0.1119	1.60
BL21	C	10	100.0%	10	0.0951	0.1169	2.18
BL21	D	10	100.0%	10	0.0802	0.1004	2.02
BL21	E	10	100.0%	10	0.0894	0.1168	2.74
BL21	F	10	100.0%	10	0.0858	0.1079	2.21
BL21	G	10	100.0%	10	0.0971	0.1182	2.11

Table 5. *C. tentans* 10-d survival

Treatment		Mean (%)	S.D.	C.V.	n
Control		92.9%	11.1%	11.98%	7
DNAPL	A, B	61.4%	10.7%	17.40%	7
PITCH	A, B	60.0%	8.2%	13.61%	7
BL1		94.3%	7.9%	8.34%	7
BL5		95.7%	7.9%	8.22%	7
BL6		84.3%	19.0%	22.57%	7
BL8		94.3%	9.8%	10.35%	7
BL9		82.9%	17.0%	20.57%	7
BL10		77.1%	26.3%	34.06%	7
BL11	B	62.9%	28.1%	44.73%	7
BL12		87.1%	9.5%	10.92%	7
BL14		84.3%	22.3%	26.40%	7
BL18		88.6%	10.7%	12.07%	7
BL20		87.1%	19.8%	22.68%	7
BL21		100.0%	0.0%	0.00%	7

A= Significantly different from BL18 reference

B=Significantly different from BL21 reference

Table 6. *C. tentans* 10-d mass

Treatment	Mean (mg)	S.D.	C.V.	n
Control	2.3	0.3	14.60%	7
DNAPL	2.6	0.6	24.45%	7
PITCH	1.8	0.3	15.01%	7
BL1	2.0	0.3	16.68%	7
BL5	2.4	0.7	29.45%	7
BL6	2.4	0.6	24.24%	7
BL8	2.2	0.4	17.18%	7
BL9	2.3	0.4	18.87%	7
BL10	2.7	0.8	28.41%	7
BL11	2.8	0.6	21.42%	7
BL12	2.5	0.5	20.71%	7
BL14	2.5	0.5	19.60%	7
BL18	2.3	0.4	18.73%	7
BL20	2.1	0.7	34.40%	7
BL21	2.1	0.4	17.15%	7

A= Significantly different from BL18 reference

B=Significantly different from BL21 reference

Table 7. *H. azteca* Day 0 water quality

Sediment	Replicate	pH	D.O. (mg/L)	Hardness (PPM Ca CO ₃)	Alkalinity (PPM Ca CO ₃)	Conductivity (μ S)	Ammonia (mg/L)
Control	A	8.18	7.72	90	110	280	1
DNAPL	A	8.20	7.84	80	110	270	2
PITCH	A	8.14	7.85	60	100	220	1
BL1	A	8.06	7.53	100	75	240	1
BL5	A	7.98	7.60	100	80	200	1
BL6	A	7.99	7.86	100	90	190	1
BL8	A	7.92	7.53	60	70	200	1
BL9	A	8.05	7.86	65	70	220	1
BL10	A	7.92	8.02	80	60	200	1
BL11	A	8.02	7.96	80	60	200	1
BL12	A	8.08	7.92	120	60	210	1
BL14	A	8.03	7.94	90	80	220	1
BL18	A	7.60	7.72	120	120	270	1
BL20	A	8.10	7.91	120	85	250	1
BL21	A	7.90	7.74	110	60	200	1
Min		7.60	7.53	60	60	190	1
Max		8.20	8.02	120	120	280	2

Table 8. *H. azteca* day 28 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
Control	A	8.26	7.86	100	80	260	1
Control	B	8.23	8.30				
Control	C	8.28	8.01				
Control	D	8.30	8.06				
Control	E	8.39	8.51				
Control	F	8.25	8.02				
DNAPL	A	8.26	8.21	70	80	260	1
DNAPL	B	8.26	7.89				
DNAPL	C	8.35	8.35				
DNAPL	D	8.14	7.47				
DNAPL	E	8.30	8.22				
DNAPL	F	8.35	8.11				
PITCH	A	8.39	8.69	80	80	260	1
PITCH	B	8.29	8.14				
PITCH	C	8.28	8.03				
PITCH	D	8.29	7.99				
PITCH	E	8.28	8.11				
PITCH	F	8.28	8.09				

¹Replicate composite measurement

Table 8 (continued). *H. azteca* Day 28 Water Quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
BL1	A	8.16	8.29	80	70	260	1
BL1	B	8.30	8.54				
BL1	C	8.32	8.50				
BL1	D	8.23	8.08				
BL1	E	8.26	8.56				
BL1	F	8.20	8.17				
BL5	A	8.30	8.36	70	80	250	1
BL5	B	8.25	8.43				
BL5	C	8.29	8.07				
BL5	D	8.29	8.28				
BL5	E	8.23	7.81				
BL5	F	8.29	8.21				
BL6	A	8.25	8.25	70	80	260	1
BL6	B	8.29	8.24				
BL6	C	8.26	7.98				
BL6	D	8.34	8.20				
BL6	E	8.28	8.12				
BL6	F	8.36	8.03				

¹Replicate composite measurement

Table 8 (continued). *H. azteca* day 28 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
BL8	A	8.29	8.47	70	70	250	1
BL8	B	8.27	7.99				
BL8	C	8.21	8.50				
BL8	D	8.33	8.05				
BL8	E	8.25	8.17				
BL8	F	8.26	8.24				
BL9	A	8.05	8.28	70	80	260	1
BL9	B	8.30	8.63				
BL9	C	8.31	8.53				
BL9	D	8.32	8.09				
BL9	E	8.26	8.02				
BL9	F	8.32	8.18				
BL10	A	8.35	8.74	70	70	240	1
BL10	B	8.25	8.77				
BL10	C	8.26	8.63				
BL10	D	8.23	8.07				
BL10	E	8.33	8.17				
BL10	F	8.30	8.70				

¹Replicate composite measurement

Table 8 (continued). *H. azteca* day 28 water quality

Sediment	Replicate	pH	D.O. (mg/L)	¹ Hardness (PPM Ca CO ₃)	¹ Alkalinity (PPM Ca CO ₃)	¹ Conductivity (μS)	¹ Ammonia (mg/L)
BL11	A	8.27	8.00	70	70	270	1
BL11	B	8.26	8.10				
BL11	C	8.25	8.61				
BL11	D	8.27	8.35				
BL11	E	8.22	7.98				
BL11	F	8.36	8.43				
BL12	A	8.25	7.82	70	80	250	1
BL12	B	8.26	8.30				
BL12	C	8.34	8.47				
BL12	D	8.11	7.99				
BL12	E	8.29	8.57				
BL12	F	8.39	8.14				
BL14	A	8.25	8.43	70	90	290	1
BL14	B	8.26	8.43				
BL14	C	8.16	8.37				
BL14	D	8.35	8.28				
BL14	E	8.26	8.15				
BL14	F	8.36	8.52				

¹Replicate composite measurement

Table 8 (continued). *H. azteca* day 28 water quality

Sediment	Replicate	pH	D.O. (mg/L)	Hardness (PPM Ca CO ₃)	Alkalinity (PPM Ca CO ₃)	Conductivity (µS)	Ammonia (mg/L)
BL18	A	8.31	8.61	70	80	260	1
BL18	B	8.08	8.14				
BL18	C	8.35	8.43				
BL18	D	8.33	8.27				
BL18	E	8.33	8.00				
BL18	F	8.23	8.40				
BL20	A	8.36	8.68	70	90	260	1
BL20	B	8.26	8.55				
BL20	C	8.27	8.51				
BL20	D	8.30	8.77				
BL20	E	8.05	8.30				
BL20	F	8.39	8.37				
BL21	A	8.19	8.50	60	80	250	1
BL21	B	8.20	8.51				
BL21	C	8.21	8.23				
BL21	D	8.03	7.88				
BL21	E	8.28	8.59				
BL21	F	8.25	7.99				
Min		8.03	7.47	60	70	240	1
Max		8.39	8.77	100	90	290	1

¹Replicate composite measurement

Table 9. *H. azteca* daily replicate temperatures

Sediment	DAY														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	22.0	21.9	23.2	23.7	23.1	23.2	23.1	23.4	23.2	23.3	23.4	23.3	23.3	23.1	23.2
DNAPL	22.0	21.9	23.2	23.7	23.1	23.2	23.1	23.4	23.2	23.3	23.4	23.3	23.3	23.2	23.2
PITCH	22.0	21.9	23.2	23.7	23.1	23.2	23.1	23.4	23.2	23.2	23.4	23.3	23.3	23.1	23.2
BL1	22.1	21.9	23.1	23.2	23.1	23.2	23.1	23.4	23.2	23.3	23.4	23.2	23.3	23.1	23.2
BL5	22.0	21.8	23.2	23.2	23.5	23.2	23.1	23.4	23.2	23.2	23.3	23.2	23.2	23.1	23.2
BL6	22.0	21.9	23.1	23.7	23.5	23.1	23.2	23.4	23.1	23.2	23.4	23.2	23.2	23.2	23.2
BL8	21.9	22.0	23.2	23.2	23.5	23.1	23.1	23.4	23.2	23.3	23.4	23.3	23.2	23.2	23.1
BL9	22.0	21.9	23.1	23.7	23.1	23.2	23.1	23.4	23.2	23.2	23.4	23.2	23.3	23.1	23.2
BL10	22.0	21.9	23.2	23.7	23.5	23.1	23.1	23.4	23.2	23.3	23.4	23.3	23.3	23.1	23.2
BL11	21.9	21.9	23.2	23.7	23.5	23.1	23.1	23.4	23.2	23.3	23.3	23.3	23.3	23.1	23.1
BL12	21.9	21.9	23.2	23.7	23.4	23.0	23.1	23.4	23.2	23.3	23.3	23.3	23.3	23.1	23.1
BL14	22.0	21.9	23.2	23.7	23.5	23.0	23.1	23.4	23.2	23.2	23.4	23.2	23.3	23.1	23.1
BL18	22.0	21.9	23.2	23.7	23.5	23.1	23.2	23.4	23.1	23.3	23.3	23.3	23.3	23.2	23.1
BL20	22.0	21.8	23.2	23.7	23.5	23.0	23.1	23.4	23.1	23.3	23.3	23.3	23.3	23.1	23.1
BL21	22.0	21.8	23.1	23.7	23.5	23.0	23.1	23.4	23.1	23.3	23.3	23.3	23.3	23.1	23.1

Table 9 (continued). *H. azteca* daily replicate temperatures

DAY														Statistics			
15	16	17	18	19	20	21	22	23	24	25	26	27	28	Mean	Std. Dev.	Min	Max
23.3	23.5	23.5	23.4	23.2	23.4	23.5	23.5	23.4	23.5	23.4	23.5	23.5	23.4	23.3	0.4	21.9	23.7
23.3	23.5	23.5	23.6	23.3	23.4	23.4	23.5	23.4	23.5	23.4	23.4	23.2	23.4	23.3	0.4	21.9	23.7
23.3	23.5	23.5	23.4	23.4	23.4	23.4	23.4	23.5	23.5	23.4	23.4	23.2	23.4	23.2	0.4	21.9	23.7
23.3	23.4	23.5	23.3	23.3	23.4	23.4	23.4	23.5	23.5	23.3	23.4	23.4	23.4	23.2	0.4	21.9	23.5
23.3	23.5	23.5	23.4	23.4	23.3	23.4	23.5	23.5	23.5	23.3	23.4	23.3	23.4	23.2	0.4	21.8	23.5
23.3	23.5	23.5	23.3	23.4	23.3	23.3	23.5	23.5	23.5	23.3	23.4	23.2	23.4	23.2	0.4	21.9	23.7
23.3	23.5	23.5	23.3	23.4	23.4	23.3	23.4	23.5	23.5	23.3	23.4	23.4	23.4	23.2	0.4	21.9	23.5
23.3	23.4	23.5	23.4	23.4	23.4	23.3	23.5	23.4	23.5	23.3	23.4	23.3	23.4	23.2	0.4	21.9	23.7
23.3	23.5	23.5	23.4	23.4	23.4	23.3	23.4	23.4	23.5	23.3	23.4	23.2	23.4	23.2	0.4	21.9	23.7
23.3	23.5	23.5	23.3	23.4	23.3	23.4	23.5	23.5	23.5	23.3	23.4	23.3	23.4	23.2	0.4	21.9	23.7
23.3	23.5	23.5	23.3	23.4	23.3	23.3	23.5	23.5	23.5	23.3	23.4	23.3	23.4	23.2	0.4	21.9	23.7
23.3	23.5	23.5	23.3	23.4	23.3	23.3	23.5	23.5	23.5	23.3	23.4	23.3	23.4	23.2	0.4	21.9	23.7
23.4	23.4	23.4	23.6	23.4	23.3	23.3	23.5	23.5	23.6	23.3	23.4	23.5	23.5	23.3	0.4	21.9	23.7
23.4	23.4	23.4	23.2	23.4	23.4	23.3	23.5	23.5	23.6	23.3	23.4	23.4	23.5	23.3	0.4	21.9	23.7
23.3	23.4	23.5	23.4	23.4	23.3	23.3	23.5	23.4	23.6	23.4	23.5	23.4	23.5	23.2	0.4	21.8	23.7
23.3	23.5	23.5	23.2	23.4	23.3	23.3	23.4	23.5	23.6	23.4	23.5	23.4	23.4	23.2	0.4	21.8	23.7

Table 10. Weekly conductivity (μ S) measurements

Sediment	WEEK		
	1	2	3
Control	280	200	240
DNAPL	270	240	260
PITCH	270	220	230
BL1	280	230	230
BL5	270	240	220
BL6	220	260	280
BL8	240	230	260
BL9	230	200	270
BL10	260	270	260
BL11	260	210	150
BL12	250	220	240
BL14	260	220	260
BL18	260	230	270
BL20	280	240	240
BL21	260	210	230
Min	220	200	150
Max	280	270	280

Table 11. *H. azteca* 28-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
Control	A	10	100%	10	0.0734	0.0756	0.22
Control	B	9	90%	9	0.0726	0.0745	0.21
Control	C	8	80%	8	0.0754	0.0774	0.25
Control	D	10	100%	10	0.0860	0.0876	0.16
Control	E	10	100%	10	0.0812	0.0828	0.16
Control	F	10	100%	10	0.0966	0.0982	0.16
DNAPL	A	10	100%	9	0.0852	0.0878	0.29
DNAPL	B	9	90%	9	0.0894	0.0916	0.24
DNAPL	C	7	70%	7	0.0826	0.0849	0.33
DNAPL	D	10	100%	10	0.0920	0.0933	0.13
DNAPL	E	10	100%	10	0.0685	0.0703	0.18
DNAPL	F	10	100%	9	0.0902	0.0936	0.38
Pitch	A	0	0%	0			
Pitch	B	0	0%	0			
Pitch	C	4	40%	4	0.0878	0.0889	0.28
Pitch	D	0	0%	0			
Pitch	E	0	0%	0			
Pitch	F	0	0%	0			

Table 11 (continued). *H. azteca* 28-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL-1	A	8	80%	8	0.0817	0.0836	0.24
BL-1	B	10	100%	9	0.0763	0.0785	0.24
BL-1	C	10	100%	9	0.0795	0.0818	0.26
BL-1	D	10	100%	10	0.0661	0.0677	0.16
BL-1	E	10	100%	9	0.0811	0.0828	0.19
BL-1	F	10	100%	10	0.0751	0.0768	0.17
BL5	A	9	90%	8	0.0798	0.0818	0.25
BL5	B	10	100%	10	0.0807	0.0824	0.17
BL5	C	7	70%	7	0.0754	0.0770	0.23
BL5	D	7	70%	7	0.0830	0.0841	0.16
BL5	E	8	80%	7	0.0656	0.0673	0.24
BL5	F	8	80%	8	0.0841	0.0857	0.20
BL6	A	6	60%	6	0.0754	0.0773	0.32
BL6	B	8	80%	8	0.0880	0.0893	0.16
BL6	C	7	70%	7	0.1037	0.1054	0.24
BL6	D	9	90%	9	0.0690	0.0706	0.18
BL6	E	10	100%	8	0.0681	0.0697	0.20
BL6	F	5	50%	5	0.0725	0.0733	0.16

Table 11 (continued). *H. azteca* 28-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL8	A	10	100%	10	0.0718	0.0737	0.19
BL8	B	6	60%	6	0.0777	0.0798	0.35
BL8	C	6	60%	6	0.0903	0.0915	0.20
BL8	D	8	80%	8	0.0712	0.0723	0.14
BL8	E	7	70%	7	0.0890	0.0905	0.21
BL8	F	9	90%	9	0.0876	0.0888	0.13
BL9	A	10	100%	10	0.0896	0.0911	0.15
BL9	B	9	90%	9	0.0894	0.0906	0.13
BL9	C	9	90%	9	0.0792	0.0802	0.11
BL9	D	8	80%	8	0.0827	0.0837	0.13
BL9	E	10	100%	9	0.0915	0.0927	0.13
BL9	F	10	100%	10	0.0848	0.0859	0.11
BL10	A	9	90%	9	0.0850	0.0861	0.12
BL10	B	10	100%	10	0.0850	0.0860	0.10
BL10	C	8	80%	8	0.1003	0.1023	0.25
BL10	D	10	100%	10	0.1066	0.1078	0.12
BL10	E	7	70%	7	0.0940	0.0950	0.14
BL10	F	10	100%	10	0.1107	0.1126	0.19

Table 11 (continued). *H. azteca* 28-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL11	A	10	100%	10	0.1190	0.1212	0.22
BL11	B	10	100%	10	0.0955	0.0974	0.19
BL11	C	10	100%	10	0.1084	0.1108	0.24
BL11	D	9	90%	9	0.1039	0.1048	0.10
BL11	E	9	90%	9	0.1044	0.1061	0.19
BL11	F	10	100%	10	0.0954	0.0966	0.12
BL12	A	10	100%	10	0.0907	0.0923	0.16
BL12	B	9	90%	9	0.0924	0.0940	0.18
BL12	C	9	90%	9	0.1069	0.1101	0.36
BL12	D	9	90%	9	0.1068	0.1081	0.14
BL12	E	10	100%	9	0.1027	0.1042	0.17
BL12	F	9	90%	9	0.0912	0.0926	0.16
BL14	A	10	100%	10	0.0874	0.0897	0.23
BL14	B	6	60%	6	0.0828	0.0837	0.15
BL14	C	10	100%	10	0.0966	0.0990	0.24
BL14	D	10	100%	10	0.0824	0.0842	0.18
BL14	E	6	60%	6	0.0780	0.0789	0.15
BL14	F	10	100%	10	0.0948	0.0967	0.19

Table 11 (continued). *H. azteca* 28-d endpoint data

Treatment	Replicate	Survival	% Survival	# on pan	pan weight (g)	pan & animal weight (g)	individual dry weight (mg)
BL18	A	7	70%	7	0.0988	0.1002	0.20
BL18	B	8	80%	8	0.1001	0.1020	0.24
BL18	C	10	100%	10	0.0930	0.0942	0.12
BL18	D	9	90%	9	0.0777	0.0790	0.14
BL18	E	9	90%	9	0.0793	0.0806	0.14
BL18	F	8	80%	8	0.0855	0.0867	0.15
BL20	A	9	90%	9	0.0794	0.0817	0.26
BL20	B	9	90%	9	0.0677	0.0698	0.23
BL20	C	10	100%	10	0.0882	0.0903	0.21
BL20	D	8	80%	8	0.0835	0.0851	0.20
BL20	E	9	90%	9	0.0698	0.0719	0.23
BL20	F	8	80%	8	0.0882	0.0905	0.29
BL21	A	10	100%	10	0.0767	0.0796	0.29
BL21	B	8	80%	8	0.0812	0.0829	0.21
BL21	C	10	100%	10	0.0790	0.0813	0.23
BL21	D	5	50%	5	0.0720	0.0737	0.34
BL21	E	10	100%	10	0.0933	0.0948	0.15
BL21	F	10	100%	9	0.1004	0.1022	0.20

Table 12. *H. azteca* 28-d survival

Treatment		Mean (%)	S.D.	C.V.	n
Control		95.0%	8.4%	8.81%	6
DNAPL		93.3%	12.1%	12.98%	6
PITCH	A, B	6.7%	16.3%	244.95%	6
BL1		96.7%	8.2%	8.45%	6
BL5		81.7%	11.7%	14.31%	6
BL6		75.0%	18.7%	24.94%	6
BL8		76.7%	16.3%	21.30%	6
BL9		93.3%	8.2%	8.75%	6
BL10		90.0%	12.6%	14.05%	6
BL11		96.7%	5.2%	5.34%	6
BL12		93.3%	5.2%	5.53%	6
BL14		86.7%	20.7%	23.83%	6
BL18		85.0%	10.5%	12.34%	6
BL20		88.3%	7.5%	8.52%	6
BL21		88.3%	20.4%	23.11%	6

A=Significantly different from BL-18 reference

B=Significantly different from BL-21 reference

Table 13. *H. azteca* 28-d mass

Treatment		Mean (mg)	S.D.	C.V.	n
Control		0.19	0.04	20.11%	6
DNAPL		0.26	0.09	35.88%	6
PITCH	#	0.26	N/A	N/A	1
BL1		0.21	0.04	19.76%	6
BL5		0.21	0.04	18.61%	6
BL6		0.21	0.06	28.85%	6
BL8		0.20	0.08	38.59%	6
BL9	B	0.13	0.02	11.95%	6
BL10		0.15	0.06	36.36%	6
BL11		0.18	0.06	31.35%	6
BL12		0.19	0.08	41.51%	6
BL14		0.19	0.04	20.25%	6
BL18		0.17	0.04	26.34%	6
BL20		0.24	0.03	13.39%	6
BL21		0.24	0.07	28.61%	6

B=Significantly different from BL-21 Reference

#=Excluded from analysis due to significant mortality in the replicate

Exhibit 5

Memorandum from Dexter Matthews, Dir., DENR Waste Mgmt. Div.,
to Rob McDaniel, DENR Hazardous Waste Section,
Re: PCBs in Badin Lake (Feb. 25, 2009)

Roger Edwards
F/E

February 25, 2009

MEMORANDUM

TO: Dexter Matthews, Director
Division of Waste Management

FROM: Rob McDaniel *RMc*
Hazardous Waste Section

SUBJECT: PCBs in Badin Lake

As a result of fish tissue study of Badin Lake conducted by the North Carolina Division of Public Health on the presence of polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs), the Division of Waste Management reviewed all available information with a goal of determining if the PCBs present at the Alcoa facility may have originated or contributed to the PCBs found in the fish tissue.

In the review of information pertaining to PCBs associated with the Alcoa facility located in Badin, North Carolina and Badin Lake, several documents were relied on heavily. These documents included the RCRA Facility Investigation Work Plan, the RCRA Facility Investigation Report, summary tables from the draft Sediment Investigation Report, the Proposed Exposure Investigation Protocol for PCB and PAH Fish Tissue Sampling for Badin Lake, Stanly and Montgomery Counties, North Carolina, the Badin Lake Fish Tissue PCB Congener Data tables, and the Badin Lake Fish Tissue Data tables from the study.

The term "aroclor" is the registered trademark for a group of polychlorinated biphenyls that were manufactured by the Monsanto Company prior to 1976. The various aroclors employed at the Alcoa facility were in common industrial use prior to the cessation of the production of PCBs in the mid-1970's.

PCB aroclors have been found to be present in the soil at the Alcoa facility. During the long operating life of the plant, PCBs and PAHs may have been introduced into Badin Lake by overland flow during storm events or through the storm water drainage system of the plant. Alcoa conducted Interim Measures activities in the 1990's to excavate or improve the caps over contaminated soil at several solid waste management units. PAHs and PCBs were found to be present in the sediment in the swimming cove and boat ramp areas of Badin Lake. A memorandum, dated May 21, 1997 (Attachment 1) from the North Carolina Occupational and Environmental Epidemiology Section determined that human exposure to the constituents (PAHs, PCBs and inorganics) did not pose a significant health risk.

The fish tissue samples collected in the North Carolina Division of Public Health study were analyzed for the 209 PCB congeners. A table was created to determine which

congeners may be present in the aroclors used at the Badin facility (Attachment 2). The PCB aroclors predominately used at the Alcoa facility were 1242, 1248, 1254, and 1260. In review of the data, soil samples at some of the solid waste management were also analyzed for the aroclors 1232, 1221, and 1016, thus the congeners that may be present in these aroclors were also included in the table. The table includes seventy-six congeners that may be present in the seven aroclors predominately used at the Alcoa.

Fish tissue collected and analyzed during the Badin Lake fish tissue study found four fish tissue samples to be above the North Carolina Fish Consumption Advisory Limit of 50 ug/kg of total PCBs. Badin Lake was divided into three regions, the Northwest region where water from the Yadkin River Basin enters Badin Lake, the Northeast region of Badin Lake in Montgomery County, and the Southwest region of Badin Lake where the town of Badin and the Alcoa facility are located. A summary table of this data was created by Alcoa (Attachment 3). The Northwest region of Badin Lake contained three fish tissue samples above the standard and another sample approaching the standard for total PCBs and no exceedances for PAHs. There were no exceedances of the standards in the Northeast region of Badin Lake for either PAHs or PCBs. The Southwest region of Badin Lake found one fish tissue sample that was above the standard for PCBs and no sample was above the standard for PAHs.

Alcoa recently conducted a Sediment Investigation Report in Badin Lake (draft summary tables of the report are included in Attachment 4). Sediment samples were collected and analyzed for lead, mercury, PAHs, and PCBs in ten transects across Badin Lake. The sediment samples were analyzed for the PCB aroclors commonly used at the facility (Aroclors 1242, 1248, 1254, 1260, 1232, 1221, and 1016) and none were detected in the sediment samples collected. Numerous PAHs were detected in Transect 1, adjacent to the Alcoa facility and two PAHs were Transect 10 in the vicinity of the Narrows Dam.

With the information available at the time of this memorandum, it can be summarized:

PCBs were in common industrial use for many decades and are found throughout the environment;

Only a limited number of PCB aroclors were employed at the Alcoa facility in Badin and these aroclors were of common industrial use;

The May 21, 1997 memo from the North Carolina Occupational and Environmental Epidemiology Section concluded that human exposure to the constituents (PAHs, PCB aroclors and inorganics) analyzed in the sediment and water samples in the Swimming Cove at Badin Lake did not pose a significant health risk;

A cursory look at the locations in Badin Lake where fish tissue samples were collected and analyzed for PCBs indicate that four of the five highest concentration of total PCBs in the fish tissue were collected in the Northwest region of Badin Lake in the area where the Yadkin River enters the lake;

The Southwest region of Badin Lake, where the town of Badin and the Alcoa facility are located found only one fish tissue sample that was above the standard for PCBs;

Seventy-six congeners may have originally been present in the PCB aroclors used at the Alcoa facility. Numerous additional congeners were detected in the fish tissue samples collected in Badin Lake;

The presence of PCB congeners in fish of the Yadkin River Basin above Badin Lake is unknown;

PCB congeners degrade when exposed to the environment or during biological ingestion of the compounds; and

Recent sediment sampling in Badin Lake for the PCB aroclors commonly used at the facility (Aroclors 1242, 1248, 1254, 1260, 1232, 1221, and 1016) yielded none of these PCB aroclors detected.

With the information available at this time, considering the vast array of PCB congeners found present in the fish tissue, it would be extremely difficult and unlikely to conclude that these congeners are due solely from one source with any degree of confidence.

ATTACHMENT 1

**MAY 21, 1997 MEMORANDUM FROM THE NORTH CAROLINA
OCCUPATIONAL AND ENVIRONMENTAL EPIDEMIOLOGY SECTION**

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Epidemiology

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
Michael Moser, M.D., M.P.H., Director



May 21, 1997

MEMORANDUM

TO: Sharon Rogers, Head
Remediation Branch
Hazardous Waste Section

FROM: Luanne K. Williams, Pharm.D., Toxicologist, *LKW*
Medical Evaluation and Risk Assessment Branch
Occupational and Environmental Epidemiology Section

SUBJECT: Comments on the May 1997 Preliminary Sediment and Water Sampling Results from Badin Lake Prepared by Woodward-Clyde Consultants for Aluminum Company of America (Alcoa) smelting facility at Badin, North Carolina in Stanly County

As requested during our meeting on May 15, I reviewed the sediment and water sample results (which includes PCBs, PAHs, and inorganics) from the swimming cove at Badin Lake and offer the following comments:

1. Based upon the sediment and water sample results submitted, human exposure to the constituent concentrations detected should not pose a significant health risk. The concentrations reported were comparable to concentrations found in urban soil (Agency for Toxic Substances and Disease Registry 1995, Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHS). U.S. Department of Health & Human Services.)
2. Because only a few samples were collected and analyzed for inorganics, it is recommended as a precaution to collect six additional sediment samples from the swimming cove. It is recommended to analyze these samples for arsenic cadmium, cyanide, and lead.

If you have any questions, contact me at 919-715-6429.

LKW:lp

Enclosure

ATTACHMENT 2

**PCB CONGENERS COMMONLY PRESENT IN AROCLORS
ASSOCIATED WITH ALCOA-BADIN**

**PCB CONGENERS COMMONLY PRESENT IN AROCLORS
ASSOCIATED WITH ALCOA-BADIN**

PCB CONGENERS	1260	1254	1248	1242	1232	1221	1016
2-CHLOROBIPHENYL (PCB-1)				X	X	X	X
3-CHLOROBIPHENYL (PCB-2)				X	X	X	X
4-CHLOROBIPHENYL (PCB-3)				X	X	X	X
2,2'-DICHLOBIPHENYL (PCB-4)			X	X	X	X	X
2,3-DICHLOBIPHENYL (PCB-5)			X	X	X	X	X
2,4-DICHLOBIPHENYL (PCB-7)			X	X	X	X	X
2,4'-DICHLOBIPHENYL (PCB-8)			X	X	X	X	X
2,5-DICHLOBIPHENYL (PCB-9)			X	X	X	X	X
2,6-DICHLOBIPHENYL (PCB-10)			X	X	X	X	X
3,3'-DICHLOBIPHENYL (PCB-11)			X	X	X	X	X
3,4-DICHLOBIPHENYL (PCB-12)			X	X	X	X	X
3,5-DICHLOBIPHENYL (PCB-14)			X	X	X	X	X
4,4'-DICHLOBIPHENYL (PCB-15)			X	X	X	X	X
2,2',3-TRICHLOROBIPHENYL (PCB-16)		X	X	X	X	X	X
2,2',5-TRICHLOROBIPHENYL (PCB-18)		X	X	X	X	X	X
2,3,3'-TRICHLOROBIPHENYL (PCB-20)		X	X	X	X	X	X
2,3,4-TRICHLOROBIPHENYL (PCB-21)		X	X	X	X	X	X
2,3',5-TRICHLOROBIPHENYL (PCB-26)		X	X	X	X	X	X
2,4,4'-TRICHLOROBIPHENYL (PCB-28)		X	X	X	X	X	X
2,4,5-TRICHLOROBIPHENYL (PCB-29)		X	X	X	X	X	X
2,4,6-TRICHLOROBIPHENYL (PCB-30)		X	X	X	X	X	X
2,4',5-TRICHLOROBIPHENYL (PCB-31)		X	X	X	X	X	X
2',3,4-TRICHLOROBIPHENYL (PCB-33)		X	X	X	X	X	X
3,3',4-TRICHLOROBIPHENYL (PCB-35)		X	X	X	X	X	X

PCB CONGENERS	1260	1254	1248	1242	1232	1221	1016
2,2',4,6,6'-PENTACHLOROBIPHENYL (PCB-104)	X	X	X	X			
2,3,3',4,4'-PENTACHLOROBIPHENYL (PCB-105)	X	X	X	X			
2,3,3',4',6-PENTACHLOROBIPHENYL (PCB-110)	X	X	X	X			
2,3,4,5,6-PENTACHLOROBIPHENYL (PCB-116)	X	X	X	X			
2,3',4,4',5-PENTACHLOROBIPHENYL (PCB-118)	X	X	X	X			
2,3',4,5,5'-PENTACHLOROBIPHENYL (PCB-124)	X	X	X	X			
2,2',3,3',4,4'-HEXACHLOROBIPHENYL (PCB-128)	X	X	X				
2,2',3,3',4,5-HEXACHLOROBIPHENYL (PCB-129)	X	X	X				
2,2',3,3',5,6-HEXACHLOROBIPHENYL (PCB-134)	X	X	X				
2,2',3,3',6,6'-HEXACHLOROBIPHENYL (PCB-136)	X	X	X				
2,2',3,4',5,6-HEXACHLOROBIPHENYL (PCB-149)	X	X	X				
2,2',4,4',5,5'-HEXACHLOROBIPHENYL (PCB-153)	X	X	X				
2,2',4,4',6,6'-HEXACHLOROBIPHENYL (PCB-155)	X	X	X				
2,3,3',4,4',5-HEXACHLOROBIPHENYL (PCB-156)	X	X	X				
3,3',4,4',5,5'-HEXACHLOROBIPHENYL (PCB-169)	X	X	X				
2,2',3,3',4,4',6-HEPTACHLOROBIPHENYL (PCB-171)	X	X					
2,2',3,4,4',5,5'-HEPTACHLOROBIPHENYL (PCB-180)	X	X					
2,2',3,4,5,5',6-HEPTACHLOROBIPHENYL (PCB-185)	X	X					
2,2',3,4',5,5',6-HEPTACHLOROBIPHENYL (PCB-187)	X	X					
2,2',3,3',4,4',5,5'-OCTACHLOROBIPHENYL (PCB-194)	X						
2,2',3,3',4,4',5,6'-OCTACHLOROBIPHENYL (PCB196)	X						
2,2',3,3',5,5',6,6'-OCTACHLOROBIPHENYL (PCB-202)	X						
2,2',3,3',4,4',5,5',6-NONACHLOROBIPHENYL (PCB-206)	X						
2,2',3,3',4,4',5,6,6'-NONACHLOROBIPHENYL (PCB-207)	X						
2,2',3,3',4,5,5',6,6'-NONACHLOROBIPHENYL (PCB-208)	X						

ATTACHMENT 3

SUMMARY TABLE OF BADIN LAKE FISH TISSUE PCB DATA

SUMMARY OF BADIN LAKE FISH TISSUE PCB DATA

Location	Sample Identification	Species	Trophic Level	Total PCBs	
				Fish Concentration (ug/kg) ^a	Trophic Level Mean (ug/kg) ^b
Badin Lake Southwest Arm	WHC 08-228	White Catfish	1	53	35
	BRB 08-229	Brown Bullhead	1	32	
	BRB 08-230	Brown Bullhead	1	19	
	RBS 08-225	Redbreast Sunfish	2	11	10
	RBS 08-226	Redbreast Sunfish	2	8	
	RBS 08-227	Redbreast Sunfish	2	10	
	LMB 08-231	Largemouth Bass	3	40	26
	LMB 08-232	Largemouth Bass	3	31	
	LMB 08-233 (dup 232)	Largemouth Bass	3	33	
	LMB 08-234	Largemouth Bass	3	6	
	CHC 08-237	Channel Catfish	1	117	
	CHC 08-238	Channel Catfish	1	48	
Badin Lake Northwest Arm	CHC 08-244 (dup 238)	Channel Catfish	1	50	56
	WHC 08-239	White Catfish	1	42	
	WHC 08-240	White Catfish	1	18	
	RES 08-235	Redear Sunfish	2	2	2
	BKS 08-236	Black Crappie	2	3	
	LMB 08-241	Largemouth Bass	3	53	
	LMB 08-242	Largemouth Bass	3	11	23
	LMB 08-243	Largemouth Bass	3	7	
	BRB 08-248	Brown Bullhead	1	8	
	FBH 08-249	Fat Bullhead	1	4	8
Badin Lake Northeast Arm	WHC 08-250	White Catfish	1	12	
	BGS 08-245	Bluegill Sunfish	2	7	
	RES 08-246	Redear Sunfish	2	1	3
	BKS 08-247	Black Crappie	2	1	
	LMB 08-251	Largemouth Bass	3	17	
	LMB 08-252 (dup 251)	Largemouth Bass	3	18	9
	LMB 08-253	Largemouth Bass	3	6	
	LMB 08-254	Largemouth Bass	3	4	

a - Concentrations based on sum of congeners - does not include nondetect (U-qualified) data

b - Duplicate values were averaged and treated as a single value.

The North Carolina Fish Consumption Advisory Limit is 50 ug/kg total PCBs

ATTACHMENT 4

**SEDIMENT INVESTIGATION REPORT IN BADIN LAKE
SEDIMENT DATA SUMMARY TABLES**



Figure 1
Sediment Sampling
and Transect Locations
 Alcoa-BadIN Works
 Badin, North Carolina

Project: State Plans North Carolina, NAD83, Part
 Source(s): NC One Map and URG Corporation

0 1,000 2,000 Feet

0 0.25 0.5 Miles



Legend

- Sediment Sample Location
- Plant Boundary
- Proposed Transect

Note:
 A to E represents a chronological sample collection
 direction equal to either a West to East or North to
 South direction along a transect.

Locator Map



NORTH CAROLINA

Table 1. Depth and Coordinate Data for Sediment Sampling Locations.

	A			B			C		
	Depth (ft)	Coordinates (N/E)		Depth (ft)	Coordinates (N/E)		Depth (ft)	Coordinates (N/E)	
		Northing	Easting		Northing	Easting		Northing	Easting
Transect 1	15	605978.003	1667963.257	27	605974.881	1668049.832	30 ft	605949.662	1668155.309
Transect 2	8	607764.241	1668228.593	25	607663.436	1668499.578	53 ft	607445.543	1668773.992
Transect 3	16	608764.080	1668686.049	27	608594.072	1668962.499	58 ft	608383.081	1669270.572
Transect 4	36	610096.021	1669275.923	57	609934.007	1669691.482	66 ft	609747.132	1670048.859
Transect 5	45	611962.077	1669883.908	58	611726.142	1670266.139	60 ft	611463.380	1670738.852
Transect 6	68	624826.498	1675722.470	89	624638.994	1676174.228	95 ft	624446.976	1676664.687
Transect 7	118	617163.434	1671202.782	116	617405.343	1671218.987	114 ft	617725.781	1671199.746
Transect 8	24	614422.344	1671414.502	128	614208.782	1671932.285	132 ft	613942.004	1672465.850
Transect 9	90	611009.125	1673193.316	159	611144.395	1673446.340	135 ft	611228.957	1673649.650
Transect 10	75	609778.061	1673571.700	130	609880.169	1673784.957	169 ft	609983.760	1674011.552

NC State Plane Feet, NAD83

Table 2. Sediment Data Summary for Badin Lake

Parameter	Transect 6		Transect 7		Transect 8		Transect 9		Transect 10	
	Composite	Discrete	Composite	Discrete	Composite	Discrete	Composite	Discrete	Composite	Discrete
Inorganics (mg/kg)	T6-SED-0	T6-SED-1B	T7-SED-0	T7-SED-1C	T8-SED-0	T8-SED-1B	T9-SED-0	T9-SED-1C	T10-SED-0	T10-SED-1C
Lead	28.8	31.4	29	33.8	20.4	32.5	20.3	25	20.3	26.4
Mercury	0.052	0.051	0.05	0.057	0.028	0.032	0.039	0.039	0.021	0.029
PAHs (µg/kg)										
1-Methylnaphthalene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
2-Methylnaphthalene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<129
Acenaphthene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Acenaphthylene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Anthracene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Benzo(a)anthracene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Benzo(a)pyrene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Benzo(b)fluoranthene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Benzo(e,h,i)perylene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Benzo(k)fluoranthene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Chrysene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Dibenz(a,h)anthracene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Fluoranthene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Fluorene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Indene(1,2,3-cd)pyrene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Naphthalene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	181
Phenanthrene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
Pyrene	<110	<126	<104	<109	<71.8	<118	<62.5	<89.3	<72	<108
PCBs (µg/kg)										
PCB-1016 (Aroclor 1016)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
PCB-1221 (Aroclor 1221)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
PCB-1232 (Aroclor 1232)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
PCB-1242 (Aroclor 1242)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
PCB-1248 (Aroclor 1248)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
PCB-1254 (Aroclor 1254)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
PCB-1260 (Aroclor 1260)	<364	<138	<344	<120	<158	<130	<138	<98.3	<158	<119
Additional Parameters										
Percent Moisture (%)	72.8	76.1	71.2	72.5	58.2	74.7	52	66.4	58.3	72.2
Mean Total Organic Carbon (mg/g)	25400	28700	25300	25500	23700	26100	24800	23900	25700	25700

Table 2. Sediment Data Summary for Badin Lake.

Parameter	Transect 1		Transect 2		Transect 3		Transect 4		Transect 5	
	Composite	Discrete	Composite	Discrete	Composite	Discrete	Composite	Discrete	Composite	Discrete
Parameter	T1-SED-0	T1-SED-1C	T2-SED-0	T2-SED-1C	T3-SED-0	T3-SED-1C	T4-SED-0	T4-SED-1D	T5-SED-0	T5-SED-1E
Inorganics (mg/kg)										
Lead	39.6	40	28.3	30.1	28.8	28.1	22.3	34.1	31	28.4
Mercury	0.044	0.055	0.031	0.045	0.034	0.063	0.061	0.056	0.064	0.053
PAHs (µg/kg)										
1-Methylnaphthalene	<54	1350	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
2-Methylnaphthalene	<54	2260	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Acenaphthene	29.4J	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Acenaphthylene	<54	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Anthracene	103	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Benzo(a)anthracene	534	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Benzo(b)pyrene	641	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Benzo(b)fluoranthene	763	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Benzo(g,h,i)perylene	345	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Benzo(k)fluoranthene	597	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Chrysene	604	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Dibenz(a,h)anthracene	199	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Fluoranthene	1010	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Fluorene	26.7I	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Indeno(1,2,3-cd)pyrene	367	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Naphthalene	72.3	672	<90.3	<33.8	<102	<105	<91.6	319	<97.5	<108
Phenanthrene	374	945	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
Pyrene	702	<192	<90.3	<33.8	<102	<105	<91.6	<128	<97.5	<108
PCBs (µg/kg)										
PCB-1016 (Aroclor 1016)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
PCB-1221 (Aroclor 1221)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
PCB-1232 (Aroclor 1232)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
PCB-1242 (Aroclor 1242)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
PCB-1248 (Aroclor 1248)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
PCB-1254 (Aroclor 1254)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
PCB-1260 (Aroclor 1260)	<59.4	<106	<99.4	<111	<112	<116	<101	<140	<322	<119
Additional Parameters										
Percent Moisture (%)	44.5	68.8	66.8	70.4	70.5	71.4	67.2	76.5	69.2	72.2
Mean Total Organic Carbon (mg/g)	32800	57700	21700	25700	17900	22400	18000	32000	26500	30600

The State of North Carolina's 21st Century Plan for the Use of The Yadkin River Resources

Volume 1

September 8, 2009



Prepared by Karen A. West, Acting General Counsel, (919) 715-5579 kwest@nccommerce.com; with contributions from Stephanie G. McGarrah, Asst. Secretary for Policy, Research and Strategic Planning and Christopher Harder, Director of Economic Analysis (economic analysis sections); Allan Sandoval, GIS Specialist (maps); Asst. Secretary for Communications and External Affairs Katharine C. Neal (primary Commerce functions); Stewart Dickinson, Commerce Finance Director and Mark N. Poole, Finance Specialist (financial model).

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Attachment II	Brief on Behalf of Intervenor State of North Carolina, Project No. 2197, Docket No. IT-5499, <i>In re Carolina Aluminum Co.</i> , Federal Power Commission (Nov. 14, 1957)
Attachment III	North Carolina Drought Management Advisory Council Activities Report – 2008, North Carolina Division of Water Resources, Department of Environment and Natural Resources, Oct. 1, 2008 (Revised Dec. 18, 2008)
Attachment IV	<i>Curriculum Vitae</i> for David H. Moreau, Ph.D.
Attachment V	<i>Water for Electricity and Public Water Supply in the Yadkin River Basin</i> , David H. Moreau, Ph.D. (Aug. 26, 2009)
Attachment VI	Review of PCB Data From Badin Lake, John H. Rodgers, Jr. Ph.D. (July 27, 2009)
Attachment VII	<i>Curriculum Vitae</i> for John H. Rodgers Jr., Ph.D.
Attachment VIII	Badin Lake Fish Consumption Advisory Photos
Attachment IX	Petition for Contested Case Hearing filed by APGI with the North Carolina Office of Administrative Hearings regarding the Badin Lake fish advisory in that contested case, entitled <i>Alcoa Power Generating Inc. v. N.C. Dep't of Health & Human Servs. & its Div. of Pub. Health</i> , No. 09-DHR-2505 (North Carolina Office of Administrative Hearings, filed April 9, 2009)
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Attachment XII	Letter from David R. Poe, Counsel to APGI, to Magalie R. Salas, Sec'y, FERC, Project No. 2197-037 (Mar. 10, 2006)
Attachment XIII	Fish and Aquatics IAG and Water Quality IAG Joint Meeting, Final Meeting Summary (Feb. 3, 2004), <i>reprinted in</i> Alcoa Power Generating, Inc., Application for License, Project No. 2197, vol. V(C) (2006), <i>available at</i> eLibrary Accession No. 20060425-4005 (attachments omitted)
Attachment XIV	Yadkin Hydroelectric Project, FERC No. 2197, Relicensing Settlement Agreement, (Feb. 2007), filed in <i>Alcoa Power Generating Inc.</i> , Project No. 2197-073 (May 7, 2007), <i>available at</i> eLibrary Accession No. 20070507-5011 (selected sections)
Attachment XV	N.C. OAH Order Granting Petitioner's Motion for Preliminary Injunction Stay of Certification 09 EHR 3078 in the Office of Administrative Hearings (May 27, 2009)
Attachment XVI	Jack Betts, <i>The Water is Shifting Under Alcoa</i> , The News & Observer, June 2, 2009, http://www.newsobserver.com/opinion/columns/story/1551070.html
Attachment XVII	N.C. Economic Development Board Strategic Plan 2008 Update (Sept. 25, 2008)
Attachment XVIII	The Estimated Economic Impact of Closure of Alcoa's Aluminum Smelting Facility in North Carolina, N.C. Department of Commerce, Division of Policy, Research and Strategic Planning (Aug. 26, 2009)
Attachment XIX	Aff. of J. Keith Crisco, North Carolina Secretary of Commerce

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Statement by North Carolina Secretary of Commerce, J. Keith Crisco

We appreciate this opportunity to present the State of North Carolina's 21st Century Plan for the Use of the Yadkin River Resources (the "Plan"), in support of the State's request to the Federal Energy Regulatory Commission ("FERC" or the "Commission"), that FERC recommend that the Federal Government exercise its right under Federal Power Act Sections 7(c) and 14, 16 U.S.C. §§ 800(c) and 807, to recapture the Yadkin Hydroelectric Project, FERC Project No. 2197 (the "Project" or the "Yadkin Project"), and transfer it to the State of North Carolina for public purposes.

Background

The Yadkin River is an invaluable natural resource for the State. Its flowing waters are used for multiple purposes by our citizens. The current Project licensee, Alcoa Power Generating, Inc. ("APGI"), developed three dams and hydroelectric plants in the early 20th century and a fourth dam and hydroelectric plant in the early 1960s, to serve the industrial needs of its parent company, Alcoa, Inc.¹ At the time, this also served local needs, as the company employed nearly a thousand local people. Those facilities comprising the Yadkin Project have essentially determined how the Yadkin River flows have been used in the State for the past 100 years. The Yadkin River has been a prime attraction for centuries. Beginning in 1753, when the Moravian settlers came from Pennsylvania and established a colony, thousands of settlers came to the area, drawn by fertile land, access to water and navigable streams, and fishing.

At the time of APGI's initial license, the company argued extensively that if it were required to acquire a federal hydroelectric license to generate electricity for its aluminum smelting operations in the Badin area, a 50-year license (rather than the usual 30-year license), was "necessary, as a matter of economics, for the continuance of the smelting operations at Badin, which is the principal industry serving that area of North Carolina."² APGI (then "Aluminum") threatened that "[t]he possibility of discontinuance or diminution of Aluminum's smelting operations at Badin, by reason of issuance of a license for... a term too short to be economically feasible for Aluminum, would entail losses to the community in taxes and employment that

¹ The Yadkin Project license was transferred to APGI from its predecessor company, Yadkin, Inc. (f/k/a Carolina Aluminum Company, the original licensee). Yadkin, Inc. was merged into APGI as a result of an Alcoa corporate restructuring. For purposes of discussion, APGI will be referred to as the licensee, regardless of the point in time under discussion, as it succeeded to and is bound by all license terms applicable to the former entity, and both were the power subsidiaries of Alcoa. FERC Order Granting Waiver and Approving Transfer of License, *Yadkin, Inc.*, Project No. 2197-039, 92 F.E.R.C. ¶ 62,029 (issued July 17, 2000).

² Motion for Reconsideration and Rescission of Order, Project No. 2197 and Project No. 2206. *In the matters of Carolina Aluminum Company and Carolina Power & Light Company* (August 23, 1957) (provided as Attachment I).

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would be disastrous in their effect.”³ At the time, the State of North Carolina supported APGI’s request for a 50-year license because the State believed that, as the largest employer and largest taxpayer in Stanly County, and with increased employment expected from increased investment, the company’s continued operation of the smelting works was in the public interest. The State also noted that “Companies such as these take root in a State and weave themselves into the economic life and well-being of the people and their industries. [They] become almost institutions of the State and the economic status and well-being of many families depend upon their regularity of operations and a progressive modernization of plants and installations.”⁴ Fifty years later, the disaster that APGI warned about has come. After declining levels of smelting operations and corresponding employment reductions for at least 20 years, manufacturing processes at the Badin smelting works finally shut down completely in 2007, and APGI is no longer woven into the economic well-being of the people. In fact, not only does APGI not offer the benefits that were a *quid pro quo* for the State’s support of its initial license, but it produces harm in that it does virtually nothing to address the water quality needs or the economic or recreational needs of the region. The State’s review of the more recent record also shows that APGI has significantly deferred major maintenance of the Yadkin Project hydroelectric facilities and failed to complete investments necessary to meet State water quality standards, and that APGI cannot demonstrate good stewardship of this resource. This is in contrast to other North Carolina power producers which are also FERC licensees and State-regulated entities that serve the people of North Carolina. Those other licensees can also generally be relied upon to partner with the State on economic development projects, and to pursue development, energy innovation and activity with sensitivity to the economic benefit to the State, primarily because – unlike Alcoa and APGI – their core businesses are located within the State and their success depends on the well-being of the State’s economy.

APGI’s initial Yadkin River Hydroelectric license expired in 2008, and APGI has now applied to the Commission for relicensing. APGI is seeking another 50-year license. Clearly, under the circumstances that exist in 2009, there is no basis to grant APGI another license. The original basis justifying the issuance of a license to APGI long ago ceased to exist.

The State recognizes that the Commission’s past practice has been to grant license renewals like that sought by APGI, but the relicensing process set out by the Federal Power Act also expressly provides for alternative actions. Under one of these alternatives (recapture), the State of North Carolina (the “State”) could seek to recover for its citizens their heritage, by once again making the Yadkin River work primarily for the citizens of this State. We believe that this case warrants recapture of the license.

We are not initiating this request lightly. North Carolina is heralded as a business-friendly State; we spend a lot of time and energy promoting the attractions of North Carolina for business location and expansion, and in developing tools to help us recruit business. We have not changed

³ *Ibid.*

⁴ Brief on Behalf of Intervenor State of North Carolina, in *Carolina Aluminum Company*, Federal Power Commission Project No. 2197 and Docket No. IT-5499 (filed Nov. 14, 1957) (provided as Attachment II).

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our outlook on the importance of private industry. The State did not start out to become a hydroelectric power operator in the Yadkin River Basin. But, now, it is important that we become one, and we are fully prepared to do so. APCI's lack of sound stewardship of this important resource, and its failure to contribute in any manner to the economic health and well-being of North Carolina, puts this company, and this FERC license, in an entirely different category than other power operators. APCI has left the State no choice but to act to save this resource from APCI's neglect, by becoming the conscientious operator of this invaluable resource for the larger public good.

Why the State Needs the Ability to Better Influence the Yadkin River Flows; Essential Needs

Because the Yadkin River is a major river, it is instrumental to ensuring the region's growth and prosperity in the coming decades. Yet, as noted above, control of the Yadkin River's flows now resides with a private corporation that no longer uses the power potential of the river for the original industrial purposes that brought it to the State. Regrettably, the more recent history of this licensee fails to demonstrate that the State can rely on this licensee to be a good steward of the Project and the Yadkin River's flows, or that the State can rely on the licensee's concerns for the State's well-being. As noted earlier, this is not something that the State experiences, as a matter of course, with other FERC-licensed projects within the State.

Without the ability to control or influence the Yadkin River's flows, and without receiving the associated economic benefit of these flows, the State's ability to ensure future growth and prosperity, for the people of this region and the State as a whole, is impaired. North Carolina now competes globally for jobs and development. The rapid pace of technological innovation and economic change – brought home by the speed and severity of the recent global economic downturn which has severely impacted the State's citizens – makes it imperative that the State be provided the capability to respond quickly and flexibly to new challenges and changing conditions. We anticipate the chief task in the 21st century to be the need to create more and better jobs, and at the same time to address the increasingly more difficult task of providing a hospitable and quality environment for our growing urbanized population, as well as our still significant rural population. An analysis of the challenges facing this State over the coming decades has led the State to the conclusion that the public interest and the discharge of its responsibilities require that it assume guardianship of the Yadkin Project resources so that the value of this great natural resource can be directed to the economic interest and well-being of the people.

With such ability, the State could better advance important public purposes and still assure the development and operation of the Project consistent with FERC's mandate to license only projects that are best adapted to a comprehensive plan for a waterway, a plan that would properly balance power generation and development with non-power uses over the full license term. These would include public use of the Yadkin River's water, economic development, mitigation and remediation of environmental hazards and enhancement of fish and wildlife, flood control, aesthetics, cultural resources, recreational opportunities and other beneficial public uses. Achieving all these tasks is essential to the well-being of the State's people in the 21st century.

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The State's Obligations to its Citizens: An Overview

The State's success depends on appropriate use of natural and human resources. The State has experienced considerable success in the field of economic development, which has brought a measure of improved prosperity to the State over the past two decades. Its continued success depends on its ability to use its natural and human resources even more effectively to attract and retain businesses and residents in the future. The State has statutorily adopted a declaration of public policy with regard to its responsibility for conservation of water and maintaining superior environmental quality as a public purpose.⁵ The statute explicitly reflects the State's responsibility for water resources as follows:

*Recognizing that the water and air resources of the State belong to the people, the General Assembly affirms the State's ultimate responsibility for the preservation and development of these resources in the best interest of all its citizens and declares the prudent utilization of these resources to be essential to the general welfare.*⁶

We regard the management of a major river basin like the Yadkin as requiring a balancing of multiple and competing uses in a purposeful manner.⁷ This is also reflected in North Carolina's statutes:

Standards of water and air purity shall be designed to protect human health, to prevent injury to plant and animal life, to prevent damage to public and private property, to insure the continued enjoyment of the natural attractions of the State, to encourage the expansion of employment opportunities, to provide a permanent foundation for healthy industrial development and to secure for the people of North Carolina, now and in the future, the beneficial uses of these great natural resources.

This is the essence of the State's daily and long-term activities. Because of our experience, we believe the State is particularly suited to making these kinds of decisions, consistent with both Federal and State law, which will play an increasingly important role in the welfare of the State and its citizens over the coming years. We discuss in more detail below, the particular problems we anticipate will need to be addressed and how the resolution of each of these problems can be improved if the State had greater authority and control over the flows in the Yadkin River.

1. Assurance of Adequate Municipal Water Supply Is Critical; Planning is Essential

Clean, reliable water resources, in particular, are essential to the State's viability. In 2008, during the State's most recent severe drought, streams in western North Carolina dropped to record lows.⁸ Monthly average flows hit all-time record lows for June and July at more than half

⁵ See N.C. Gen. Stat. § 143-211(a).

⁶ *Ibid.*

⁷ See N.C. Gen. Stat. § 143-211(c).

⁸ U.S. Geological Survey's N.C. Water Science Center. Data available at <http://nc.water.usgs.gov/>

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of the U.S. Geological Survey's long-term gauges in the region, and low-water records were set in the Catawba, Yadkin and Broad River basins of North Carolina.

Stream flow determines how much water feeds the reservoirs used by most municipalities in the greater Charlotte region. Stream flow is also important to numerous industry sectors in the region, including manufacturing, agriculture (including poultry production), and forestry. According to the Division of Water Resources, a growing population, combined with severe drought conditions over the last decade, has resulted in a number of water supply problem spots, where increased water needs threaten to exceed available supply. Necessary actions to coordinate the State's water resources to assure the adequacy of present and future water supplies have been identified.⁹

Meeting North Carolina's present and future water supply needs requires a partnership between State and local governments. The State must monitor water use, potability, and availability Statewide; provide a State and regional framework for planning; administer water management laws; and establish policies that will contribute to solving water supply problems. It must ensure that backup systems are in place to protect every community in the event of emergencies and prolonged droughts. The example of Atlanta, which may face a significant disruption in its water supply due to a legal dispute over its right to withdraw water from Lake Lanier, has been watched with concern here in North Carolina.¹⁰

The State has consulted with Dr. David H. Moreau,¹¹ former Chairman of the NC Environmental Management Commission, who is an expert in modeling complex stream-reservoir systems. He has four decades of experience studying the Yadkin River region. Dr. Moreau has prepared a number of scholarly papers on the Yadkin area, including a report on regional water resource planning,¹² and has also provided a statement to the Department (the "Statement") regarding the use of the Yadkin River Basin waters for both hydroelectric power generation and to meet water demand.¹³

According to Dr. Moreau, rapid urban growth in North Carolina will lead to more conflicts over the uses to which the available water in the Yadkin River basin should be applied. This is a clear

⁹ North Carolina Drought Management Advisory Council Activities Report – 2008, North Carolina Division of Water Resources, Department of Environment and Natural Resources, Division of Water Resources, Oct. 1, 2008 (Revised Dec. 17, 2008) (provided as Attachment III).

¹⁰ *In re: Tri-State Water Rights Litigation*, ___ F. Supp. 2d ___, 2009 WL 2371506 (M.D.Fla. July 17, 2009).

¹¹ A copy of Dr. Moreau's *curriculum vitae* is provided as Attachment IV.

¹² *Regional Water Resource Planning for Urban Needs*, Water Resources Institute of the University of North Carolina, 1973.

¹³ *Water for Electricity and Public Water Supply in the Yadkin River Basin*, David H. Moreau, Ph.D. (August 26, 2009). This document is provided as Attachment V.

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trend.¹⁴ The exact points at which such resource conflicts will become so substantial as to be considered critical is unclear, because the exact timing of any such event is subject to weather conditions and other factors that cannot be predicted with certainty. This is the very reason why the State must start short-term, mid-term and long-term planning for this waterway. In order to do such planning and then implement those plans, the State simply must have more influence on directing Yadkin River uses than it has had in the past, or than it would have if the licensee continued to be a private corporation operating for the primary purpose of maximizing its electricity revenues from hydro production.

Absent the authority to plan for these eventualities which would be occurring over multiple years, the State would not be in a position to make the best, rational decisions that would lead to the most efficient use of the Yadkin River flows. Nor would it be positioned to engage in the balancing of legitimate public interests and the desires of different stakeholders that would result in lower long-term cost to the public. As Dr. Moreau notes, it is not unreasonable to conclude that there could come a time when some or all of the Yadkin River waters now used for hydroelectric power generation are likely to be more valuable to the State for other purposes, even over the next 40 to 50 years. Dr. Moreau's projections are conservative; many observers warn that water shortages are upon us.

The changing value and appreciation of the water in the future will be complicated by other practical considerations. For example, in his Statement, Dr. Moreau cautions that very few opportunities remain in North Carolina to develop new reservoirs to meet the State's growing demand for water supplies, as most of the best reservoir sites in North Carolina have already been developed. As a consequence, the State could be seriously handicapped in its ability to make the best use of these waters at the least cost to its citizens. Nevertheless, Dr. Moreau believes that changes can and must be made to satisfy the increasing urban needs, and that these changes can be made without precluding the use of the Yadkin flows for recreation, electric power generation, aesthetics and other benefits to the region.¹⁵

Planning for infrastructure takes foresight, and as Dr. Moreau notes, changes to the uses of water supplies, particularly from reservoirs, "would be facilitated if the ownership of the license were in public hands rather than being controlled by a private entity."¹⁶ It has become clear to the State that access and the ability to deliver water are essential in discharging its responsibilities. With adequate control of the waters and effective planning, the State would acquire the ability to act swiftly when and where action is required, as in the case of a drought. This would provide stability and certainty to companies and individuals, all of whom need and use clean supplies of water.

¹⁴ See, for example, Peter Rogers, "Facing the Freshwater Crisis," *Scientific American* (August 2008); Michael E. Webber, "Catch 22: Water v. Energy," *Scientific American*, Special Issue, Vol. 18, No. 4 (2008).

¹⁵ See footnote 13.

¹⁶ Attachment V, pg. 7.

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The drought also taught us that the public requires assurance of the long-term sustainability of water supplies, and it is our belief that only the State can provide this assurance through planning, coordination of multiple units of government, and where possible, the ability to control the flows of major waterways. The State will be far more effective in addressing all these needs if it were not forced to wait until there is a crisis, and if it had the means of control to permit it to take steps to match variable supply and demand over time. Quite simply, this river and its reservoirs provide an essential tool to the State in planning for the region's long-term water needs. While other rivers have established ownership patterns, the State regards the control of the Yadkin River flows and reservoirs as particularly important. While the re-direction of a river's flows might be accomplished by coordination, the Yadkin River is a special case, since its flows in the Badin area are owned by a private company that has virtually abandoned its base of operations in the State, but has still sought a 50-year Federal license to engage in its primary purpose of maximizing the revenues from the generation and sales of electricity outside North Carolina, that come from the Yadkin River flows and reservoirs.

Another environmental expert, Dr. Greg Characklis,¹⁷ has studied dam/reservoir operations in both the Catawba and Roanoke basins. Based on his research in the Catawba basin, it is reasonable to say that regarding the Yadkin-Pee Dee basin and the Alcoa hydroelectric facility, there is the potential during severe droughts for conflicts between municipal water supply and water used to generate electricity. Low-inflow protocols, such as those put in place on the Catawba River by Duke, can mitigate those conflicts. However, there remains the potential for conflict around how a private entity operates a dam to maximize revenue vs. having a nonprofit or government agency managing the water resource for the broader public good.¹⁸

We hope and expect that the types and amount of renewable power generation will increase in the future, as new technologies are developed. But there is no substitute for water. Having the capability of shifting some of the Yadkin River uses for consumptive water usage may be necessary and crucial to the State in the future, as the value of and need for consumptive water use grows. Greater State control of the Yadkin River is particularly pivotal as the current licensee no longer retains the economic interests within the State that would necessarily make it sensitive to the State's concerns.

2. Availability of Clean Water Resources; Environmental Degradation of Yadkin Water Quality Remains A Public Concern

Low flows arising from drought conditions concentrate pollutants, creating problems for sewage treatment; harm fish and other aquatic life due to a reduced oxygen level in the water; and have the potential to compromise water quality for consumers. Continuing degradation of the quality of the water in the Yadkin region remains of great concern to the State, especially as to public health issues raised not only by the recent drought but also by past contamination from industrial

¹⁷ Gregory W. Characklis, Ph. D., Associate Professor, Dept. of Environmental Sciences & Engineering University of North Carolina at Chapel Hill, School of Public Health.

¹⁸ Telephone call and electronic mail exchange between Dr. Characklis and Katharine C. Neal, Assistant Secretary, Communications and External Affairs, N.C. Dept. of Commerce, August 25 and 26, 2009.

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activities that continues to affect the region's public health. Water quality issues involving Badin Lake (which is part of the Yadkin Project), in particular, continue to raise concerns. Stanly County recently submitted a report¹⁹ to counsel for the Department of Environment and Natural Resources ("DENR"), Division of Water Quality ("DWQ"), which summarizes evidence showing a relationship between polychlorinated biphenyls ("PCBs") in lake sediments and PCBs found in the tissues of certain fish taken from the lake. These fish are caught and eaten by some of the local residents, many of whom are forced to supplement their diets with these fish.

According to this PCB congener study, the PCBs found in the tissues of the fish in Badin Lake are the same PCBs that Alcoa's former industrial operations at the Badin aluminum smelting plant deposited in Badin Lake. This PCB congener analysis was conducted by the Director of the Ecotoxicology Program in the Department of Forestry and Natural Resources at Clemson University.²⁰ The same report was submitted to DENR's Division of Waste Management ("DWM"), and we understand that the County has asked DWM to perform further analysis or require further definition and exploration of the PCB contamination, and that DWM has the matter under advisement.²¹

The State's Department of Health and Human Services ("DHHS"), Division of Public Health ("DPH"), recently posted a fish consumption advisory for Badin Lake in Stanly and Montgomery Counties, as a result of elevated levels of PCBs and mercury found in the tissues of certain Badin Lake fish.²² This advisory warned that certain vulnerable individuals in the population should avoid eating largemouth bass and catfish from Badin Lake, and recommended no more than one meal per week of these fish for all other individuals.²³ Pursuant to this advisory, DPH proposed to posts signs at Badin Lake warning people of the health hazards associated with eating these fish. APGI filed a legal proceeding in the N.C. Office of Administrative Hearings ("OAH") challenging the DPH's legal right to issue this fish consumption advisory and to post the fish advisory signs.²⁴ APGI's lawsuit alleged that DHHS and the DPH's issuance of the advisory warning at-risk people about the health hazards of consuming certain fish from Badin Lake had

¹⁹ *Review of PCB Data From Badin Lake*, John H. Rodgers, Jr. Ph.D., July 27, 2009 (provided as Attachment VI).

²⁰ See Curriculum Vitae of John H. Rodgers, Jr., Ph.D. (provided as Attachment VII).

²¹ Information provided by the law firm of Parker, Poe, Adams and Bernstein, LLP, counsel to Stanly County.

²² See North Carolina Division of Public Health - Epidemiology Section, Fish Consumption Advisories, Feb. 11, 2009. <http://www.epi.state.nc.us/epi/fish/current.html>.

²³ See Badin Lake Fish Consumption Advisory photos provided as Attachment VIII.

²⁴ Petition for Contested Case Hearing filed by APGI with the North Carolina Office of Administrative Hearings regarding the Badin Lake fish advisory in that contested case entitled *Alcoa Power Generating Inc. v. North Carolina Dept. of Health and Human Services and its Division of Public Health*, No. 09-DHR-2505 (North Carolina Office of Administrative Hearings, filed April 9, 2009) (provided as Attachment IX).

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“deprived [APGI] of property” and had “substantially prejudiced [APGI’s] rights” because the issuance of the fish advisory at that particular time(i) threatened APGI’s ability to obtain from DENR the Clean Water Act Section 401 Certification (the “Certification” or the “Section 401 Certification”) that APGI absolutely had to obtain in order to be eligible to receive a new 50-year license from FERC to operate the Yadkin River Project (No. 2197); and (ii) threatened APGI’s ability to obtain from FERC its desired operator’s license for the Yadkin River Project (No. 2197).²⁵ After DENR issued a Section 401 Certification to APGI, and that Certification was appealed, APGI consented to stay this legal proceeding pending resolution of the Clean Water Certification proceedings²⁶ (which have been consolidated at the OAH).

As was identified in the Section 401 Certification process, which was handled by DENR’s Division of Water Quality,²⁷ pollutants from former APGI industrial operations at the site of the Project remain a threat to human health and the environment. In addition, a condition of issuance of the Certification²⁸ was that APGI post a surety bond within 120 days of the issuance of the Certification, in the amount of \$240 million, to guarantee that financial resources would be available to make improvements to the hydroelectric plants in order to modernize the facilities and to improve dissolved oxygen levels in the discharge of the dams, as promised by APGI in this proceeding. APGI failed to post the required bond, and APGI is now contesting the requirement to post the bond.

²⁵ *Ibid.*

²⁶ See Order Granting Motion to Amend Scheduling Order, July 27, 2009 (provided here as Attachment X). DHHS and its DPH entered into an agreement with APGI staying the APGI fish advisory lawsuit in the OAH pending: (i) the outcome of the previously filed APGI and Stanly County OAH lawsuits challenging the Clean Water Certification issued by DENR; and/or (ii) a possible settlement of the Alcoa fish advisory lawsuit.

²⁷ North Carolina 401 Water Quality Certification No. 003173 issued to APGI, dated May 7, 2009, and accompanying documentation. This is provided together with a DENR one-page summary release, as Attachment XI.

²⁸ While the State might have chosen to reject APGI’s application for a Clean Water Act, Section 401 Water Quality Certification, DENR chose another route. DENR issued the Clean Water Certification subject to conditions requiring APGI to meet various water quality criteria, and to post a substantial bond to ensure those criteria would be achieved. APGI has challenged the condition requiring the posting of the bond. Earlier, DENR had joined the APGI relicensing settlement agreement filed with FERC (see Attachment XIV). DENR, however, expressly preserved its authority to issue and enforce a proper Water Quality Certification. Yadkin Hydroelectric Project, FERC No. 2197, Relicensing Settlement Agreement, pg. 1-16 to 1-17, Section 1.3.12 (filed May 7, 2007) (provided as Attachment XIV). At any rate, DENR is charged with enforcement of specific concerns that represent a small, albeit important, part of the State of North Carolina’s complete set of interests, as expressed in this 21st Century Plan for the Yadkin River Resources. DENR makes its decisions based on its specific concerns, and the State must necessarily be more expansive in the scope of its concerns as they affect the Yadkin River. Also, events have come to light about the dangers of PCB exposure in the Yadkin River that were not available at the time of DENR’s decision-making (see Attachment I).

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The investments in the hydroelectric plant and the addition of the aeration equipment were approved by FERC in 2000, as an amendment to APGI's initial license.²⁹ It was anticipated that the improvements would be complete prior to the time that the initial license expired in 2008. However, six years after APGI received FERC's approval, the major maintenance had been deferred, and the modernization of the plant and installation of aeration equipment were largely incomplete.³⁰ According to APGI, the work was stalled because "capital dried up."³¹ Today, APGI has made only a small percentage of the necessary investments, which it concedes would improve output overall for the Project and would also likely improve the quality of the water. In APGI's current FERC relicensing proceeding, it submitted a relicensing settlement agreement (the "RSA") in which it agrees with third parties to make certain long overdue investments to modernize its outdated equipment and install additional aeration facilities to improve the dissolved oxygen content of the water releases at the Project turbines.³² Under the RSA, however, APGI has given itself many more years to complete this essential work. Furthermore, through its litigation at the OAH, APGI is objecting to the efforts of DENR to assure that Alcoa timely completes the work this time. Given APGI's history regarding the diligence with which it undertakes such investments, even during the extended schedule it now promises in the RSA, the State is concerned about whether APGI can be relied upon to make them now.

With respect to the ongoing Section 401 Certification controversy, Stanly County has been granted its requested stay of the effectiveness of this Certification pending a contested case hearing by the North Carolina Office of Administrative Hearings to determine whether, under North Carolina law, the Certification should have been issued in the first place.³³ Given the current uncertainty as to whether the Certification was lawfully and effectively issued to APGI, it seems most sensible, if the Commission does not recommend recapture right away, that it defer its consideration of APGI's relicensing application until these matters are resolved, as they directly affect the Project. The final State decision on the Certification and the FERC license should not present conflicting positions.

²⁹ *Yadkin, Inc.*, 92 F.E.R.C. ¶ 62,084, pg. 64,100 (2000).

³⁰ Letter from David R. Poe, Counsel to APGI, to Magalie R. Salas, Secretary, FERC, regarding APGI, Yadkin Hydroelectric Project No. 2197-038 (Mar. 10, 2006), *available at* eLibrary Accession No. 20060310-5115 (provided as Attachment XII).

³¹ See pages 3-5 of Attachment XIII, which contains the report of one of APGI's Yadkin Project relicensing consultation meetings. This report was included in Volume V(C) of APGI's 2006 Yadkin Project License Application. APGI, Application for License – Volume V (C), Project No. 2197 (2006), *available at* eLibrary Accession No. 20060425-4005.

³² See Yadkin Hydroelectric Project, FERC No. 2197, Relicensing Settlement Agreement, pg. 2-2 to 2-5, Section 2.2 (Water Quality) (Feb. 2007), filed in *Alcoa Power Generating Inc.*, Project No. 2197-073 (May 7, 2007), *available at* eLibrary Accession No. 20070507-5011 (provided as Attachment XIV).

³³ N.C. OAH Order Granting Petition's Motion for Preliminary Injunction Stay of Certification 09 EHR 3078 in the Office of Administrative Hearings (May 27, 2009) (provided as Attachment XV)

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The lengthy discussion above is designed to highlight the kinds of problems that the State will continue to face, throughout this century, as our public health and environmental standards become higher and the technological and analytical tools to assess the impacts on our health become more refined. The State believes that it must move forward with economic development, but is well aware that moving forward will require that we address, at the same time and more comprehensively than has been done in the past, how to clean up the contamination created by past activities, especially where it has led to contamination of major rivers.

3. Recreational Use: A Key Quality of Life Issue

In addition to being able to assure both individuals and industry an adequate supply of potable water, the State, with public input, is in the best position to develop the potentially diverse recreational uses of this resource, maintain its aesthetic attraction, provide for prudent economic development, and establish the conditions conducive to and sustaining an overall higher quality of life -- all attributes prized by those in rural and urban areas. The N.C. Department of Commerce (the "Department") is responsible for recruiting new companies and helping existing companies expand and create new jobs and investment in the State, also vital to the State's long-term interests. Sections III and Section VI provide information on the Department and its success in this area. The State must build on this success in the Yadkin River Basin area.

Long-term Planning to Achieve Multiple Uses Is Essential: Adequate Tools are Required

The Yadkin River is capable of accommodating multiple uses for a mixed urban and a rural population. But planning for such multiple uses, and implementing those plans, takes time. Today, there is scarce opportunity to develop new water storage reservoirs large enough for urban populations, and events like droughts can bring a society to the breaking point. The State must make plans in an environment that includes unpredictable climate, unpredictable river flows, uncertainty with regard to economic development and jobs, and changing individual and public priorities. The State must conduct infrastructure planning covering long periods of time, balancing production of hydroelectric power and supply and demand for water resources, as needs change. And, it must be in a position to act promptly and effectively. At present, the State's ability to do so would be significantly hampered by a 50-year license that gives substantial control over the Yadkin River and its reservoirs to Alcoa.

The awareness that there will be increasing pressure on the Yadkin River to satisfy the basic water and related needs of the State's residents, combined with the State's recent experience with the drought and its impact on North Carolina's communities, compelled Governor Perdue, soon after taking office, to submit her request to FERC to provide North Carolina with the ability to do its job by meeting its people's needs, and to reject the issuance of another 50-year license to an entity that cannot, by virtue of its corporate charter and its obligations to shareholders, address these needs.³⁴ The State, by its very nature, has a longer time horizon and a broader mandate than a corporate entity. As a State Government, North Carolina routinely engages in the process of balancing and harmonizing conflicting interests in such a way that optimizes the use of a

³⁴ See Raleigh News & Observer article, *The Water is Shifting Under Alcoa*, by Jack Betts (The Charlotte Observer), published June 2, 2009 (provided as Attachment XVI).

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limited resource, while doing so openly, transparently, and with accountability. In other words, the State is well qualified to be a FERC licensee under the standards of the Federal Power Act.

The Federal licensing system allows FERC to examine the Yadkin River's use only every 30 to 50 years. Once granted a license, the licensee has exclusive and monopolistic control over operation of the hydro resources. Alcoa's exclusive right to this Project expired in 2008. Congress limited the Federal hydroelectric license to 50 years, a period long enough to allow an operator to recover its investment and generate returns; but after that initial period of time, the law reserves to the Nation (through FERC, Federal Agencies, and Congress) the opportunity to take a second look to ensure that this irreplaceable and vital public resource is operated with the public interest in mind, as required by the Federal Power Act.

The State's Plan: Management of the Yadkin Resources for the Public Good

The purpose of the State's Yadkin River Plan is to manage the Yadkin River resources for the public good and to demonstrate the State's ability to manage this resource by:

1. Providing sound stewardship of this crucial and valuable public resource and fiscally prudent operation and maintenance of both the water resources of the Yadkin River and the hydroelectric plant facilities.
2. Allocating a portion of the Project revenues for timely capital improvements to the Project that will enhance the quality of the Yadkin River waters and production from the outmoded plant facilities, and assure access of citizens to potable water, even during severe droughts.
3. Dedicating a portion of the annual revenues to funding long-term, ongoing programs that enhance the infrastructure of the region and the State, including enhancement and sustained funding of our community college system.
4. Dedicating a portion of the annual revenues to fund local improvements near the Project, whether environmental, public health, or recreational, with input from local communities and agencies.
5. Providing funds for long-term, comprehensive planning for the Yadkin River Basin, to accommodate changing public beneficial needs, and that will provide the State with the flexibility to act promptly to meet public needs relating to water supply and the management of the Yadkin River.
6. Providing a model for operating the Yadkin Hydroelectric Project efficiently and in a business-like fashion with value flowing back into publicly valuable infrastructure for the State.

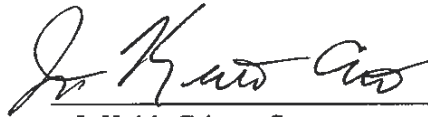
Were the State able to acquire the license for the Yadkin Hydroelectric Project, the State itself would have the ability to plan for long-term water use, including the balancing of electricity generation and non-power uses. For the present, however, it is contemplated that the State will primarily continue the power operations, which should provide the State with income from its

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ownership and management of the Project, even after payment to APGI for its net investment in the Project (plus any allowable severance damages). The net income generated from operating the Project would be applied to address a variety of Statewide purposes, such as a regional economic development fund; expediting the clean-up of the Project waters, especially at Badin Lake and the former Alcoa smelting plant site; providing a continuous source of funding for discretionary incentive programs used to recruit new and expanding companies; for infrastructure development in rural communities across the State; and to fund the community college system's upgrading of equipment used to train future workers.

Conclusion

Because of the role that the Yadkin River should and will play in directly affecting the quality of life for the State's citizens over the next half century and because of the State's lack of confidence in the current FERC licensee to provide the stewardship and cooperation necessary to allow the State to best meet the expectations and needs of its citizens as to their water supplies and other critical public concerns, the State earnestly requests that the Commission exercise the power Congress provided it to recommend Federal recapture for the public purposes stated in this Plan, with the intent that the State obtain the license upon reimbursing the United States Government for the statutory recapture payment to the present licensee, all as APGI agreed to in its 1958 license. The Plan also presents additional details of how the State would proceed, if it were to acquire the FERC license for the Project, subject to the Commission's recommendation and the approval of the United States Congress. We share our concerns, our hopes, our vision, and our plans for managing this resource. It is our belief that this presentation demonstrates the urgency of the State's request and the wisdom of the Federal Power Act in providing for ways to help the State achieve this public purpose objective by requiring a thorough re-examination every 50 years of the public interest in vital water resources, before granting the renewal of a license.



J. Keith Crisco, Secretary,
State of North Carolina, Department of Commerce

September 8, 2009

J. Keith Crisco was appointed Secretary of Commerce by Gov. Bev Perdue in January 2009. For more than 20 years, Crisco ran a highly successful North Carolina company (Asheboro Elastics Corp.), with global manufacturing and sales, which he co-founded. He holds a Pfeiffer University bachelors degree in mathematics and physics, and a Harvard MBA. From 1970-71 he served as a White House Fellow in Washington, DC, as assistant to the U.S. Secretary of Commerce during the Nixon administration. He has chaired the N.C. Center for Public Policy Research, and has been an active member of the UNC School of Public Health Advisory Council, the N.C. Community Foundation, Action for Children North Carolina, and various land trust and environmental organizations

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Overview of the North Carolina Economy With Special Emphasis on the Yadkin River Region

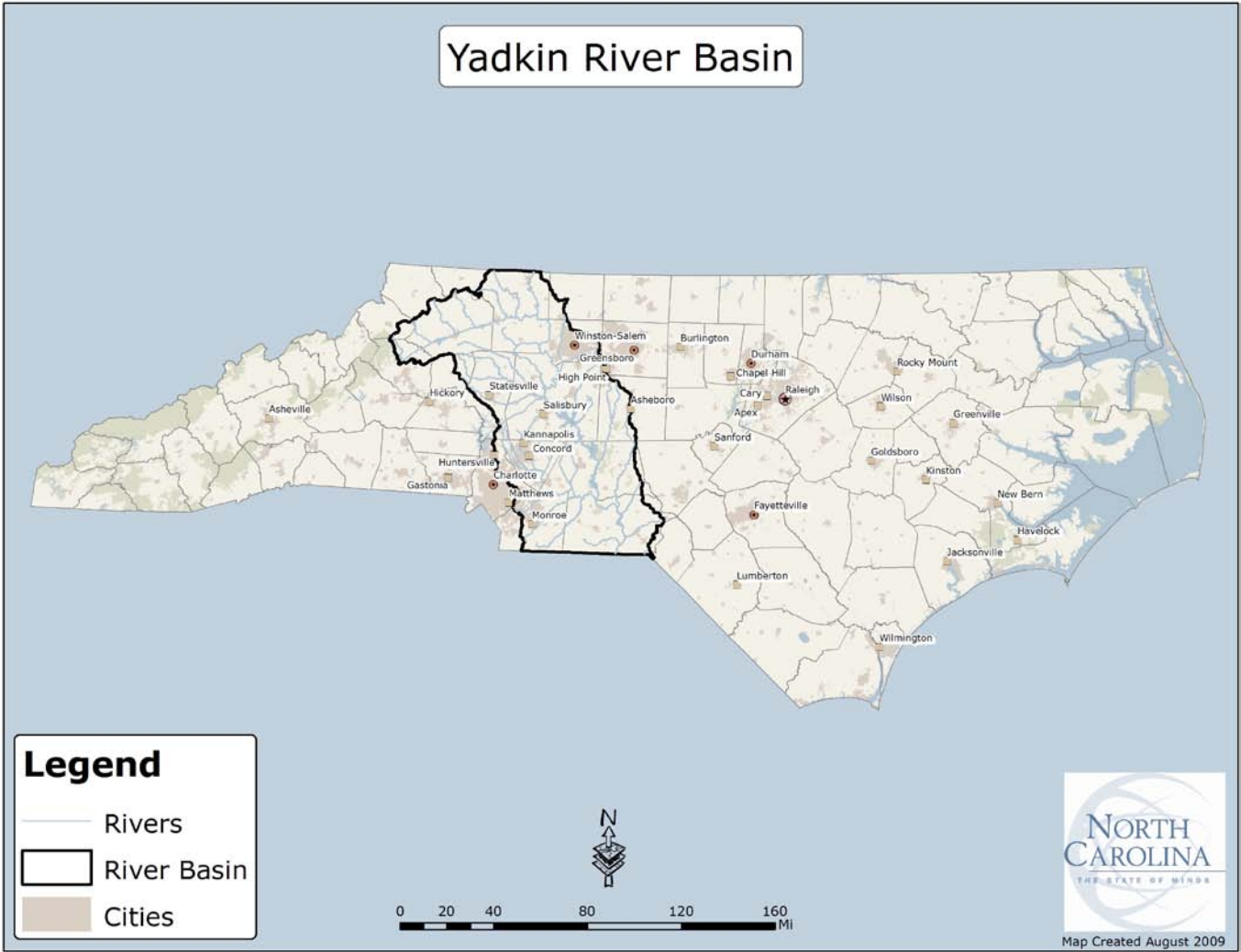
Recapture of the Project and its transfer to the people of North Carolina will have significant long-term statewide economic benefits. Revenue generated from the facilities has the potential to contribute significantly to economic development in North Carolina, thus harnessing the Yadkin River to benefit the people of North Carolina. Several long-term trends, such as the State's transition from traditional industries (agriculture and manufacturing) to more knowledge-based industries, the lack of widely shared prosperity across different regions of the State, and significant demographic changes, to name just a few of the challenges, will require effective and flexible economic development tools. In addition to these economic development challenges, North Carolina, like most states, is dealing with the impacts of a severe global recession. What follows is an in-depth analysis of North Carolina's economy, with a special emphasis on the Yadkin area.

The Yadkin River Basin drains from the Virginia border to South Carolina, cutting a swath through west central North Carolina. With 7,400 square miles, or 15.6% of the land area, this is the second largest drainage basin in the State, and the second most densely populated watershed, with 1,193,353 people, or 17.5% of the State's total population.³⁵ It also has the second largest number of stream miles - 5,855. There are 23 counties in this large drainage area. The counties are Alexander, Allegheny, Anson, Cabarrus, Caldwell, Davidson, Davie, Forsyth, Guilford, Iredell, Mecklenburg, Montgomery, Randolph, Richmond, Rowan, Scotland, Stanly, Stokes, Surry, Union, Watauga, Wilkes, and Yadkin.

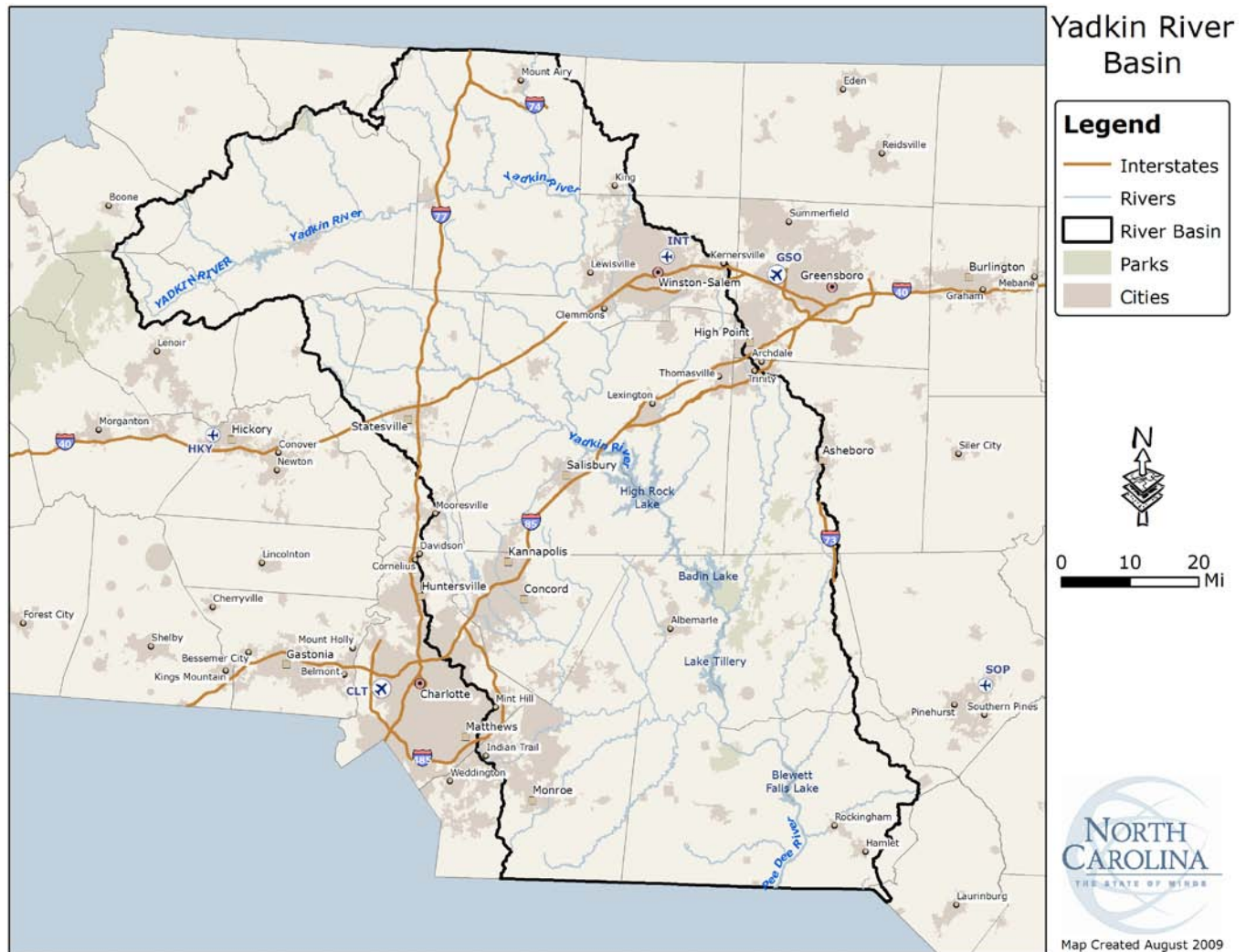
Depending on the economic indicator under discussion, the analysis below focuses on North Carolina as a whole, the State's seven economic development regions, or the seven-county region (the "Yadkin Region") most directly impacted by the Yadkin River Project currently licensed to APGI. The seven-county Yadkin Region analyzed consists of the counties of Stanly, Anson, Richmond, Montgomery, Randolph, Davidson, and Rowan.

³⁵ *Yadkin River Basin*, North Carolina State University, College of Agriculture and Life Sciences, NCSU Water Quality Programs: <http://www.water.ncsu.edu/yadkin.html>.

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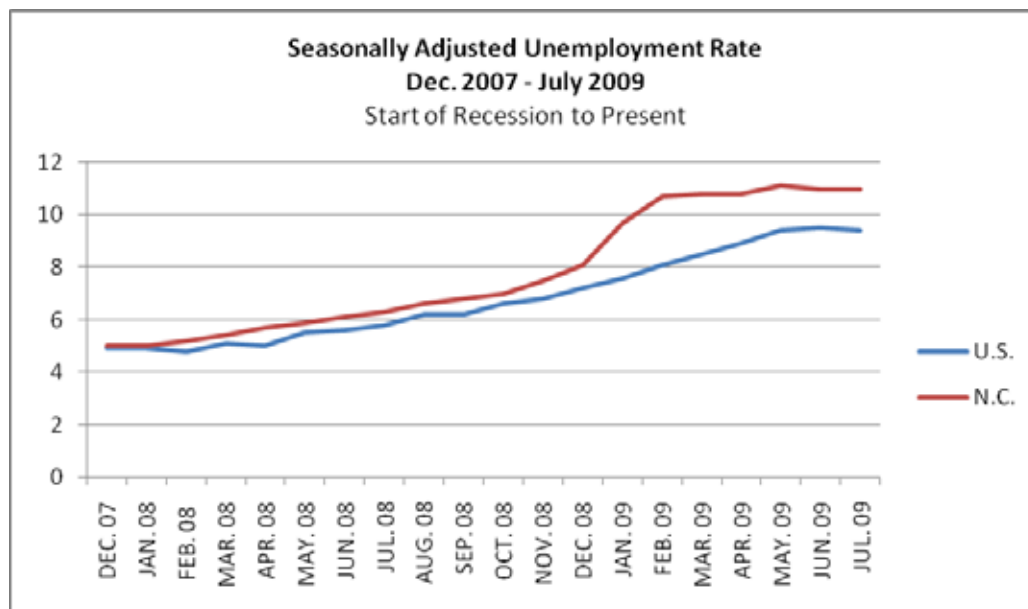


Close-up of Yadkin Region showing Yadkin River.

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Impact of the Current Recession

The current economic recession has significantly impacted employment in North Carolina. Compared to the same time last year (July 2008), there are 209,024 more unemployed workers in the State, a 73% increase. At 11.0%, North Carolina is tied for the 7th highest seasonally adjusted unemployment rate in the nation. Compared to the same month a year ago, the State's unemployment rate is 4.7 percentage points higher.



N.C. Employment Security Commission

Since the start of the recession in December 2007, North Carolina's total nonfarm employment has decreased by approximately 260,300 (6.2% of the workforce). Sectors with the greatest employment decline since December 2007 are: Manufacturing (90,500); Construction (60,500); Trade, Transportation & Utilities (50,400); and Professional & Business Services (37,900).

North Carolina Nonfarm Employment Trends by Supersector								
	Jun-09	Jul-09	Previous Month (07/09 compared to 06/09)		Last Year - Same Month (07/09 compared to 07/08)		Start of Recession (07/09 compared to 12/07)	
			Change	% Change	Change	% Change	Change	% Change
Mining & Logging	6,400	6,400	0	0.0%	(200)	-3.0%	(500)	-7.2%
Construction	193,300	192,400	(900)	-0.5%	(42,700)	-18.2%	(60,500)	-23.9%
Manufacturing	447,700	442,600	(5,100)	-1.1%	(72,500)	-14.1%	(90,500)	-17.0%
Trade, Transportation, & Utilities	733,600	729,800	(3,800)	-0.5%	(39,000)	-5.1%	(50,400)	-6.5%
Information	67,200	67,000	(200)	-0.3%	(4,400)	-6.2%	(5,300)	-7.3%
Financial Activities	199,700	199,100	(600)	-0.3%	(12,600)	-6.0%	(13,000)	-6.1%
Professional & Business Services	464,100	469,300	5,200	1.1%	(36,400)	-7.2%	(37,900)	-7.5%
Education & Health Services	540,700	541,200	500	0.1%	7,900	1.5%	8,100	1.5%
Leisure & Hospitality	389,900	393,100	3,200	0.8%	(4,600)	-1.2%	(6,000)	-1.5%
Other Services	178,100	174,700	(3,400)	-1.9%	(11,200)	-6.0%	(5,600)	-3.1%
Government	717,400	696,100	(21,300)	-3.0%	(6,200)	-0.9%	1,300	0.2%
Total Nonfarm Employment	3,938,100	3,911,700	(26,400)	-0.7%	(221,900)	-5.4%	(260,300)	-6.2%

U.S. Bureau of Labor Statistics

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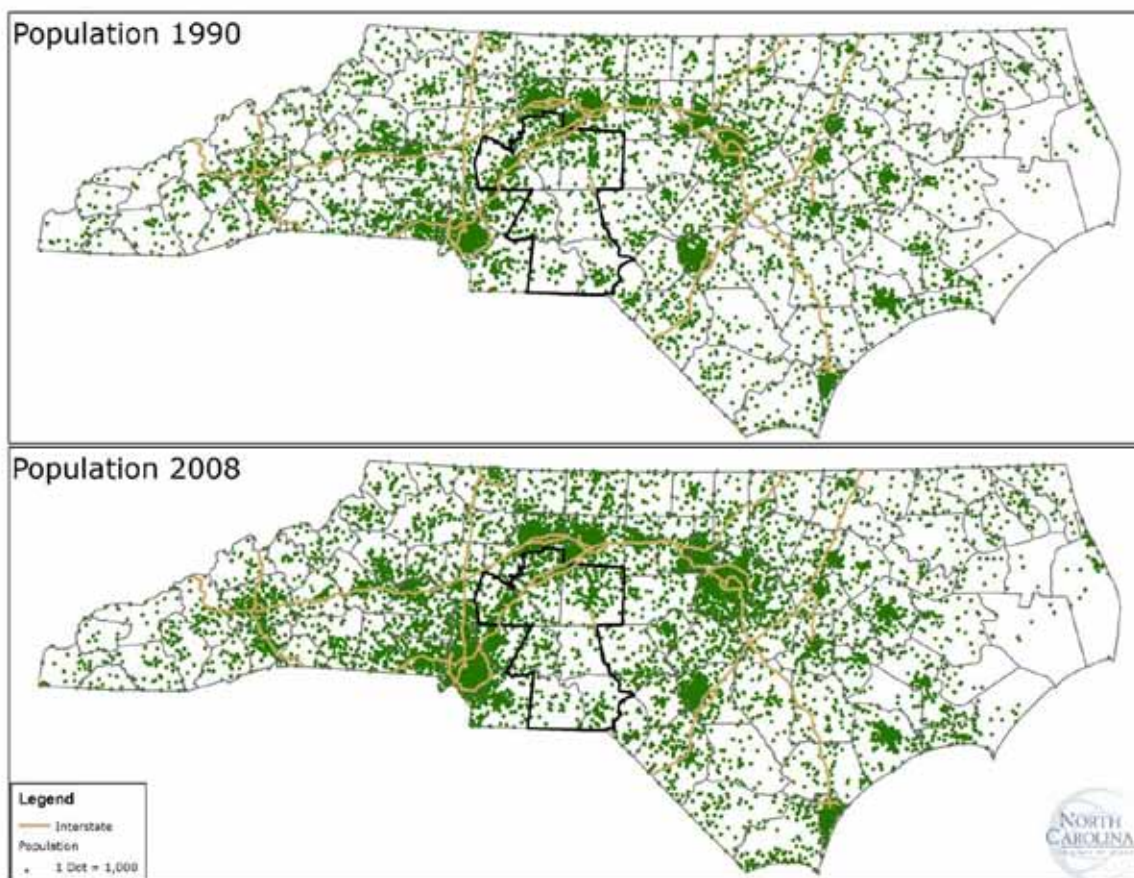
Demographic Change

Demographic changes are significantly impacting North Carolina. The State's population is rapidly growing, there is a migration trend away from rural areas to North Carolina's more urban centers, and the workforce is aging.³⁶ As North Carolina experiences demographic change, it will be essential that the necessary economic development tools are in place to ensure that the State's labor force has the right mix of skills, the appropriate business and social services are available, and the necessary infrastructure such as roads, utilities, and learning institutions are funded.

The relationship between economic development and population growth is strong. North Carolina will experience population growth if employment opportunities continue and the State maintains an attractive business environment and a high quality standard of living. However, changes in population also have social and economic implications that influence business location decisions and impact existing infrastructure. North Carolina's population experienced substantial growth over the past decade as a result of people moving to the State from other states or countries (positive net migration). Currently, North Carolina is the 10th largest state in the United States, with a resident population of more than 9.2 million. Since 1990, the State's population has increased by more than 2.6 million people, a 39% increase. Since 2000, North Carolina's population has increased by approximately 1.2 million people, resulting in the 9th largest percent increase in population (14.6%) among all 50 states and the District of Columbia. North Carolina's population is projected to grow 9-10% between 2008 and 2013, resulting in an additional 850,000 people.

³⁶ North Carolina Department of Commerce, Division of Policy, Research and Strategic Planning, *2009 North Carolina Economic Index: A Summary of North Carolina's Economic Strengths, Challenges, and Opportunities*, March 2009.

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In the Yadkin Region the population increased by 24% between 1990 and 2000, resulting in an additional 115,000 people. The region's population is expected to grow by an additional 23,000 between 2008 and 2013.

The Project licensed to APGI is situated near three of the State's seven economic development regions: the Charlotte Region, the Piedmont Triad Region, and the Southeast Region. Between 2000 and 2008, the Charlotte Region's population increased by more than 400,000, the largest increase among the State's seven economic development regions. Almost 70% of the Charlotte Region's growth is the result of people moving from other regions in North Carolina or from other States and countries. The Piedmont Triad and Southeast Regions experienced similar population growth, but on a smaller scale.

Migration from rural to urban areas (or at least to rural areas in close proximity to urban areas) is another demographic trend the State is experiencing. Urban and suburban areas are growth centers for jobs, especially those associated with high-growth knowledge-based industries. This trend is evident in the State's regional population change figures. Population change associated with North Carolina's three largest and most urban economic development regions is mostly the result of net migration. The Charlotte Region, the Research Triangle Region, and the Piedmont Triad Region all experienced net migration in excess of 60%.

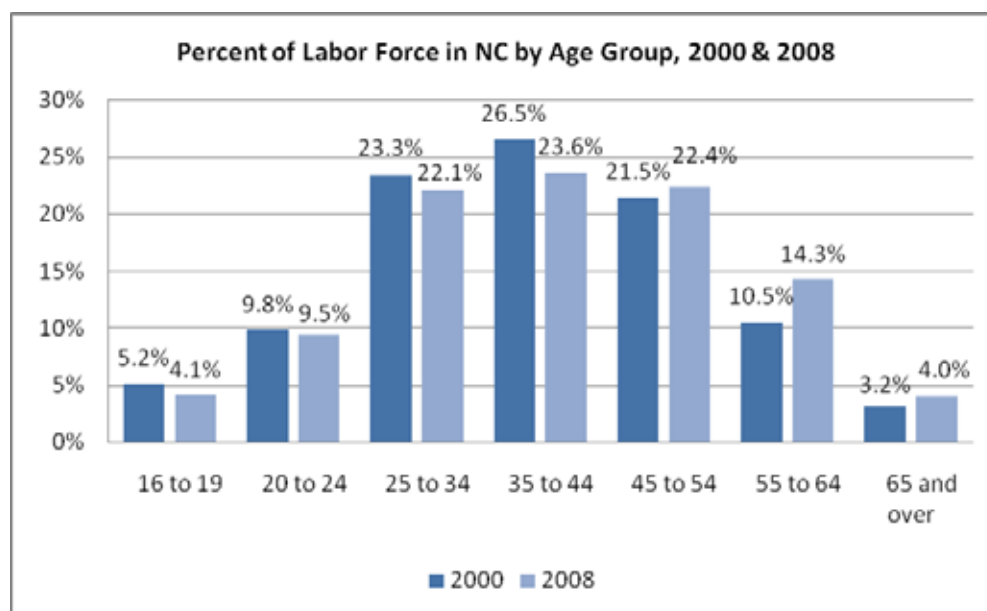
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Population Change for N.C. Economic Development Regions, 2000-2008

Region	Population Change	% Natural Increase	% Net Migration
Advantage West	67,853	8.0%	92.0%
Charlotte Region	401,539	30.2%	69.8%
Eastern Region	58,356	86.9%	13.1%
Northeast Region	16,648	25.4%	74.6%
Southeast Region	105,407	52.0%	48.0%
Piedmont Triad Region	145,470	38.6%	61.4%
Research Triangle Region	401,015	30.0%	70.0%
North Carolina Total	1,196,288	34.5%	65.5%

U.S. Census Bureau

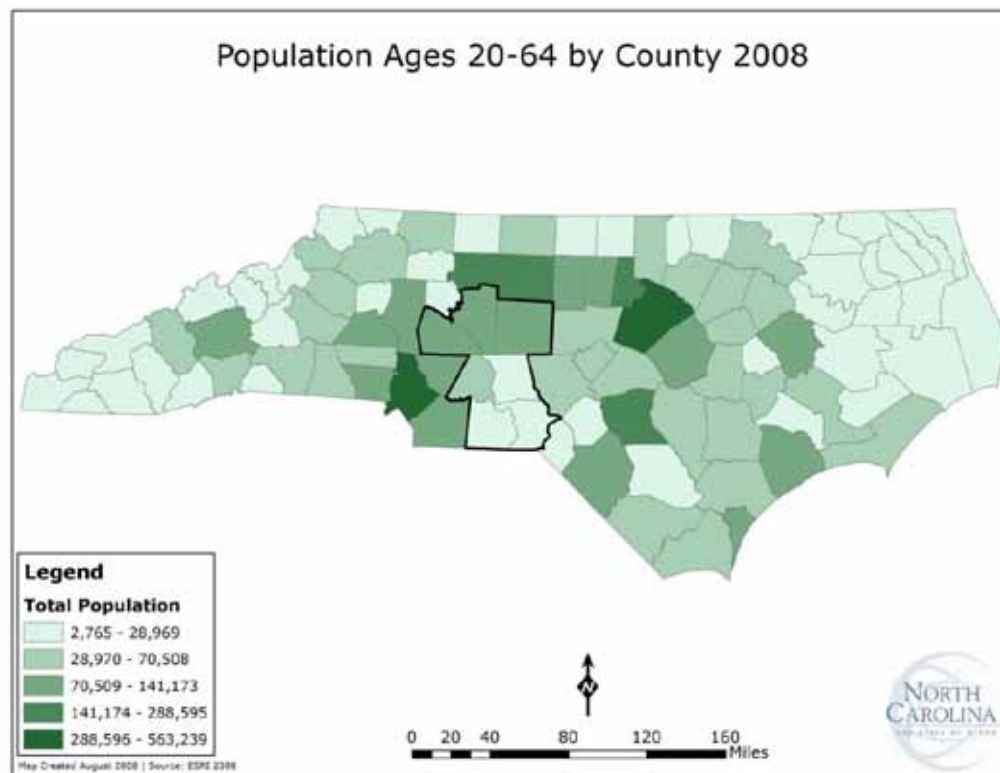
The majority of North Carolina's labor force is currently between the ages of 25 and 54. However, the impending retirement of the Baby Boomer generation may deprive North Carolina of the workers it needs to compete economically. If population growth or in-migration does not fill the gap, employers may become increasingly dependent on workers age 55 and above to meet the demand for skilled workers. In 2008, workers age 55 and above constituted 18.3% of North Carolina's labor force, up from 13.7% in 2000. Given the recent decline in job opportunities for workers in labor-intensive industries, combined with the aging workforce, occupational extension and workforce development programs will become increasingly important.



U.S. Bureau of Labor Statistics

From a geographic perspective, most of North Carolina's working population is concentrated in the State's urban centers of Charlotte, the Research Triangle (Raleigh, Durham and Chapel Hill) and the Piedmont Triad (Greensboro, Winston-Salem and Highpoint) (the "Urban Centers"). These three metropolitan areas also have the majority of the State's growing knowledge-based industries.

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Transitioning Economy

North Carolina's economy is transitioning from traditional labor-intensive industries (*e.g.* textile and furniture manufacturing) to knowledge-based or service industries. While this transition is not new, the rate of change is accelerating. The transition of North Carolina's economy suggests the need to significantly invest in workforce training as well as aggressive business development strategies to provide employment opportunities for displaced workers.

More than 50% of employment³⁷ in North Carolina is currently concentrated in the manufacturing, retail trade, health care and social assistance, and government sectors. Of these four sectors, manufacturing employment decreased between 2003 and 2008. Between 2003 and 2008, manufacturing in North Carolina experienced a decline in the percentage it represented of total employment (15.5% down to 12.4%). North Carolina's manufacturing employment decreased 12.3%, or approximately 71,000 jobs. Increased employment in the construction sector is a result of population growth and the increase in housing demand. North Carolina's aging population fostered demand in health-related services. Finally, the State's continued transition from labor-intensive industries to knowledge-based industries has fueled employment growth in sectors such as the professional and technical services and finance and insurance.

³⁷ All employees covered by unemployment insurance. Covered employment is subject to the Employment Security Law on which Unemployment Insurance taxes must be paid.

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North Carolina Employment by Industry Sector, 2003 & 2008

Industry Sector	2003		2008		2003-2008
	Employment	% of Total	Employment	% of Total	% Change
Agriculture, forestry, fishing and hunting	34,814	0.9%	29,672	0.7%	-14.8%
Mining	3,969	0.1%	4,134	0.1%	4.2%
Utilities	14,132	0.4%	12,349	0.3%	-12.6%
Construction	211,728	5.5%	255,419	6.0%	20.6%
Manufacturing	602,137	15.5%	527,823	12.4%	-12.3%
Wholesale trade	163,628	4.2%	185,719	4.4%	13.5%
Retail trade	432,592	11.2%	467,417	11.0%	8.1%
Transportation and warehousing	132,008	3.4%	137,177	3.2%	3.9%
Information	75,421	1.9%	72,866	1.7%	-3.4%
Finance and insurance	138,006	3.6%	152,778	3.6%	10.7%
Real estate and rental and leasing	47,280	1.2%	54,565	1.3%	15.4%
Professional and technical services	146,679	3.8%	190,852	4.5%	30.1%
Management of companies and enterprises	61,419	1.6%	71,892	1.7%	17.1%
Administrative and waste services	211,884	5.5%	242,877	5.7%	14.6%
Educational services	46,250	1.2%	60,095	1.4%	29.9%
Health care and social assistance	364,343	9.4%	452,915	10.7%	24.3%
Arts, entertainment, and recreation	45,692	1.2%	53,544	1.3%	17.2%
Accommodation and food services	292,207	7.5%	351,895	8.3%	20.4%
Other services, except public administration	96,690	2.5%	106,036	2.5%	9.7%
Government	755,162	19.5%	820,549	19.3%	8.7%
Total Covered Employment	3,876,041	100.0%	4,250,574	100.0%	9.7%

Economic Modeling Specialists, Inc.

The two State economic development regions closest to the Yadkin Project, the Charlotte Region and the Piedmont Triad Region, are heavily concentrated in Manufacturing and Trade, Transportation and Utilities.³⁸ Specifically, the region is more concentrated than North Carolina as a whole in: Durable Goods Manufacturing; Non-Durable Goods Manufacturing; Wholesale Trade, Retail Trade; and Transportation, Warehousing, and Utilities.

³⁸ To measure concentration, location quotient share is calculated to determine the share of regional employment in a particular industry compared to the share of employment in the same industry statewide. A location quotient above 1.0 indicates that the analysis region is more concentrated than the nation as a whole. Location quotient = percent of local employment in industry / percent of national employment in industry.

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Current Employment and Concentration, Select Industries in Project Region

Select Industry Sectors	Employment Spring 2009		Project Region (Combined ED Regions)	
	Charlotte ED Region	Piedmont Triad ED Region	Employment	Location Quotient
Manufacturing	126,337	113,204	239,541	1.15
Durable Goods	76,292	56,331	132,623	1.22
Non-Durable Goods	50,045	56,873	106,918	1.08
Trade, Transportation, & Utilities	224,913	150,108	375,021	1.13
Wholesale Trade	59,476	35,147	94,623	1.25
Retail Trade	116,814	82,202	199,016	1.03
Transportation, Warehousing & Utilities	48,623	32,759	81,382	1.32
Total Covered Employment	1,039,419	728,890	1,768,309	

Economic Modeling Specialists, Inc. (EMSI)

While the region will remain concentrated in these sectors for the foreseeable future, the State must work to address potential employment losses associated with a transitioning economy. Since the start of the current recession (December 2007), North Carolina has lost almost 90,000 manufacturing jobs, or approximately 17% of the industry's workforce. Likewise, employment in Trade, Transportation and Utilities is down 6%, or 50,400 workers, since December 2007.

Lack of Widely Shared Prosperity

North Carolina's economic transformation has brought many benefits to the State – new jobs and opportunities, international recognition as a business location, and rapid population growth – but the successes have not been widely-shared. Healthy economies generate opportunities for all individuals and households to increase incomes. As North Carolina continues its economic transition, the State must focus on expanding high-wage industries, dedicate resources to providing training opportunities and improve the education levels of the labor force.

The growth of North Carolina's economy is predicated on the capabilities of its workforce, and educational attainment is a fundamental way of measuring those capabilities. North Carolina's educational attainment levels rank below the national figures. This means North Carolina employers could face challenges finding and hiring a highly educated workforce. In 2008, the State trailed or tied national averages in all educational attainment categories except for Associates Degrees and Some College/No Degree.

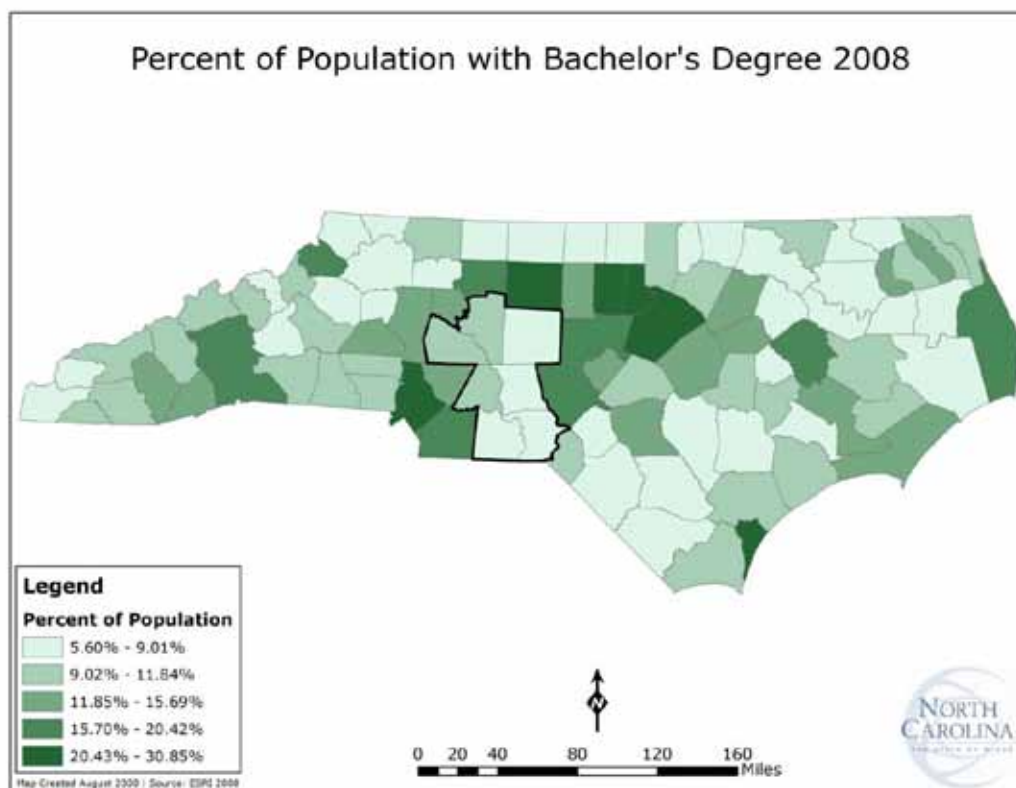
Educational Attainment by Degree Category, 2008

	US	NC
Less than a High School Graduation or Equivalent	16.4%	18.5%
High School Graduation or Equivalent	29.6%	29.5%
Associate's Degree	7.2%	8.0%
Some College, No Degree	20.1%	19.4%
Bachelor's Degree	17.0%	16.7%
Graduate or Professional Degree(s)	9.7%	7.9%

U.S. Census Bureau

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From a geographic perspective, counties with the highest percent of population with a bachelor's degree are concentrated near the State's Urban Centers. Many of the State's more rural counties or regions significantly lag in terms of educational attainment when compared to North Carolina's urban and suburban areas. In the Yadkin Region educational attainment levels are some of the lowest in the State. Bachelor's degrees are essential for the knowledge-based industries such as finance, biotechnology, advanced manufacturing and professional services.

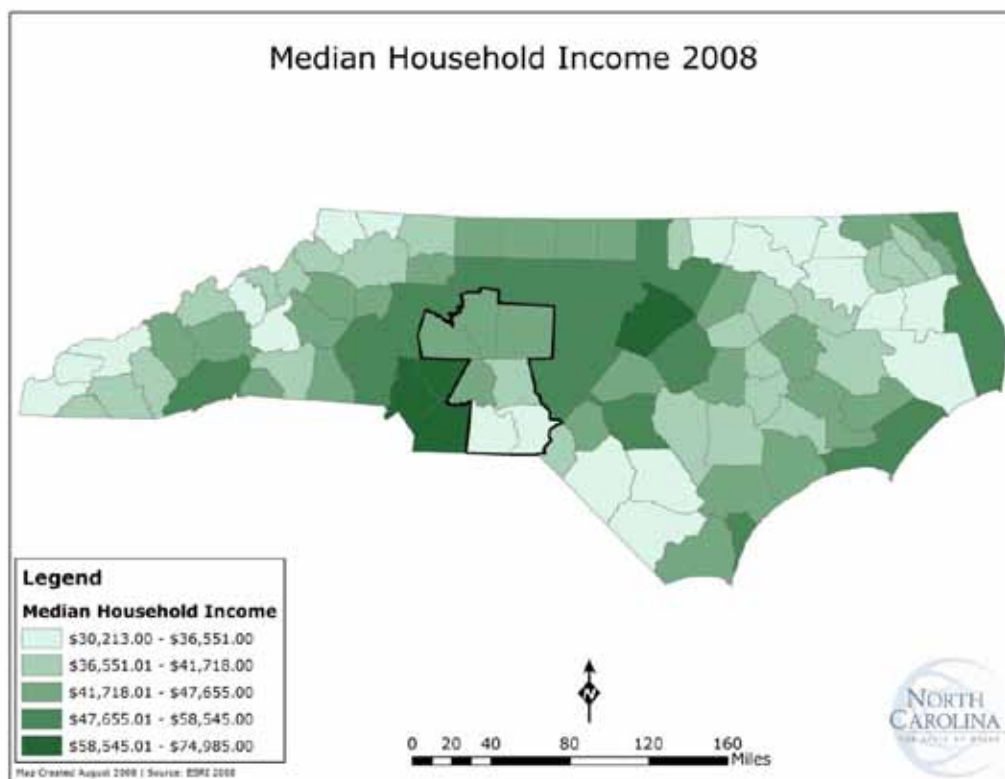


Yadkin Region is outlined in South Central North Carolina.

Earnings are often cited as a key indicator of job quality and the overall health of an economy. Increasing the number of high-wage jobs is a major goal of economic development, allowing for greater consumer spending which leads to economic growth. North Carolina's relatively low earnings (median household income, average weekly wage) reflect the State's comparatively low cost of living and its traditional concentration of labor-intensive industries.

In 2008, North Carolina's median household income was \$51,411. Median household incomes in the Yadkin Region are all below the State's median household income. Of the seven counties in the Yadkin Region, Davidson had the highest median household income of \$47,655, whereas Richmond County had the lowest at \$36,115. Similar to other prosperity measures, the State's urban counties have the highest income levels.

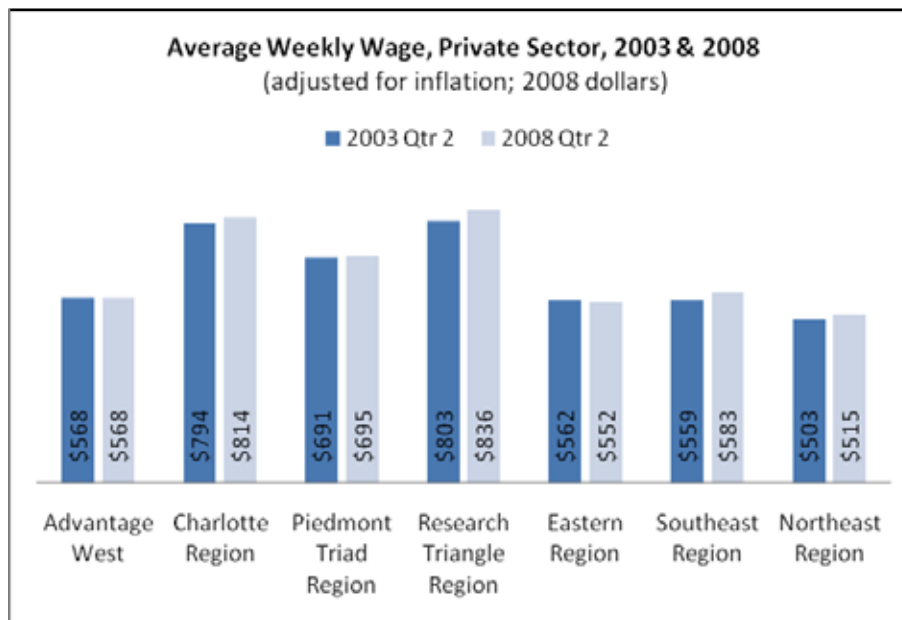
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Yadkin Region is outlined in South Central North Carolina.

The Urban Centers had the highest average weekly wages in 2008 (\$836, \$814, and \$695, respectively). These urban regions have a high concentration of highly paid, knowledge-based jobs. When adjusted for inflation, there has been little increase in average weekly wages across the State between 2003 and 2008. The Southeast region experienced the largest percentage increase in wages, 4.3%, followed closely by the Research Triangle region (4.1%). The Piedmont Triad region experienced relatively no growth (0.6%) and the Advantage West and Eastern regions experienced a decrease in average weekly wages (-0.1% and -1.8%, respectively).

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N.C. Employment Security Commission

Between the late 1980s and the mid 2000s, the income of the country's wealthiest families grew at a significantly higher rate than the income of the country's poorest families. The incomes of the nation's wealthiest 20% of families grew by 36.1% between 1987-1989 and 2004-2006, while the income of the poorest 20 percent of families had more modest gains (11.1%).³⁹ Income disparities grew in 37 states over the past two decades, including North Carolina. North Carolina mirrored national trends, with the income of the State's wealthiest families growing much more rapidly than the State's poorest families. Between 1987-1989 and 2004-2006, the income of the State's wealthiest 20% of families grew by 34.2%, or \$30,154. The income of the State's poorest 20% of families grew by 9.9%, or \$1,474. Income growth of North Carolina's wealthiest families (34.2%) was below the national average (36.1%). The income growth of the poorest families was also below that of the United States average (Economic Policy Institute).

Conclusion

Economic development is a long-term investment in the future of North Carolina. In the short-term, the State faces an historical set of economic challenges, as well as the more recent challenges brought by the recession. To remain competitive and attract 21st century businesses, North Carolina must continue its transition from traditional industries to knowledge-based industries, by strengthening its "human capital" through basic education and workforce development. To ensure widely-shared prosperity, the State must dedicate resources to providing economic opportunity for all North Carolinians, regardless of income level or geographic location. Finally, as North Carolina experiences demographic change, it will be essential that the necessary economic development tools are in place to ensure that the State's labor force has the right mix of skills, the appropriate business and social services are available, and the necessary infrastructure such as roads, utilities, and learning institutions are funded. Revenues generated

³⁹ Bernstein et al. Pulling Apart: A State-by-State Analysis of Income Trends, April 2008.

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from the Yadkin Project and available to the State have the potential to contribute significantly to State economic development programs and initiatives designed to address these issues, as discussed in Section V.

SECTION III

SECTION III

The North Carolina Department of Commerce And its Role in Economic Development and Resource Management

Governor Beverly Eaves Perdue has directed the Department to prepare a plan in support of the State's motion that the Commission deny APGI's relicensing application and the State's motion that the Commission recommend Federal recapture of the Project and its transfer to the State.⁴⁰ The Department is uniquely positioned to prepare such a plan, given its pivotal role in the economic development of the State.

The Department is statutorily charged with providing for and promoting the policy of the State "to actively encourage the expansion of existing environmentally sound North Carolina industry [and] the recruitment of environmentally sound national and international industry into North Carolina through industrial recruitment efforts and through effective advertising, with an emphasis on high wage paying industry; to promote the development of North Carolina's labor force to meet the State's growing industrial needs; to promote the growth and development of [the State's] travel and tourism industries; to promote the development of [the] State ports; and to assure throughout State government, the coordination of North Carolina's economic development efforts."⁴¹ The Department's functions include all executive functions of the State in relation to economic development, including promotion of the orderly development of the State's counties and communities, energy resource management, energy policy development, and the provision of local and regional planning assistance.⁴²

Thus, the Department's focus is on five critical areas:

- **Economic Development.** This includes recruitment and retention of companies that rely on the water resources available in the Yadkin-Pee Dee River Basin. The Department is the State's lead economic development agency. Since 2001, the State has achieved remarkable success in recruiting new business and helping existing business expand in the State, especially in knowledge-based industry sectors such as Aviation/ Aerospace, Financial Services, Information Technology and Life Sciences. For seven of the past eight years, the State has ranked as having the top business climate in the U.S.⁴³ Factors

⁴⁰ Motion of the State of North Carolina to Present Evidence in Support of its Request that the Commission Recommend Federal Recapture, Comments and Evidence of the State in Support of its Request for Recommended Recapture and in Opposition to the Issuance of a New License to Alcoa, Motion of the State to Supplement Final Environmental Impact Statement, Request of the State for Waivers of Commission Regulations, if Necessary, and Motion of the State for Oral Argument Before the Full Commission (Alcoa Power Generating, Inc., Project No. 2197).

⁴¹ North Carolina General Statutes §§ 143B-428, 429.

⁴² North Carolina General Statutes § 143B-431(a)(1).

⁴³ Site Selection Magazine. See <http://www.siteselection.com/portal/>

SECTION III

important to that ranking include the State's mid-skilled workforce, business-friendly policies, strong education system from K-12 through community colleges and universities and an exceptional quality of life.

- **Workforce Development.** North Carolina's population continues to grow. As discussed in Section II, much of the population growth is a result of in-migration, *i.e.*, people moving to North Carolina from outside the State.⁴⁴ Many of these in-migrants, attracted by high-paying, knowledge-based jobs in the State's technology sectors, are members of the so-called, "creative class." For them and their families, quality of life, including a clean environment and abundant outdoor recreation sites, figures prominently in their location decisions. Richard Florida, the internationally known urban studies expert and author of "The Creative Class," has written extensively on how members of this class are demanding to live in places that offer cultural and natural assets, and the availability of these assets will play a significant role in determining how well companies and communities prosper. To continue to succeed in attracting and retaining the talented workforce required by knowledge-based industries of the 21st century, North Carolina must provide an exceptional quality of life.

Community Development. This includes providing local communities with resources and services to help them realize economic prosperity, plan for new growth and address community needs. The Department's Division of Community Assistance ("DCA") also provides smaller communities with planning and other technical assistance. Within the DCA, the North Carolina Main Street Center promotes downtown revitalization based on economic development within the context of historic preservation, a concept developed by the National Trust for Historic Preservation that has proven successful in more than a thousand smaller communities across the country. The North Carolina Main Street program helps small towns to recognize and preserve their historic fabric, and, using local resources, build on their unique characteristics to create vibrant central business districts that meet the needs of today's communities. The Center offers two programs that work with selected towns across the State: Main Street, which focuses on communities under 50,000 that have downtown managers, and Small Town Main Street, which provides guidance to local committees in communities under 7,500 that do not have downtown managers. Several communities in the Charlotte region are participating in this program, including Albemarle (Stanly County) and Lexington (Davidson County).

The DCA's 21st Century Communities program harnesses resources to help challenged communities thrive in a modern economic climate. Initiated in 2001 in response to business and industry closures and the loss of thousands of jobs in the manufacturing and textile industries, the 21st Century Communities program has positively impacted the State's most challenged communities and helped jump start economic development. Anson and Montgomery counties are program participants from the Charlotte region.

⁴⁴ North Carolina Department of Commerce, Division of Policy, Research and Strategic Planning, *2009 North Carolina Economic Index: A Summary of North Carolina's Economic Strengths, Challenges, and Opportunities*, March 2009.

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Travel and Tourism Development. Tourism is one of North Carolina's top industries. Governor Perdue announced in May that domestic visitors to and within North Carolina spent a record \$16.9 billion in 2008, an increase of 2.1% from 2007. State tax revenues from visitors increased by 3.5% from 2007, rising to \$843.2 million in 2008. Local tax revenues also increased, gaining 2.5% from 2007 to a total \$542.3 million in 2008. During the last five years, visitor spending has increased 27.3% while State and local tax revenue is up 20.7%. The travel and tourism industry directly employs more than 190,000 North Carolinians who work in hundreds of small and mid-size businesses.⁴⁵ There are significant natural, cultural and heritage assets in the Yadkin-Pee Dee River Basin, including:

- Old Stone Vineyard & Winery, Salisbury
 - The Rowan Museum, Salisbury, an 1854 courthouse that survived Stoneman's raid. It is one of the finest examples of pre-Civil War architecture in the State.
 - Stony Mountain Vineyard, Albemarle
 - Historic Downtown Davidson
 - Uwharrie National Forest. Covers 50,000 acres in parts of Randolph, Davidson and Montgomery counties. Various outdoor activities are permitted in the forest, including hiking, horseback riding, mountain biking, camping and water activities.
 - Village of Gold Hill, described in the 1800s as "The richest mining property east of the Mississippi." Today, the restored village is a popular tourist spot.
- **Energy Resource Management.** This includes ensuring that both residential and industrial customers have affordable access to electricity and other power sources. Governor Perdue recently signed into law House Bill 1481, to foster a three-pronged strategy designed to make North Carolina a leader in green economy jobs by strengthening State leadership in energy policy, to make smart investments that will create jobs and foster innovation, and to provide green collar workforce training. As part of the Governor's plan to strengthen and focus leadership in State energy policymaking, under HB 1481, the State Energy Office was moved to the Department to link its activities with economic development efforts; the Residential Energy Conservation Assistance Program was transferred to the relocated State Energy Office; and the Energy Policy Council, which will focus on green job creation and environmental protection, was strengthened by improving representation from environmental groups, alternative energy producers and energy services specialists.

In performing its unique role, the Department has developed a vast body of knowledge and experience, and has formed critical economic partnerships that allow it to fulfill its mission statement: to improve the economic well-being and quality of life for all North Carolinians.

⁴⁵ 2008 Visitor Profile and 2008 Economic Impact Profile, N.C. Dept. of Commerce Division of Travel and Tourism.

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The Department's Policy Research and Strategic Planning Division ("PRSP") acts as the Governor's key resource in leading strategic planning and conducting economic modeling necessary to drive rational and effective economic development efforts. PRSP works closely with the Department's Divisions of Business and Industry; Workforce Development; Tourism, Community Assistance; and the Commerce Finance Center in recruiting businesses and assisting them in meeting their needs for a qualified well-trained workforce, and providing financial assistance for expansion and relocation of businesses. The research conducted by the Department also supports the North Carolina Economic Development Board⁴⁶ which is responsible for developing the Comprehensive Strategic Economic Development Plan (the "Strategic Plan").⁴⁷ The Strategic Plan reflects public and private sector input in setting priority development objectives that recognize the increasingly competitive economic environment, addresses the changing needs of the State in a comprehensive manner, and provides for the effective utilization of limited resources.⁴⁸ The Strategic Plan is discussed further in Section V.

⁴⁶ The North Carolina Economic Development Board oversees State economic development research and planning and makes policy recommendations to the Governor, Secretary of Commerce, and the General Assembly. The 37-member Board is comprised of State government officials, members of the North Carolina House of Representatives, members of the North Carolina Senate, and citizens representing non-profits, economic development organizations, and private industry appointed by the Governor.

⁴⁷ See N.C. Economic Development Board Strategic Plan 2008 Update, September 25, 2008, provided as Attachment XVII.

⁴⁸ North Carolina General Statutes § 143B-434.01(c).

SECTION IV

SECTION IV

The Financial Model for the Yadkin Hydroelectric Project

To evaluate the potential range of options available if the State were to assume the Yadkin Project license, the State has estimated revenues that could be generated from the Project's sales of electricity. The revenue figures used in the State's financial model reflect very conservative estimates, in terms of both electricity output and income. In part, this conservatism is driven by the State's obligation to manage a natural resource in a manner that will serve the greatest good for the people in the State, as opposed to the need to maximize short-term profits on behalf of shareholders and to further the management goals of a single corporation. A common thread throughout this Plan is the State's view that a continuous and reliable source of revenues from the Project could form the most effective basis for sustaining the programs that are described in Section VI. These programs are intended to improve the well-being of North Carolina's citizens, by providing infrastructure, job training, incentives to attract high quality companies, and a healthy and attractive environment.

In constructing the State's financial model, a number of factors were considered, including:

- historical flow data;
- elevation storage curves;
- head-power relationships; and
- power output at full pool and normal draw downs

In addition, conservative assumptions were made that would most realistically anticipate the downside variations that are known to occur in the operations of hydro projects. These include reductions in generation during periodic drought conditions, unit outages for the performance of major maintenance, and scheduled equipment upgrades. Additionally, there has recently been a significant downward trend in wholesale power prices, reflecting lower demand associated with current economic conditions that could reduce earning capacity from hydroelectric generation.

On the other hand, certain factors exist that could substantially increase revenues in the future. These include:

- the possibility of higher energy prices due to new environmental requirements on power supply;
- the potential price premium associated with generation projects such as the Yadkin Hydroelectric Project which do not produce greenhouse gases;
- transmission line upgrades throughout the United States, which could considerably increase the ability to deliver energy from renewable sources and positively impact the value of the dam complex; and
- electricity market changes that could facilitate and add value to the sale of capacity, energy and reserves from the Project, as more sophisticated electric products are developed for the interstate grid.

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These other factors, and their potentially significant positive effects on Project revenue, are identified but were not used to increase the State's revenue estimates for purposes of this analysis. However, the existence of these positive factors would enhance revenues and allow the State to provide more funds for its programs, or establish sinking funds for debt retirement.

As a result of this conservative approach and the considerations listed above, it is expected that the State would realize no less than \$31.5 million in annual average gross revenues from generating and selling hydroelectric power from the Yadkin Project. See *Table 1 below*. It should be noted that this figure is considerably lower than APCI's 2006 estimate of \$43.6 million.⁴⁸ While we believe, based on historical data for existing Project operations, and with allowances for major maintenance and upgrades, the earning potential at the Project is much higher, we believe using the lower figure here is appropriate. If one assumes operations and maintenance over the life of the license at APCI's average of 0.45 cents per KWH (\$2.8 million annually on revenues of \$31.5 million),⁴⁹ gross income, less O&M in less-than-optimal conditions, reaches \$28.7 million.

There are capital costs that must also be funded from Project revenues. These include (1) the cost of acquisition, and (2) performance of deferred major maintenance such as generator rewinds and runner replacement, control upgrades, and the installation of aeration technology. For the purpose of this model we have priced these capital costs at \$150 million (explained in note 4 of Table 1). While the figure appears large, there are a number of reasons why this amount is not burdensome. The State is acquainted with and has used a variety of financing vehicles available to public bodies and believes that in demonstrating the historical revenue potential of the Project, financing can be obtained. To calculate the carrying costs on this financing, numbers from an actual municipal bond issuance were used to demonstrate that by financing \$150 million through 20-year bonds in three 5-year increments, cash flow, at its lowest point, after paying debt service, still exceeds \$17 million.

Table 1

	Yrs. 1-5	Yrs. 6-10	Yrs. 11-20	Yrs. 21-25	Yrs. 26-30	Yrs. 31-50
Projected Annual Output (MWH) (1)	620,000	620,000	620,000	620,000	620,000	620,000
Projected Revenue (2)	\$31,500,000	\$31,500,000	\$31,500,000	\$31,500,000	\$31,500,000	\$31,500,000
Projected Expenses (O&M) (3)	\$2,790,000	\$2,790,000	\$2,790,000	\$2,790,000	\$2,790,000	\$2,790,000
Projected Income	\$28,710,000	\$28,710,000	\$28,710,000	\$28,710,000	\$28,710,000	\$28,710,000
Debt Service (4)	\$3,800,000	\$7,600,000	\$11,400,000	\$7,600,000	\$3,800,000	\$0
TOTAL AVAILABLE REVENUE*	\$24,910,000	\$21,110,000	\$17,310,000	\$21,110,000	\$24,910,000	\$28,710,000

⁴⁸ APCI, Yadkin Hydroelectric Project, Application for License, pg. D-4.

⁴⁹ The 0.45 cents/kWh average was derived from APCI's FERC Form 1s for calendar years 2001 through 2008, page 406.1 (Hydroelectric Generating Plant Statistics (Large Plants)), lines 12 and 34.

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Key Assumptions

- (1) Annual output was derived by taking a conservative approach to historical data from the Yadkin River basin
- (2) Based on a rate of \$51 MWH. This rate was calculated by dividing total revenue by total output, using an average taken from quarterly data on revenue and output from the last five fiscal years (consisting of twenty total data points), and eliminating the lowest and highest two figures as outliers.
- (3) Based on APGI expense/net generation (\$.0045) from 2001-2008 (FERC Form 1).
- (4) Covers \$150 million cost of acquisition that includes (a) net investment as of December 2005 (\$24 million; APGI License Application, page D-2, Section D.2.2); (b) Narrows Unit 2 upgrade completed after December 2005 (\$13 million; estimate based on Yadkin-Pee Dee FEIS, page 244 and estimate of relicensing cost from APGI Form 1s for 2006 and 2007, page 216); (c) other significant planned major maintenance and upgrades (\$110 million; FEIS, page 245, Table 54); and (d) installation of aeration technology (\$2.5 million; FEIS pg. 248, Table 54). Assumes issuance of \$50 million bonds at years 1, 5, and 10, at 4.5%.
- (5) *Subject to adjustment for FERC license conditions and terms ordered in Final License Order.

This simplified spreadsheet demonstrates that the State could comfortably accommodate necessary expenses, including debt service, and still generate significant cash flow sufficient to support a variety of the mitigation measures identified by FERC Staff in its FEIS (pages 245-55, Table 54) and by APGI in its Relicensing Settlement Agreement. If weather and water conditions are favorable, there will be additional funds, and steps could be taken to pay down the debt sooner. If weather and water conditions are adverse, it might be necessary to defer contributions to certain intended uses. But these are decisions that will be made by a responsible governing body that will be established to manage this resource in the public interest. In any event, this spreadsheet demonstrates the ability to generate a dedicated amount of income representing a stable revenue source for programs described in Section VI. By using a conservative projection, it is shown that revenues will be available to achieve the State's public purposes of providing a reliable and robust revenue stream for vital programs, maintaining the Project in good condition, and fulfilling any terms and conditions of the Project license.

As financial obligations directly associated with the Project ease, the State would have the ability to more proactively coordinate its efforts with other public agencies, private sector representatives, and other stakeholders, to devote more revenues to long-range planning and implementation. It is critical that this planning include the best use of the Yadkin River for the State's anticipated needs, as discussed in Section I. This ability to plan for the future enables the State to consider a broad spectrum of needs that can and should be addressed, such as improving the efficient distribution of water, conservation of water for individual consumption, promoting new businesses, tourism and recreation.

SECTION V

SECTION V

The State's Use of Revenues from Its Operation of the Yadkin River Hydroelectric Plants

The State would use revenues received from the sale of electricity generated by the Yadkin Project for a variety of Statewide economic development purposes. Several potential uses for the funds represent long-standing needs that have consistently been identified by the State in its Strategic Plan.⁵¹

The uses identified here include examples of high priority State programs that could be made more effective with reliable long-term funding. The actual use of Project revenues will ultimately be determined by the administrative body for the Project, as directed by North Carolina's General Assembly and Governor.

1. A regional economic development fund for the Yadkin River area. The dollars could be used to fund an enhanced Main Street pilot project that would provide dollars for small town redevelopment, infrastructure, entrepreneurship programs, worker training programs, tourism development, and business recruitment and retention in the Yadkin Region;
2. A continuous funding source for the One North Carolina Fund, which is used for recruiting new companies and assisting existing companies in starting new business activity and creating new jobs in North Carolina;
3. A continuous funding source for the Utility Fund, which provides money for infrastructure development in rural communities across the State;
4. A continuous funding source for the North Carolina Community College System's equipment fund. The Community College System is a critical part of North Carolina's workforce development network, but often has difficulty obtaining adequate funds for equipment used in worker training;
5. Resources to effect the prompt environmental clean-up of the water and surrounding areas;⁵²
6. Resources for long-term water use planning and implementation as outlined by the statewide Drought Management Advisory Council (see Attachment III).

⁵¹ See footnote 48 and accompanying text.

⁵² APGI and its parent Alcoa, as the responsible party, must pay the full clean-up costs when it is legally required to commence remediation of the environmental contamination it caused by its activity over the past decades; however, the State has an important public interest to serve in starting that process as soon as possible, rather than waiting for APGI to decide when to meet its responsibilities in this area.

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The revenues from sale of electricity from the Project, used to fund ongoing programs on a sustained reliable basis, would serve a broader public purpose and help North Carolina to better realize some of the goals and objectives outlined in the Strategic Plan. The Strategic Plan focuses on seven economic development goals for the State:

1. Develop an outstanding education system and a highly qualified workforce.
2. Invest in science, technology, and university outreach.
3. Ensure a competitive environment for the recruitment and retention of business, capital investment, and job creation.
4. Create strong metropolitan growth centers that generate regional business development, shared prosperity, and a high quality of life in partnership with surrounding areas.
5. Develop thriving rural areas that maintain a high quality of life; achieve “One North Carolina” by mobilizing the State’s resources to create strong regional partnerships and programs that foster broader economic development opportunities in rural North Carolina.
6. Develop a competitive regionally based infrastructure and promote sustainable economic development.
7. Maintain and strengthen the tourism, film, and sports industries; preserve, protect, and promote our State’s cultural, natural, and heritage assets.

SECTION VI

SECTION VI

Description of Programs Proposed to Be Funded with Project Revenues

Yadkin River Regional Economic Development Fund

Widely shared economic prosperity in North Carolina is a high priority goal of the Economic Development Board and the State. The Yadkin Region is rural and has lagged the State in terms of median household income (\$42,792 for the region compared to \$51,411 for the State as a whole). Additionally, at 13%, the Yadkin Region has a higher unemployment rate than the State as a whole (the State unemployment rate is 11.2%). With the closing of the Alcoa Badin Works aluminum smelting facility in 2002, Stanly County experienced the full effect of the jobs lost that have been difficult to replace. The Department's Division of Policy, Research and Strategic Planning estimated the economic impact associated with the closed Alcoa facility on the North Carolina economy under a conservative and an average production capacity scenario.⁵³ The analysis concluded that the lost output, value-added, and employee compensation associated with the closed Alcoa smelting facility result in a significant economic loss for both the State and the seven-county Yadkin region. Impact estimates suggest that North Carolina is losing between \$220 million and upwards of \$850 million in total output under conservative and average production capacity models, respectively, with losses in annual total employment ranging from 570 to 2,000 jobs, as a result of Alcoa's decision to curtail aluminum smelting operations at its Badin facility. It is important that North Carolina address this loss by harnessing the Yadkin River and its hydro facilities to serve the needs of its people through attracting new business to this region.

According to Stanly County officials, residents have suffered from continuous high unemployment and the County now experiences one of the highest suicide rates in the State, as well as other health-related impacts. Stanly County residents have ranked unemployment as one of their highest concerns.⁵⁴

Research suggests that there is a relationship between a community's level of economic development and socioeconomic standing, and the health of that community. In general, the poor have the worst health. According to the World Health Organization "[w]ithin countries, the evidence shows that in general the lower an individual's socioeconomic position the worse their health. There is a social gradient in health that runs from top to bottom of the socioeconomic spectrum. This is a global phenomenon, seen in low, middle and high income countries."⁵⁵

⁵³ See Attachment XVIII, *The Estimated Economic Impact of Closure of Alcoa's Aluminum Smelting Facility in North Carolina*, N.C. Dept. of Commerce, Division of Policy, Research and Strategic Planning (Aug. 26, 2009).

⁵⁴ *2007 Community Health Assessment*, found at <http://health.co.stanly.nc.us/news/Community%20Health%20Assessment/Stanly%20County%20-%20CHA%202007%20-%20final.doc>

⁵⁵ See http://www.who.int/social_determinants/thecommission/finalreport/key_concepts/en/index.html

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More specifically, employment and income associated with having a job impact an individual's well-being. Income determines living conditions and access to important things such as safe housing and neighborhoods, and sufficient nutritious food. Social status is also related to health, through its relationship to feelings of control over life circumstances and ability to manage stressful conditions. The conditions of employment and unemployment may also influence health, apart from the influence they exert on income and social status. The stress and loss of income that is associated with unemployment will play a major role in health.⁵⁵ Quite simply, unemployment is associated with a large number of health risks, and inadequate employment is associated with poor health outcomes.⁵⁶

Thus, economic development can have crucial positive impacts on community health. Employment opportunities typically correlate with increased health care, in part because employed people often have access to health insurance coverage. Employment opportunities result in decreased personal and family stress and greater opportunities for personal growth. Public health professionals often say that one of the best community health improvement programs is a good economic development program that provides jobs and training opportunities. Counties with poor economic indicators typically have poor community health indicators.

Aligned with goal 5 of North Carolina's Strategic Plan, revenues generated from the Yadkin Project could be used effectively by helping to redevelop its small towns, promote entrepreneurship, build infrastructure, and create jobs in the region. It is a logical outcome that this valuable economic resource located right within their community should be used to assist those most adversely affected in their daily lives by the loss of a major employer like APGI.

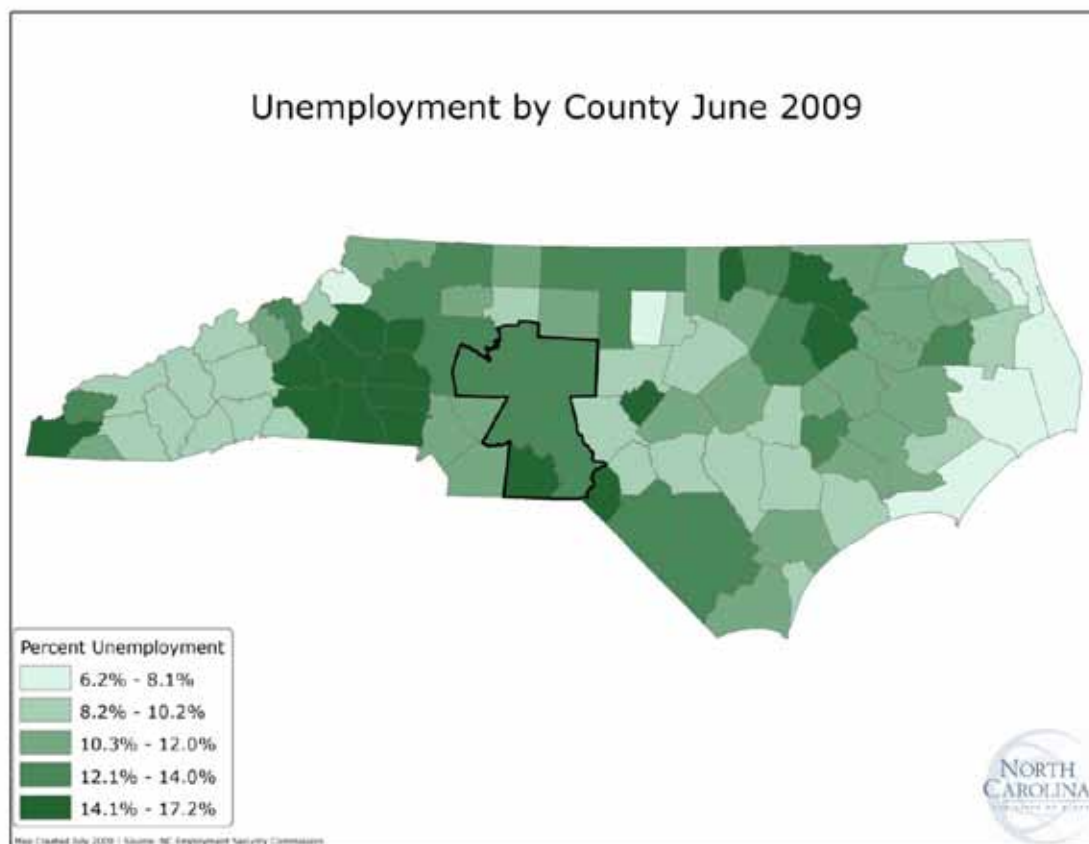
With a plan to target economic development in these communities, funds from the Yadkin River Regional Economic Development Fund could also stimulate communities to leverage this by applying for other funding for which they would be eligible, such as Community Development Block Grants, the purpose of which is "to develop viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low and moderate income."⁵⁷

⁵⁵ Wellesley Institute, *Poverty Is Making Us Sick*. See <http://www.wellesleyinstitute.com/files/povertymakingussickfinal.pdf>.

⁵⁶ U.S. Dept of Health and Human Services/California Wellness Foundation. See <http://aspe.hhs.gov/ezec/healthec/index.htm>.

⁵⁷ See 4 N.C.A.C. 19L.0101 and <http://www.nccommerce.com/en/CommunityServices/CommunityDevelopmentGrants/CommunityDevelopmentBlockGrants>.

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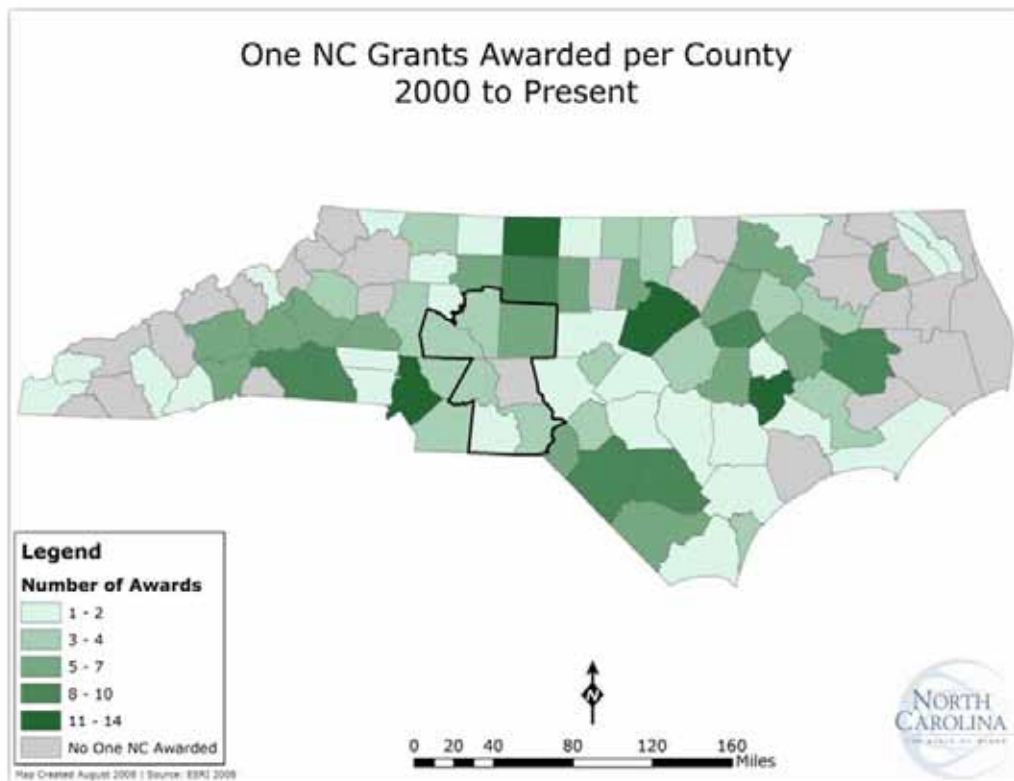


Yadkin Region shown in outline in Southcentral N.C.

One North Carolina Fund

North Carolina seeks to ensure a competitive environment with the most effective tools possible to retain and recruit businesses that will invest and create sustainable well-paying jobs in high-value-added, knowledge-driven industries. A key component of the State's economic development portfolio is the One North Carolina Fund. This program provides cash grants based on job creation, to be used for acquisition of new machinery and equipment, or infrastructure improvements, to companies locating new projects in North Carolina. The One North Carolina Fund is one of the State's most powerful discretionary incentives; it has resulted in the creation of 41,249 jobs and over \$7 billion in investment since 2000.

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*Yadkin
Region
shown in
outline in
Southcent
ral N.C.*

The State does not have a dedicated funding source for the One North Carolina Fund and must rely on yearly appropriations, which can cause a gap in the ability to provide grants for good projects that would contribute to the economic development of a region, especially during economic downturns. Yet, this is the very time when efforts to attract and retain jobs are most critical. Goal 3, objective 3.1, action step 3 of the Strategic Plan calls for a dedicated funding source for the One NC Fund to ensure that North Carolina remains competitive. By linking this effort with a less volatile funding source, the ability of this program to address needs at the most difficult times, should be enhanced.

Several states have attempted to address this issue by developing dedicated or unique funding streams for incentive programs. The Texas Enterprise Fund (TEF) is the largest “deal-closing” incentive fund in the nation. When it was created, the Texas legislature appropriated \$295 million for the biennium for the TEF, from the state’s Economic Stabilization Fund (*i.e.*, the rainy day fund generated from general and special tax revenue, including oil and gas tax revenues).⁵⁸ For the 2005 and 2007 biennia, the TEF was reauthorized but at a reduced amount of \$185 million. Georgia uses funds from the national tobacco settlement to finance economic development programs. In fiscal year 2009, Georgia allocated 30% of its tobacco settlement

⁵⁸ Baylor, D. Center for Public Policy Priorities. Enterprise Fund Policy Page: High Road or Low Road, February 2, 2005. <http://www.cppp.org/files/2/POP%20224%20Texas%20Enterprise%20Fund.pdf>

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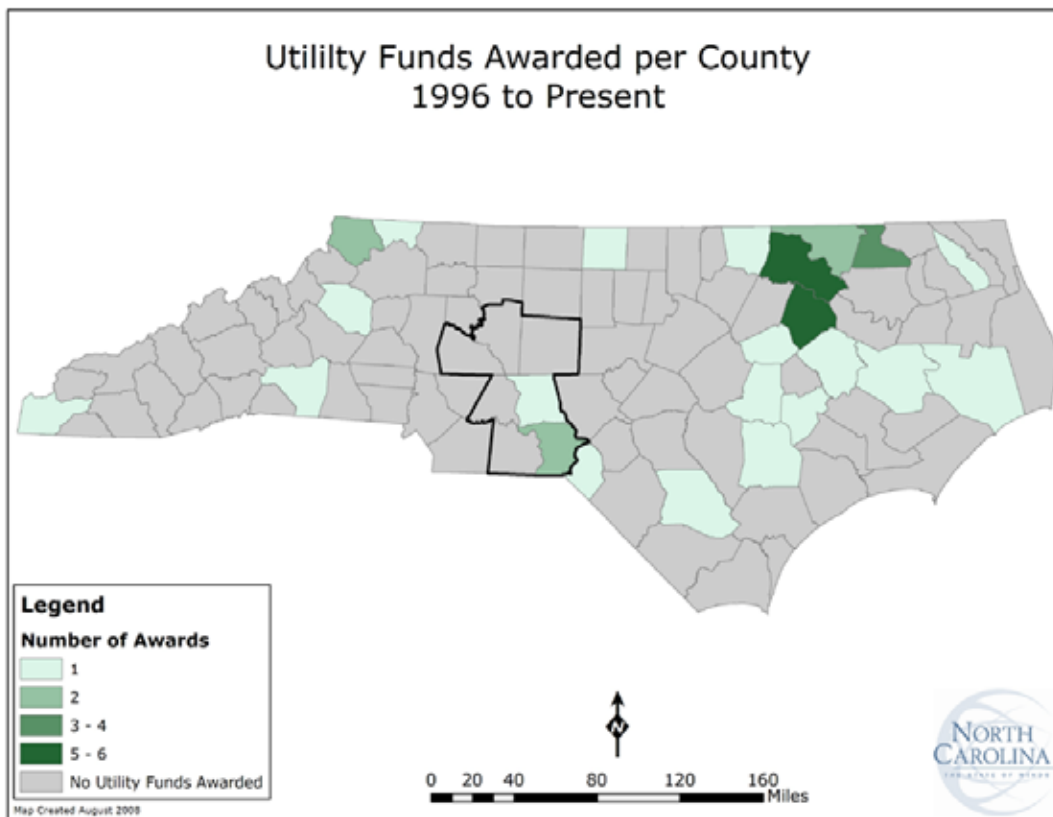
funds to the One Georgia Fund.⁵⁹ Delaware created the Delaware Competitiveness Fund—a nonbanking financial institution collaboration between the State of Delaware and Citizen’s Bank—to assist in purchases or upgrades of machinery and equipment and building acquisitions, expansions, and remodeling. Connecticut is adding \$2 million to the Governor’s Small Manufacturers Competitiveness Fund in bond funding from the Connecticut Stimulus Package—a state level \$525 million stimulus bond program. North Carolina’s proposed use of funds from the Yadkin Project would be consistent with these examples by providing dedicated funding to critical economic development-related programs.

Utility Fund

The need for a strong State commitment to building infrastructure is critical to comprehensive and sustainable economic development in North Carolina’s rural communities. The Utility Fund provides infrastructure, such as water and sewer improvements critical to a business seeking to expand or locate in one of the 80, mostly rural, economically distressed counties. Although tremendous strides have been made in recent years, many of the State’s rural communities lack the basic infrastructure that is essential to supporting long-term economic prosperity. The Strategic Plan notes that through direct intervention on specific issues relating to water/sewer, natural gas, transportation, technology and electricity, the State can significantly enhance the competitiveness of rural North Carolina. Like the One North Carolina Fund, the Utility Fund lacks a dedicated source of funding and is subject to annual appropriations by the General Assembly; amounts have varied considerably, year to year, making it difficult for this program to operate efficiently. The Utility Fund currently has more potential projects than it can fund, and a permanent source of funding would allow North Carolina to expand its funding capacity to meet the needs of more of the State’s rural areas.

⁵⁹ Sweeny, T. & Ray, S. Georgia Budget and Policy Institute, *Examining How Georgia Spends Tobacco Settlement Revenues*, October 2008 <http://www.gbpi.org/documents/20081007.pdf>

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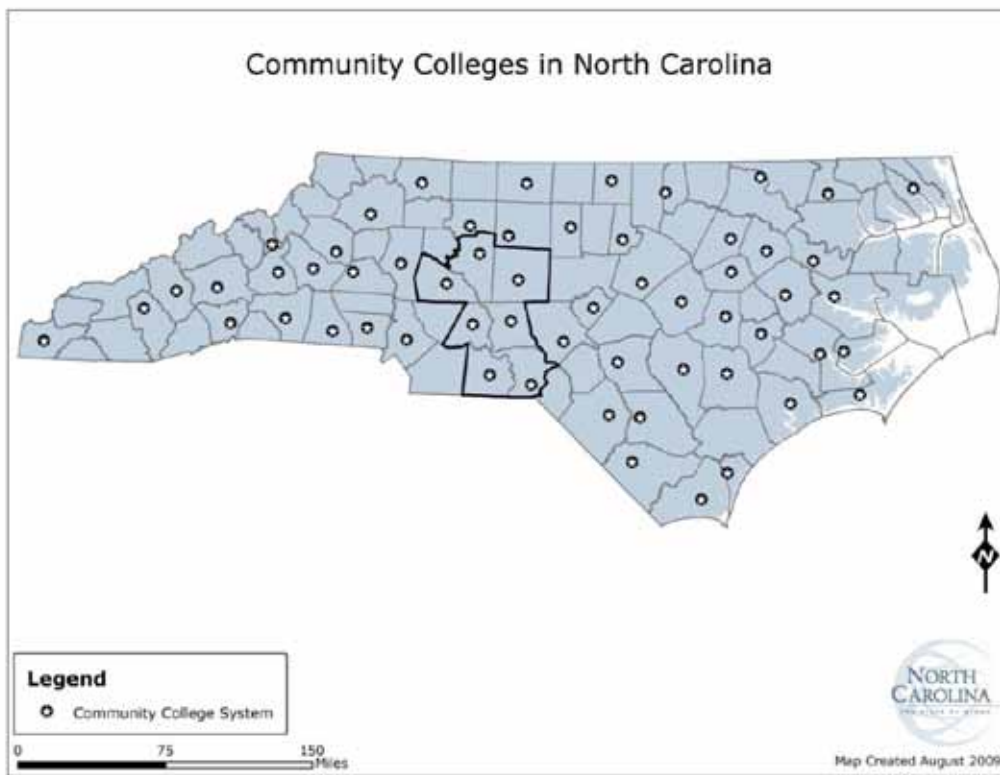
Yadkin Region outlined in Southcentral N.C.

NC Community College System Machinery and Equipment

The North Carolina Community College System (the “NCCCS”) offers free, customized job training for new and expanding businesses. Comprised of 58 colleges across the State, it is the third largest community college system in the country and has earned accolades from the economic development, business and industry, and educational communities worldwide. With 160 physical facilities, the 58 colleges provide accessible training to all 100 counties. Community college classrooms are within a 30-minute drive of virtually every North Carolinian, and distance learning technology reaches students in their homes and workplaces.

Community colleges provide the programs needed to build the economy by preparing students to do the jobs available now and in the future. There are more than 1,000 curriculum programs under more than 250 curriculum titles offered across the State. Programs are offered at the certificate, diploma and associate degree levels. New programs are established as a response to local and regional labor market needs and student demand.

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Yadkin Region outlined in Southcentral N.C.

For the community colleges to provide competitive skills to students, they must have state-of-the-art equipment. However, NCCCS lacks sufficient equipment funding; at the current rate, NCCCS can only replace its equipment (from desktop computers to heavy machinery) every nine years, and it has no extra funds to purchase additional new equipment. The lack of sufficient funding for equipment has resulted in outdated information technology, worn-out training equipment, and the necessity to re-direct limited operating funds to equipment accounts, none of which are acceptable methods of operation for the community colleges. Without the ability to train students on modern equipment actually used in the workplace, adequate worker training that would attract businesses that could provide stable well-paying jobs cannot be accomplished. For example, Aerospace has become an important industry in the State's business recruitment efforts. Manufacturing skills in the aerospace industry are unique to that industry, and proper equipment must be provided to train workers to meet this need.

The most basic building block of economic development is a skilled and trained workforce. Having a permanent funding source from the Yadkin Project would enable the State to compete internationally for high technology manufacturing projects that would bring good jobs and investment to communities across North Carolina.

SECTION VI

Funds for Environmental Clean-up

As the state's third-largest industry, tourism is a major part of North Carolina's economy. The Strategic Plan includes the goal of protecting, promoting and preserving the State's natural resources in order to increase tourism and create jobs throughout the State.

A polluted environment is typically not where tourists seek to travel. Although the Yadkin Region has attractions that tourists might otherwise seek, some of which are described in Section III, the level of pollution in the area would be likely to serve as a deterrent to many. For almost 100 years, Alcoa and its predecessors have conducted industrial process operations on lands Alcoa owns within Stanly County. Alcoa's operations at the Badin Smelting Works—which occupies 126 acres in the center of Badin, North Carolina, adjacent to Badin Lake, one of the Project reservoirs—produced large amounts of hazardous waste. For example, the facility produced approximately 4,800 tons per year of spent pot linings, a hazardous waste containing cyanide complexes.⁶⁰ Some of that hazardous material was discharged into the air and water of Stanly County. The spent pot-linings and other refuse from the aluminum smelting operations were stored on or buried in the land.

Environmental contamination of the Badin Smelting Works site and the official disposal sites used by Alcoa in Stanly County—all of which are located on or near the shore of Badin Lake—has been documented by Alcoa.⁶¹ In recent years, local residents have also publicly identified other potential Alcoa waste disposal sites in Stanly County that had not previously been mentioned by Alcoa in its official environmental reports to the State.⁶² Alcoa subsequently acknowledged to North Carolina's Department of Environment and Natural Resources, one of those sites as a potential, previously undocumented waste disposal location.⁶³

⁶⁰ *North Carolina Department of Environment, Health, and Natural Resources Screening Site Investigation, Alcoa Badin Landfill*, page 1.3 (March 1991).

⁶¹ See, e.g., MFG, Inc., *RCRA Facility Investigation Report* (March 2001) (RFI). See also Stanly County Board of Commissioners, Public meeting (February 5, 2007), Videofile (Attach. B), which provides an overview of: (1) the contamination that Alcoa acknowledges at the Badin Smelting Works and official dumping locations; and (2) the steps the company has taken, to date, to address the contamination. The meeting was held at the request of the Stanly County Board of Commissioners. Alcoa provided an expert from its environmental remediation staff based in Alcoa's Pittsburgh headquarters.

⁶² Affidavit of Tony Dennis, attached to Scoping Comments of Stanly County and Request for Additional Information from Licensee, *APGI, Inc.*, Project No. 2197-073 (filed Feb. 26, 2007) (Stanly County Scoping Comments); Affidavit of Gary Lowder, Stanly County Scoping Comments, Attach. I; Affidavit of Mary Elizabeth Chivington, Comments Of Stanly County in Response to Licensee Filing of Relicensing Settlement Agreement, App. A (June 6, 2007).

⁶³ Stanly County Scoping Comments, Attach. B, 7:04, 9:32-10:00; Transcript Supplementing Video Submitted as Attachment B to Scoping Comments of Stanly County, attached to Affidavits of Jerry D. Myers, Robert M. Van Geons, Tony M. Dennis, April B. Underwood, and Gary S. Lowder (Feb. 27, 2007), available at eLibrary Accession No. 20070301-0093; Brief of Stanly County, Ex. G, SB 1046: An Act to Study the Impacts on the State of North Carolina of the Potential Issuance of a Fifty-Year License by the Federal Energy Regulatory Commission for the Operation of the Yadkin Hydroelectric Project, available at <http://www.ncleg.net/gascripts/DocumentSites/browseDocSite.asp?nID=12&sFolderName=>

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The government of Stanly County has also expressed concerns about groundwater quality, noting that environmental documentation for the Badin Smelting Works indicates that groundwater contamination has occurred under the site, and that the groundwater flows toward and discharges to Badin Lake.⁶⁴ As noted in Section I, earlier this year, State health authorities posted a fish-consumption advisory for largemouth bass and catfish caught in the Badin Lake, because those species may be contaminated by polychlorinated biphenyls, or PCBs, which can cause a range of health problems, possibly including cancer.

Remediation of the environmental contamination in and around the Badin Smelting Works site could both facilitate productive reuse of that industrial site and protect surface and ground water quality in the adjacent Yadkin River and Project reservoir, which is currently used for public water supply and is a crucial resource for the State. Stanly County has sites contaminated from the Alcoa Badin Plant that, if remediated, could be developed and generate tax revenues. Accelerating clean-up of these sites would facilitate development of sites within Stanly and neighboring counties.

From a tourism, recreational (fishing, boating, swimming, picnicking), public health, and economic development perspective, directing revenues from the Project to hasten environmental remediation is a wise step that would achieve a worthy public benefit.

Water Resources Management

To promote North Carolina's long-term economic growth, the State must manage its water resources to ensure that people and businesses will have access to adequate, clean and reliable supplies of water. As one of North Carolina's five major river basins, the Yadkin River basin covers more than one-fifth of North Carolina's 100 counties in its drainage area, includes 17.5% of North Carolina's population, and touches three of North Carolina's combined statistical areas (CSAs): Charlotte-Gastonia-Salisbury, Greensboro-Winston-Salem-High Point, and Lumberton-Laurinburg.⁶⁵

In the last few years, ending in 2008, North Carolina experienced a drought that was the worst on record since 1895.⁶⁶ As a result of the drought, the North Carolina Drought Management Advisory Council met to discuss the drought and its impact statewide, including its impact on public health, agriculture, businesses and economic development. As a result of both the 2002

\Alcoa%20-%20Stanley%20County%20-%20FERC%20Re-licensing\Stanley%20briefing%20info (follow "Exhibit G" hyperlink).

⁶⁴ Stanly County Scoping Comments, page 12, *citing* RFI, page 123.

⁶⁵ North Carolina State University, College of Agriculture and Life Sciences, NCSU Water Quality Programs, *Yadkin River Basin*, <http://www.water.ncsu.edu/yadkin.html>.

⁶⁶ See Attachment III, North Carolina Drought Management Advisory Council Activity Report – 2008, North Carolina Division of Water Resources, Department of Environment and Natural Resources, Oct. 1, 2008 (Revised Dec. 18, 2008).

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and 2007 droughts, North Carolina's government agencies came together to work on interconnections to prevent the most vulnerable municipalities from running out of water and encouraged the municipalities to conduct their own water resources planning to prepare for drought. Led by the North Carolina Department of Environment and Natural Resources, North Carolina agencies are working to find funding for the most vulnerable municipalities to help them pay for interconnections and new water intakes and pump stations.⁶⁸ To prevent similar emergency situations from occurring in the future, North Carolina and its municipalities must plan for the long-term use and delivery of water to population centers, businesses, medical facilities and other institutions. Revenues from the Yadkin Project could be set aside to help conduct these long-range plans.

⁶⁸ *Ibid.*

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The State as Project Licensee; The State's Capacity to Manage The Project

The State is prepared to establish an entity that will undertake responsibility for the operations of the Project by the time it receives the FERC license. In doing so, the State would expect to employ the approximately 35 employees currently engaged in operating activities for the Project. To the extent necessary or desirable, there are also subcontracting options that would involve engaging other experienced hydropower producers singly, or as a joint venture, to assist in the routine as well as the special tasks associated with operating the facilities, for at least some period of time.⁶⁹

The State has hundreds of years of business experience in operating entities created to serve public purposes. Just a few examples are the vast University of North Carolina System, the North Carolina Ports and the North Carolina Railroad, which are described below.

University System⁷⁰

In North Carolina, all the public educational institutions that grant baccalaureate degrees are part of the University of North Carolina. Chartered by the North Carolina General Assembly in 1789, the University of North Carolina was the first public university in the United States to open its doors. The first class was admitted in Chapel Hill in 1795.

The 1931 session of the General Assembly redefined the University of North Carolina to include three State-supported institutions: the campus at Chapel Hill, North Carolina State College, and Woman's College (now the University of North Carolina at Greensboro). By 1969, three additional campuses had joined the University through legislative action: the University of North Carolina at Charlotte, the University of North Carolina at Asheville, and the University of North Carolina at Wilmington.

In 1971 legislation was passed bringing into the University of North Carolina the State's ten remaining public senior institutions, each of which had until then been legally separate:

⁶⁹ A recent experience of the State's owning and planning for the operations of a valuable resource for the public's benefit is the State's purchase of the landmark Chimney Rock Park, a popular tourist attraction since 1885, from a private family. The existing operator continues to operate the park while the State develops an operations plan. The State acquired the property to protect the important landmark for future generations, in the context of making it part of the larger State park system. The N.C. Division of Parks and Recreation has engaged an environmental planning and landscape architect firm to develop the master plan that will balance conservation and protection of sensitive habitats and rare species, and recreation (and the need to locate State park infrastructure). The master plan will provide for the long-term development of facilities and protection of natural resources, with input from the parks division, as well as from the public. See <http://ils.unc.edu/parkproject/ncparks.html> and <http://www.virtualblueridge.com/news-and-events/news-428.asp>.

⁷⁰ See UNC website at <http://www.northcarolina.edu/about/mission.htm>

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Appalachian State University, East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina Agricultural and Technical State University, North Carolina Central University, the North Carolina School of the Arts (now the University of North Carolina School of the Arts), Pembroke State University (now the University of North Carolina at Pembroke), Western Carolina University, and Winston-Salem State University.

The UNC Board of Governors is the policy-making body legally charged with "the general determination, control, supervision, management, and governance of all affairs of the constituent institutions." It elects the president, who administers the University. The 32 voting members of the Board of Governors are elected by the General Assembly for four-year terms.

In addition to its teaching role, the University of North Carolina has a long-standing commitment to public service. The UNC Center for Public Television, the UNC Health Care System, the cooperative extension and research services, nine area health education centers, and myriad other University programs and facilities reap social and economic benefits for the State and its people.

The official mission statement for the University is reflected at Chapter 116-1 of the General Statutes:

The University of North Carolina is a public, multi-campus university dedicated to the service of North Carolina and its people. It encompasses the 16 diverse constituent institutions and other educational, research, and public service organizations. Each shares in the overall mission of the University. That mission is to discover, create, transmit, and apply knowledge to address the needs of individuals and society. This mission is accomplished through instruction, which communicates the knowledge and values and imparts the skills necessary for individuals to lead responsible, productive, and personally satisfying lives; through research, scholarship, and creative activities, which advance knowledge and enhance the educational process; and through public service, which contributes to the solution of societal problems and enriches the quality of life in the State. In the fulfillment of this mission, the University shall seek an efficient use of available resources to ensure the highest quality in its service to the citizens of the State.

The UNC system demonstrates the successful public management of an enormous business. Some examples of businesses within the UNC system are UNC Hospitals, which has an operating budget of \$912 million, 6,900 employees, plus an additional 1,500 physicians. And some of the businesses within UNC own and operate utilities: Appalachian State University's New River Light and Power Company has an operating budget of \$14 million, with 28 employees; and UNC-Chapel Hill's utility operations have an operating budget of \$110 million, with about 150 employees.⁷¹

North Carolina Railroad⁷²

The North Carolina Railroad ("NCRR") was instrumental in encouraging the economic development of North Carolina in the 19th century, helping to define new markets, new

⁷¹ James O. Smith, Associate Vice President-Finance, UNC General Administration.

⁷² Information provided by Catherine Campbell, NCRR.

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industries, and new cities. Today, NCRR continues to contribute to the State's economy, as it invests in ongoing capital improvement projects to enhance the efficiency and safety of transportation in the State. The following data come from a study conducted by the Research Triangle Institute International in May of 2007, reflecting 2005 data.

- NCRR carried 254,000 carloads of NC freight in 2005, including 7,800 intrastate carloads and 246,500 interstate carloads; 1.5 million carloads total
- NCRR carries 300,000 passengers each year
- NC freight spending by NCRR customers: \$74.7 million; total NC impact: \$143 million annually
- NCRR saves its customers \$198 million in transportation costs annually (against the substantially more expensive truck transportation); total impact on NC output: \$338 million annually. The information below summarizes NCRR cost and economic impacts.

Impact Measure	Cost Savings by NCRR Freight Customers		Indirect Impact	Induced Impact	Total Impact
	Direct Impact				
Output (\$)	\$198,000,000	\$223,100,000	\$73,900,000	\$40,800,000	\$337,700,000
Employment		611	432	385	1,428

- NCRR invests millions of dollars each year in North Carolina
- North Carolina's economy depends on NCRR's rail transportation. In counties bordering NCRR tracks, industries using rail freight services account for \$143 billion in output, more than 24% of North Carolina's total economy in 2005
- NCRR freight transportation has environmental benefits, conveying \$65.7 million in external benefits (cost savings)

North Carolina State Port Authority⁷³

The N.C. State Port Authority (the "Port") is an enterprise agency unique within the North Carolina State Government. It was established in 1945 with no State or Federal funding for operations. There is support for capital improvements only. The State owns two modern, expanding deepwater container ports at Wilmington and Morehead City and the future North Carolina International Port, and two breakbulk/bulk facilities at Wilmington and Morehead City. The State enforces sound fiscal policy through a constitutionally mandated balanced budget. See 2002-2008 operating budget, below.⁷⁴ The Port employs about 200 people in Wilmington and 80 in Morehead City.

In 2005, Martin Associates, a national transportation and economic consulting firm, produced the North Carolina State Port Authority's economic impact report. The study used a standard port industry model which measures economic impact in terms of jobs directly and indirectly related to port activities.

⁷³ This information was provided by Jason Smith, N.C. Port Authority.

⁷⁴ Chart of budget provided by Laura Godwin, Director of Government Relations, N.C. Port Authority.

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The study shows that North Carolina's Ports in Morehead City and Wilmington directly and indirectly support 85,000 jobs, which contribute \$299 million annually in State and local tax revenues, based on the Port's fiscal 2005 cargo volumes.

Only 5,000 of those jobs are at the Ports, or otherwise directly related to maritime activity - including some 300 employees of the Ports Authority, members of the International Longshoremen's Association, trucking companies, ship's chandlers, fuel companies and so forth. Another 6,500 jobs are created by the purchasing power of those direct jobs.

In 2008, Martin Associates produced a second study, this time examining the potential economic impact of the proposed North Carolina International Terminal on the west bank of the Cape Fear River in Brunswick County. The projections confirm planners' early expectations: by the time the facility is completely built out, around 2030, it will support nearly half a million jobs and generate State and local tax revenues of well over a billion dollars each year.

Jobs and taxes are generated by companies that locate in the community and thrive due to port access. Some examples are Leather Italia (Leland), International Paper (Riegelwood), Sue Bee Honey (Elizabethtown), Aludisc (Clinton), WestPoint Home(Maxton) in the Southeast, and Lowe's, QVC, Thomasville, Broyhill, K-mart, Polo-Ralph Lauren, and Hallmark Cards, throughout the State. Spirit AeroSystems ("Spirit") was attracted to the Global TransPark (airport), in part because of its proximity to the Moorehead City and Wilmington ports. Spirit expects to create 1,031 jobs over the next six years.⁷⁵

⁷⁵ John Lewelling, Senior Vice President, Spirit AeroSystems.

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North Carolina State Ports Authority Budget and Actual past 7 years: FY 2002-FY 2008

	FY 01-02	FY 02-03	FY 03-04	FY 04-05	FY 05-06	FY 06-07	FY 07-08
Operating Budget							
Operating Revenue	26,202,693	26,675,014	29,163,826	32,248,269	39,034,574	46,964,820	43,978,041
Operating Expense	<u>32,068,278</u>	<u>32,039,874</u>	<u>33,516,875</u>	<u>34,899,840</u>	<u>38,587,446</u>	<u>43,629,746</u>	<u>41,673,275</u>
Operating Income	(5,865,585)	(5,364,860)	(4,353,049)	(2,651,571)	447,128	3,335,074	2,304,766
Non Operating Expenses*	<u>660,901</u>	<u>39,974</u>	<u>(673,325)</u>	<u>(358,840)</u>	<u>3,606,158</u>	<u>(114,068)</u>	<u>(1,820,818)</u>
Net Income	(5,204,684)	(5,324,886)	(5,026,374)	(3,010,411)	4,053,286	3,221,006	483,948
	-	-	-	-	-	-	-
Operating Actual							
Operating Revenue	26,245,650	26,810,559	29,141,871	34,900,562	40,680,611	39,072,670	39,594,989
Operating Expense	<u>30,052,138</u>	<u>31,584,320</u>	<u>32,721,000</u>	<u>37,156,482</u>	<u>38,492,589</u>	<u>39,328,180</u>	<u>37,470,078</u>
Operating Income	(3,806,488)	(4,773,761)	(3,579,129)	(2,255,920)	2,188,022	(255,510)	2,124,912
Non Operating Income*	<u>889,333</u>	<u>481,910</u>	<u>(381,972)</u>	<u>851,146</u>	<u>9,525,557</u>	<u>(681,218)</u>	<u>(1,014,145)</u>
Net Income	(2,917,155)	(4,291,851)	(3,961,101)	(1,404,774)	11,713,579	(936,728)	1,110,767

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The Impact of the Project License; The Need to Take Action

This Plan discusses a specific topic, namely, how the State would manage the Yadkin Hydroelectric Project for the next fifty years if it were to obtain the Federal license for the Project. What motivates the State's request, however, is what the State views as a compelling need to gain meaningful control over the Yadkin River resources in the future. If any single asset is vital to the State's well-being, it is an adequate, reliable water supply. The Yadkin River is one of the State's larger rivers and its development for hydropower has resulted in the creation of several large reservoirs. It is these reservoirs and the flows of the Yadkin River that will become the water sources that the State must rely on for its future water needs.

Because the Yadkin reservoirs are associated with hydroelectric production, they are subject to regulation by Federal Energy Regulatory Commission. Where a private entity like APGI holds the Federal license, the State is constrained in its ability to make and implement plans regarding these reservoirs and their use, even though located within the State. FERC is authorized to issue hydroelectric power licenses for up to 50 years. The main effect of the Federal licensing system on the State's water policy is that the State's ability to provide and plan for water resources of the Yadkin River to serve its citizens is subject, in this case, to a 50-year license, which is essentially a contract between the Federal government and APGI that determines primarily how the river and plants located geographically in the State, are operated. As to the important question of securing water supplies from FERC-licensed projects, FERC has a standard license provision that permits governmental bodies to request that the licensee provide water for consumption purposes, but the licensee may charge the user for water withdrawals based on the price of power sales it lost as a result of the water sale. In theory, this practice should make the licensee relatively indifferent during the license term as to whether it obtained its revenues by generating power from water or by selling that water for public consumption. The effect of this standard, however, is to tie the price of raw water to the price of electricity. The expense of transporting the water further increases that cost.⁷⁶

A typical FERC license also provides for certain minimum flows for environmental purposes, water supplies for certain communities, and other measures designed to enhance recreation, fishery, and aesthetics. However, once in place, the license essentially locks in the use for the full term of the license. While some changes can be made, the license itself cannot be changed or amended without the mutual consent of FERC and the licensee. Third parties like the State, if APGI receives the new license, are limited in what they might request during the term of the Project license.

⁷⁶ Terms and Conditions of License of Constructed Major Project Affecting Navigable Waters of the United States, Form L-3, Article 13. <http://www.ferc.gov/industries/hydropower/gen-info/comp-admin/l-forms/l-03.pdf>.

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States, through their various agencies, participate in FERC licensing and relicensing proceedings. The state agencies that participate usually include the state's department of environmental resources and its historical preservation office. Federal agencies also participate, like the US Fish & Wildlife Service ("US F&W"), and the National Marine Fisheries Service. These agencies participate in the consultative process, along with other interested individuals and organizations, to arrive at a single document, like a settlement agreement, that reflects their understandings on matters of concern. FERC has an independent obligation to review the license applicant's proposal or any settlement agreement to make sure it meets the statutory standard of "best adapted to a comprehensive plan of development for the riverway."⁷⁷ In addition, the licensee applicant must apply for a Water Quality Certification ("WQC") under Section 401 of the Clean Water Act, and the State agency responsible for implementing that provision of the Clean Water Act is authorized to rule on that WQC application. No FERC license may be issued unless the State issues a WQC or waives the certification requirement.

It is against this background that the State and its agencies became involved in the Yadkin Project relicensing application. During the latter part of the consultative process, one participant, Stanly County, raised other issues that it believed should be considered in relicensing the Yadkin Project. The County is the site of the Yadkin Project and Alcoa's mothballed Badin Smelting Works, which was powered by the Yadkin Project and had earlier provided a substantial number of jobs (nearly 1,000) in the years after the 1958 licensing of the Yadkin Project. The State supported Alcoa in 1958 when Alcoa requested a 50-year license, rather than the shorter term the Federal Power Commission initially allowed, because Alcoa represented to the FPC and to the State that it could not justify the investment needed to continue operations and employment at the Badin Smelting Works, for a shorter period.⁷⁸

In recent years, as discussed previously, the State experienced the worst drought in its recorded history. The Yadkin River Basin was one of the rivers experiencing the effects of the drought. It became clear, as the State examined the situation, that there were vulnerable spots in its water delivery system. Because most of the water delivery systems are local, the State took the initiative to examine what steps could and needed to be taken to deal with the scarcity of water supplies under drought or other emergency situations. Interestingly enough, the few communities that had experienced loss of their water supplies prior to the drought years were the most prepared to deal with the situation. In addition to the stress and costs added to individuals and industries, there was also a cost to the environment and recreation amenities.⁷⁹

⁷⁷ FPA Section 10(a), 16 U.S.C. § 803(a).

⁷⁸ *Carolina Aluminum Co.*, 19 F.P.C. 704 (1958); *Carolina Aluminum Company, Petition for Rehearing and for Other Relief, in Carolina Aluminum Co.*, Federal Power Commission Project No. 2197, Docket No. IT-5499 (Apr. 25, 1957).

⁷⁹ See North Carolina Drought Management Advisory Council Activities Report – 2008, North Carolina Division of Water Resources, Department of Environment and Natural Resources, Oct. 1, 2008 (Revised Dec. 18, 2008).

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The real questions became what could the State do to take effective action. In that regard, it became evident that the conditions that led to the initial licensing of the Yadkin River had changed significantly. The licensee, APCI, no longer operated the Yadkin Hydro Project to supply the Badin Smelting Works; by 2007, APCI had entirely eliminated its aluminum operations. Instead, APCI has chosen to sell the electricity generated from the Yadkin Hydroelectric Project at market prices on the open wholesale electricity market. In 2006, when its relicense application was filed, APCI reported approximately \$44 million in annual gross revenues.⁸⁰ Although APCI claims the Project costs \$28,310,097 annually to operate, including almost \$10 million in Operating and Maintenance expenses,⁸¹ APCI's FERC Form 1s report annual Total Production Expenses range only from \$2.1 million to \$4.0 million during the years 2001-2008.

In 2008 and 2009, North Carolina like the rest of the country, entered a period of financial contraction; we are not yet out of the recession. The result has been a loss of jobs, income, and taxes to the State. Against this background, we are faced with the prospect of a changing world climate that is causing significant impacts in our environment. The Federal government, as well as state and local governments and the governments of other countries are taking steps to address global climate issues, especially since scientists caution that these changes, which include a pattern of prolonged and severe weather variations, could stress our society's ability to assure fundamental goods like water and clean air and to maintain their standard of living.

These issues converged in 2009, when the State recognized that there was a once-in-a-lifetime opportunity for the State possibly to recover some larger share of the control of the Yadkin River than it had experienced in the 20th century. Federal law provided a basis for the State to recover this fundamentally critical asset, so that it could be managed in a way that would best serve the interests of the people. Specifically, the Federal Power Act provides that the Federal Energy Regulatory Commission, based on the evidence before it, can decide to recommend recapture of a project license for public purposes, to the United States Congress, if it is in the public interest. It is North Carolina's contention that the public purpose achievable by the State if it more fully controlled and participated in the decisions of how a major river in the State can be used for the public benefits set out in its Plan and its pleading, provide more than ample evidence supporting a request that the Commission recommend to Congress that the United States exercise its recapture rights under Sections 7 and 14 of the Federal Power Act, for subsequent transfer to the State of North Carolina, as proposed in this Plan.

Accordingly the State has set out its proposal as a Plan to accompany the State's request for such relief to FERC. That proposal has the following elements:

1. Payment to the U.S. Government of the statutory net investment and severance damages for the Yadkin Project. The result is that the transfer would not cost the U.S. Government any funds from General Revenues.

⁸⁰ APCI, Yadkin Hydroelectric Project, Application for License, pg. D-4.

⁸¹ *Ibid.*

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2. North Carolina would seek legislation in the United States Congress directing FERC to accept a license application from the State, for the Yadkin Project.
3. Upon transfer of the Project property, the State would assume ownership of the facilities and control of the Project operations.
4. Until physical transfer is final, APGI would operate the Yadkin Project on the basis of its existing license, allowing it substantial revenues.
5. The State would file a license application with the Commission and be subject to all license terms and conditions required by the Commission or enter into a settlement agreement with third parties and participating agencies in the course of its relicensing before FERC.
6. In the event that the U.S. Congress does not provide legislation that would allow the transfer to North Carolina within a specified time period, the law provides that the Commission may resume the relicensing considerations for the Yadkin Project, subject to applicable laws at the time.

The end result of the North Carolina proposal would be that North Carolina, if the U.S. Congress agrees, would become the licensee for the Yadkin Project, and that APGI would be compensated for its Project investment, as agreed to by APGI when it initially received its FERC license. Any license received by the State would be subject to the terms and conditions required by FERC. The value of the Project, thereafter, would be distributed in the manner discussed herein, that is, for the benefit of the citizens of North Carolina. A successful transition would mark the first use of the Federal Energy Regulatory Commission's authority under Sections 7 and 14 of the Federal Power Act, but the time and circumstances, in North Carolina's opinion, have now converged to make its exercise imperative and in the public interest.

Finally, North Carolina wishes to share with the Commission its thoughts on the kind of discourse that the State's recapture request has engendered in North Carolina. The State's recapture request has been received by many citizens and groups within the State as a sound, sensible, and timely measure.⁸² Indeed, the State's recapture request has raised the awareness of many of its citizens about the infrastructure needs of the State, especially the need for clean and

⁸² See, e.g., "It's Time North Carolina Recovered Hydro Plants" [Subtitle: "State Wants to Refocus Use of Water to Produce N.C. Jobs"], *The Charlotte Observer*, August 6, 2009 (<http://www.charlotteobserver.com/opinion/story/872215.html>); "Support Grows for Yadkin River Trust Bill," *Carolina Business Connection*, August 28, 2009 (<http://www.carolinabusinessconnection.com/cbc/article.html?id=8465>); "Panel of NC Lawmakers OK Yadkin River Dams Bill" [Subtitle: "NC Legislative Committee Passes Bill to Help State in Attempt to Control Yadkin River Dams"], Associated Press, August 6, 2009 (<http://finance.yahoo.com/news/Panel-of-NC-lawmakers-OK-apf-195743432.html?x=0&.v=1>).

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adequate water supplies, and the purposefulness with which these needs must be pursued if the State is to achieve anticipated standards and quality of life for its citizens.

The State's initial attempt to establish by way of legislation, in advance of a recapture decision, a public trust to own, hold the license for, and operate the Project in the public interest in the event the State were to acquire the Project, passed overwhelmingly on two occasions in the North Carolina Senate, but did not pass the North Carolina House of Representatives during the closing days of the legislation session just ended. During most of that session, the attention of the entire General Assembly was focused almost exclusively on an approximately \$4 billion budget shortfall, representing 20% of the entire State budget. This was a crisis on a scale unseen since the 1930s. Legislators were embroiled in reaching a complex and difficult compromise to balance the budget, and, until this was accomplished, it was impossible for adequate energy or attention to be placed on the Yadkin River Trust legislation. There were only a few days remaining in the session when a comprehensive budget compromise was reached, leaving no time to debate or study the merits of the proposed Yadkin River Trust legislation, or for supporters to answer questions about it and respond adequately to Alcoa's program of disinformation. However, the full text of the enabling legislation remains intact, and is currently in conference between the House and Senate. We are confident that when the new legislative session begins, the conference report will report favorably on the Yadkin River Trust concept, especially since the members of the General Assembly will then have adequate time to study the facts, make inquiries, and recognize the need for enacting the legislation promptly.

The misinformation provided by APGI included characterizing the State's request to FERC as a "takings" issue inconsistent with the United States Constitution, rather than a lawful measure expressly provided for, under Federal law and included in virtually every FERC license, including APGI's current Yadkin Project license. The licensee, APGI, is fully aware of its predecessor company's representations to the Commission's predecessor, about its concerns that its Project would be subject to takeover at the expiration of the 1958 license. In fact, it not only acknowledged the Government's right to such takeover, its core argument for special treatment resulting in a license lasting 50 years for all four Yadkin Project developments was the possibility that the Federal government would decide to recapture the Project at the end of the license term. Despite this awareness, and despite the deal struck with the State over 50 years ago that the Yadkin River would, in fact, be used to promote and sustain jobs in the Yadkin Basin, many members of the Legislature were told by APGI's representative, in public hearings before legislative committees considering legislation to create the Yadkin River Trust, that Alcoa considered the State's Trust proposal and FERC request a prohibited and unfair Government taking of its private property.⁸³ We find these pronouncements by APGI disingenuous, given Alcoa's original argument that a 50-year license was necessary, because it was possible that the Government would seek to recapture the Project when its 1958 license expired.

It is North Carolina's intent to use lawful means to acquire what it believes to be in the best interest of its citizens as it seeks to regain control of the Yadkin River flows, to optimize their multiple uses in a way that is more fully responsive to the public's concerns. Every citizen in

⁸³ See Comments of Gene Ellis, APGI Relicensing Consultant, to the NC House Water Resources Committee of the NC General Assembly, <http://yadkinproject.blogspot.com/2009/07/report-from-nc-general-assembly.html>.

SECTION VIII

North Carolina has the right, every day of every year, to petition his government if he disagrees with what the Governor of North Carolina or its legislature is doing, and to remind his or her elected official of the official's obligations. However, a petition to *Alcoa* complaining about the Yadkin River Project operations or seeking to change the operations, even if to benefit the public, can anticipate only constrained relief, as Alcoa has the protection of a FERC License, which establishes the terms of its exclusive license for fifty years. Absent APGI's consent, as well as FERC's approval, the terms of the license cannot be changed, however meritorious or pressing the need of the State and its citizens. To the State, it is troubling that a licensee would not acknowledge its own history and would consciously engage in misinformation, to retain a license that it obtained under very different circumstances and by promising to create so many jobs in this region of the State, some 50 years ago. Fortunately, the Commission is familiar with the law and the facts, and will be able to deal appropriately with any such misinformation.

SECTION IX

IX

CONCLUSION

The State is uniquely equipped to determine how the Yadkin River flows can best meet the State's public purpose objectives over the next 50 years. The relicensing of the Yadkin Project presents a one-time opportunity for the State to ensure that this crucial resource is managed to provide a fair share of the Yadkin River's value to the citizens of North Carolina, to enhance the State's ability to craft timely responses to changing conditions within the State, and to perform the balancing that must be done among competing uses, including hydroelectric power, public health and environmental objectives (including maintaining the safety of its fish for consumption), maintaining access to reservoirs during droughts, assuring water supplies for new and existing businesses and communities, promoting tourism and recreation and improving the overall quality of life for North Carolina citizens.

Every major river and its flows is subject to competing uses, and the question for the future is whether and how these decisions affecting a great North Carolina river should be made. Would the public interest prevail, as contemplated in the Federal licensing law from its inception, if North Carolina must rely, over the next 50 years, on a private corporation (that has not demonstrated responsiveness in these areas) with a Federally-issued license that is essentially fixed for 50 years? How can North Carolina best meet its citizens' interests and the concerns of its businesses for adequate, clean water supplies? The State has decided, for the reasons supported here, that the answer to that question is straightforward. There is too much at stake to place trust wholly in a private corporation that cannot, by its own structure and charter, operate the Project and make decisions about Yadkin River water primarily for the citizens of this State. In contrast, the State is constitutionally aligned with exactly this purpose:

*. . . all government of right originates from the people, is founded upon their will only, and is instituted solely for the good of the whole.*⁸⁴

⁸⁴ N.C. Constitution, Article I, Sec. 2.



Attachments to The State of North Carolina's 21st Century Plan for the Use of The Yadkin River Resources

Volume 2

September 8, 2009



Prepared by Karen A. West, Acting General Counsel, (919) 715-5579 kwest@nccommerce.com; with contributions from Stephanie G. McGarrah, Asst. Secretary for Policy, Research and Strategic Planning and Christopher Harder, Director of Economic Analysis (economic analysis sections); Allan Sandoval, GIS Specialist (maps); Asst. Secretary for Communications and External Affairs Katharine C. Neal (primary Commerce functions); Stewart Dickinson, Commerce Finance Director and Mark N. Poole, Finance Specialist (financial model).

North Carolina Dept. of Commerce | 301 North Wilmington Street | Raleigh, NC 27601-1058
Mailing Address | 4301 Mail Service Center | Raleigh, NC 27699-4301

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Attachment I

Motion for Reconsideration and Rescission of
Order, Project Nos. 2197, 2206, *In re*
Carolina Aluminum Co. (Aug. 23, 1957)

ATTACHMENT I

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

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In the Matters of :

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CAROLINA ALUMINUM COMPANY : Project No. 2197
and
CAROLINA POWER & LIGHT COMPANY : Project No. 2206

----- X

MOTION FOR RECONSIDERATION
AND RESCISSION OF ORDER

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<i>[Signature]</i>	
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CAROLINA ALUMINUM COMPANY (Aluminum) by its attorneys, moves that the Commission reconsider and rescind its order issued August 21, 1957 in the above-entitled proceedings, which order consolidates for the purpose of public hearing the matters involved in the application filed by Aluminum for a license for its Project No. 2197 and in the application filed by CAROLINA POWER & LIGHT COMPANY (Power & Light) for a license for its Project No. 2206.

In support of its motion Aluminum alleges:

1. The principal issue concerning the application filed by Aluminum is the term of any license which may be issued for its Project No. 2197. While the Commission's order recites that this same question is presented by Power & Light's application for license for its Project

ATTACHMENT I

-2-

No. 2206, Aluminum believes that the considerations compelling the issuance of a fifty-year license for Project No. 2197 are substantially different from those affecting the license term of Project No. 2206.

2. Project No. 2197, when completed, will consist of Aluminum's existing High Rock, Narrows and Falls Developments and the proposed Tuckertown Development, a new development which will accomplish full utilization of the hydroelectric potentials of the Yadkin-Peedee River in the reach controlled by Aluminum. Power & Light's Project No. 2206, on the other hand, does not contemplate any new development but simply seeks a license for two existing plants, one of which is to be improved by the installation of a new unit.

3. Aluminum's Project No. 2197 is designed to provide the hydroelectric power required for the operation of Aluminum's smelting works at Badin, North Carolina. The project is essentially an adjunct to an industrial enterprise and the fifty-year license term sought is necessary, as a matter of economics, for the continuance of the smelting operation at Badin, which is the principal industry serving that area of North Carolina. The possibility of discontinuance or diminution of Aluminum's smelting operation at Badin, by reason of issuance of a license for Project No. 2197 for a term too short to be economically

ATTACHMENT I

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feasible for Aluminum, would entail losses to the community in taxes and employment that would be disastrous in their effect. No such considerations, it is submitted, are involved in Power & Light's application for license for Project No. 2206.

4. The evidence supporting the two applications as to the license term is, therefore, clearly unrelated and, it is submitted, no useful purpose would be served in hearing the two applications together.

5. In addition, the Commission will consider evidence as to the effect of the two projects upon the interests of interstate or foreign commerce. In a prior proceeding designated "Docket No. DI-135", evidence was presented relating to the hydraulic effect of Aluminum's existing developments on the Yadkin-Peedee River and of the anticipated effect of the development then proposed to be constructed at Tuckertown. Although Aluminum and the Staff of the Commission disagree as to the interpretation of the hydraulic evidence presented at the prior proceeding, there is little, if any, factual dispute. It has been proposed by the Staff that the record in Docket No. DI-135 be incorporated in the hearing on the application for license for Project No. 2197, which procedure would, the Staff believes, substantially shorten the hearing and expedite an early determination.

ATTACHMENT I

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6. Since Power & Light was not a party to the proceeding in Docket No. DI-135, introduction of the record in that proceeding might well be objected to by Power & Light, insofar as it might serve as a basis for any determination the Commission might make with respect to licensing jurisdiction over Project No. 2206. Furthermore, since Power & Light's two developments are downstream from Aluminum's three existing developments and the proposed Tuckertown Development, questions will almost inevitably arise between the two applicants relating to the hydraulic effects of their separate developments which will inject new and complicated issues into the hearing if the consolidation is permitted to stand.

7. Aluminum filed its original application on May 29, 1956. As stated in the application, if a license acceptable to Aluminum is issued by the Commission, Aluminum plans to renovate and improve its smelting facilities at a cost of over \$20,000,000. It is of vital concern to Aluminum and its parent, Aluminum Company of America, that a decision with respect to Project No. 2197 be issued at an early date, since, if it should be determined that renovation and improvement of the smelting plant at Badin should be uneconomical by reason of too short a license term for Project No. 2197, other plans must be formulated,

ATTACHMENT I

-5-

and put into effect with dispatch, to provide for necessary expansion of smelting facilities for Aluminum Company of America.

8. For the reasons stated, Aluminum submits that consolidation of the two applications would promote difficulty and delay in that the economic issues involved in the two proceedings are wholly unrelated and the issues involving hydraulic factors would be augmented and confused by the consolidation. In the opinion of Aluminum, the consolidation would clearly not be in the public interest.

WHEREFORE, Aluminum respectfully moves that the Commission reconsider its order issued August 21, 1957 and upon reconsideration rescind said order and provide for a separate hearing on Aluminum's application for license for Project No. 2197 on October 15, 1957, all in accordance with the Commission's order of June 20, 1957.
Dated: August 23, 1957

Respectfully submitted,

LE BOEUF, LAMB & LEIBY
Attorneys for
Carolina Aluminum Company
15 Broad Street
New York 5, New York

ATTACHMENT I

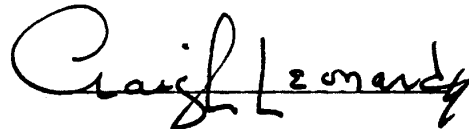
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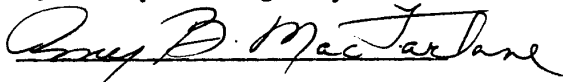
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CRAIGH LEONARD, being duly sworn, deposes
and says:

I am a partner in the law firm of LeBoeuf,
Lamb & Leiby, attorneys for Carolina Aluminum Company
in this proceeding. I have read the foregoing motion
and know the contents thereof. All of the statements
contained therein are true and correct to the best of
my knowledge and belief. I further certify that I have
served a copy of the foregoing motion upon Carolina
Power & Light Company, the applicant for Project No.
2206.



Sworn to before me this
23rd day of August, 1957.



AMY B. MAC FARLANE
Notary Public, State of New York
No. 31-7649500
Qualified in New York County
Commission expires March 30, 1958

Attachment II

Brief on Behalf of Intervenor State of
North Carolina, Project No. 2197,
Docket No. IT-5499, *In re Carolina Aluminum Co.*
Federal Power Commission (Nov. 14, 1957)

ATTACHMENT II

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

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In the Matter of : Project No. 2197
: and
CAROLINA ALUMINUM COMPANY : Docket No. IT-5499

BRIEF IN BEHALF OF INTERVENOR
STATE OF NORTH CAROLINA

GEORGE B. PATTON
Attorney General of North Carolina

RALPH MOODY
Assistant Attorney General

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UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

In the Matter of : Project No. 2197
: and
CAROLINA ALUMINUM COMPANY : Docket No. IT-5499

BRIEF IN BEHALF OF INTERVENOR

STATE OF NORTH CAROLINA

S T A T E M E N T

North Carolina will not attempt to restate the history of these applications since these particular steps are all a matter of record in the files of the Commission and no doubt will be reviewed in the briefs filed in behalf of the applicants. Carolina Aluminum Company will be referred to as: Carolina Aluminum; and Carolina Power & Light Company will be referred to as: Carolina Power. The State of North Carolina will hereafter be referred to as: North Carolina.

The Commission allowed North Carolina to intervene pursuant to its order issued on October 31, 1957, which confined the intervention of this State to "asserted rights and interests specifically set forth in the petition for leave to intervene." North Carolina, however, by virtue of the order of the Commission, is not recognized as a party that might be aggrieved because of any order or orders of the Commission in the proceeding. North Carolina supports the applications of Carolina Aluminum and Carolina Power, and it is the position of the State that these applicants should be granted a

-1-

ATTACHMENT II

50-year license for their projects dating from the date of issuance. It is the position of North Carolina that there is no conflict of interests between Carolina Aluminum and Carolina Power and no conflict of interests between public and private power, and the State is therefore not supporting one set of applicants as opposed to the interests of other citizens and applicants residing within the State.

A R G U M E N T

I.

The position of intervenor, Miss Eliza Doby.

North Carolina refers to the argument of the intervenor, Miss Eliza Doby (Transcript Volume 1, page 30 et seq). This intervenor is supported by her sister, Miss Julia Doby, whose statement appears in Volume 1, page 53 of the Transcript. These ladies are particularly interested in the matter because they own land located in the reservoir area of the Tuckertown project which will be covered with water if the project is developed. These are the same arguments that are always made by persons who will to some extent suffer some inconvenience because of the location of their property and when their interest is compelled to yield to the overall and larger interests of industry, commerce and the community at large. It goes without saying that these people will all be compensated for their property and holdings within this area and, in case of disputes that cannot be amicably settled, a jury of their neighbors will determine the value of their property.

ATTACHMENT II

It is submitted that the new-found love of these ladies for conservation of natural resources and for the retention of all things in their natural state springs from the fact that they own land within the contemplated reservoir of the Tuckertown project. It would appear that these ladies love a controversy, and, as authority for this statement, see *BROWN v. DOBY*, 244 N. C. 746.

II.

Economic and technical arguments in support of application.

North Carolina does not enter into the economic and technical arguments in support of the applicants' positions. The transcript of evidence produced in behalf of the applicants, as well as the exhibits, have been reviewed, and North Carolina is of the opinion that the opinions, both economic and technical, as therein stated, are sound and correct. From previous experience with these companies, North Carolina has confidence in the integrity and honesty of the management of these companies and believes that the statements and opinions of the technical staffs of the applicants can be relied upon, and North Carolina urges upon the Commission that their views be accepted. So far as this phase of the case is concerned, North Carolina adopts the evidence of the applicants, and exhibits filed in support of same.

III.

The interests of the State of North Carolina.

ATTACHMENT II

North Carolina supports the position of the applicants for the following reasons:

(1) The State for many years has fostered the development of its resources by the private enterprise method and believes that the results have been good. Carolina Power is one of the major public service companies of the State engaged in the generation, sale and distribution of electric energy, and serves almost one-half of the area of the State, as well as one-fourth of the area of South Carolina, and this service includes 400,000 customers of various categories, such as residential, commercial, textile and industrial. Carolina Aluminum is an affiliate of a large organization and has been in business in Stanly County for approximately 40 years. Companies such as these take root in a State and weave themselves into the economic life and well-being of the people and their industries. These larger units become almost institutions of the State and the economic status and well-being of many families depend upon their regularity of operation and a progressive modernization of plants and installations.

(2) The Yadkin River is one of 16 major rivers in the State. It rises on the eastern slopes of the Blue Ridge Mountains, crosses the piedmont plateau and traverses the coastal plain, reaching the ocean near Georgetown, South Carolina. As far as the mouth of Uwharrie River, it is known as the Yadkin, and below the mouth of the Uwharrie, it is

ATTACHMENT II

known as the Pee Dee. There are five dams within a reach of about 85 miles. The basin is composed of 157 townships, 39 of which are partially within the basin, and 63 towns and cities. The river flows through what might be called the principal industrial region of the State.

(3) The dams involved are the Blewett Falls Plant on the Pee Dee, and Norwood or Tillery Plant, Yadkin Falls Plant, the Narrows Plant, and High Rock Plant. The Blewett Falls installations and the Tillery installations are operated by Carolina Power - the other operations are operated by Carolina Aluminum. The State of North Carolina prefers that its portion of the river be developed by these companies.

(4) There are no conflicting applications on the part of other firms or corporations and, so far as North Carolina knows, all appropriate federal agencies have been notified, and it is not believed that there is any substantial opposition from these quarters, and the office of the Chief of Engineers of the Department of the Army says that the proposed developments would not affect the interest of navigation in the foreseeable future. The North Carolina Wildlife Commission has some contentions as to access areas, but, for the purpose of this hearing, it is not necessary for North Carolina to now take the position, since the Commission has the authority, upon appropriate notice, to reopen and to re-examine this question.

(5) So far as the Tuckertown development is concerned,

ATTACHMENT II

an anticipated expenditure of approximately \$37,000,000.00 is involved. North Carolina wishes this expenditure made within its borders and wishes its people to have the benefit of this employment, and the same position is taken with reference to the proposed expansion of Carolina Power.

(6) The economic effect of a license for 40 years on the constructed projects and 50 years on the Tuckertown development really reduces the license period to 37 years from the viewpoint of utilization of a synchronized and integrated project since it will require three years to construct Tuckertown and this period is valueless for integrated purposes. The object is to provide a source of power for the Badin Smelting Works. In order to become competitive in the aluminum industry the Badin Smelting Works requires extensive and costly modernization and the additional electric power that can be furnished from the Tuckertown development. Because of increased costs the amount of \$37,000,000.00 will be necessary for the modernization and construction of the Tuckertown development. This expenditure is justified only on the basis of a 50-year license period. The reduced license term for the three existing developments would prohibit coordinated operation for the balance of the license term of the Tuckertown development.

(7) The Commission is required to issue a license for a project that will be best adapted to a comprehensive plan for the improvement or development of a waterway. The project

ATTACHMENT II

on a 50-year license basis would permit the production of additional aluminum for defense and ordinary commercial purposes with attendant benefits in taxes and employment arising from additional industrial activity. The completion of the Yadkin project and modernization of the Badin Smelting Works are interdependent. The Company cannot go forward with modernization unless assured of additional power from Tuckertown.

(8) Carolina Aluminum is the largest employer of labor and the largest taxpayer in the Badin area, and its ability to continue in business is in the public interest. Carolina Aluminum employs at Badin about 1,000 persons and about 75% of these persons reside in surrounding portions of Badin Township and Stanly County. The remainder reside on farms in five adjacent counties within a radius of 30 miles. The annual payroll is approximately \$5,000,000.00 and is one-third of the total non-farm income in Stanly County. About 17% of the employees at Badin have had 25 years or more of continued service with the Company. The Company pays approximately 85% of the taxes levied in Badin Township and more than 10% of the taxes levied in Stanly County. At the present time the productive capacity is about 68,000,000 pounds per year, and it is estimated that the completion of this project will result in a production of 105,000,000 pounds, but this will still be one of the smallest smelting units in the aluminum industry in the nation. The Company would have to

ATTACHMENT II

seriously consider whether or not it would be best to invest this \$37,000,000.00 in the expansion of one of Alcoa's larger and newer plants. A license term of less than 50 years would have an adverse effect upon the financing of plant expansion.

(9) Carolina Power and Light has an annual payroll in excess of \$9,000,000.00, and it pays to the State of North Carolina approximately \$5,645,837.00 in taxes. All that we have said in behalf of Carolina Aluminum can just as well be stated in behalf of Carolina Power, except that it should be stated that Carolina Power is a public service company regulated by the North Carolina Utilities Commission, and its expansion and modernization is closely related to the public service status of the State.

(10) The State is interested in increased employment that will result from these expenditures, and it is also interested in its citizens who are employees who have accumulated retirement and pension rights because of many years of service, and it does not wish these rights to be curtailed in any manner.

In closing, North Carolina again emphasizes that on this river no question of discrimination as to the time of the length of license arises since these applicants are developing the river in a cooperative manner. North Carolina is also supported in its position as to Carolina Aluminum by its Senators, the Congressman from the District involved,

ATTACHMENT II

and other Congressmen, as well as Chambers of Commerce and local officials. North Carolina, therefore, requests the Commission to approve the applications of Carolina Aluminum and Carolina Power for the full 50-year term from the date of issuance and without retroactive effect on the plants and installations already in existence.

Respectfully submitted,

George B. Patton
GEORGE B. PATTON
Attorney General of North Carolina
Ralph Moody
RALPH MOODY
Assistant Attorney General

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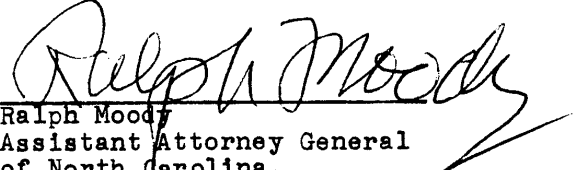
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FEDERAL POWER COMMISSION

In the Matter of	:	
CAROLINA ALUMINUM COMPANY	:	Project No. 2197
and	:	
CAROLINA POWER AND LIGHT COMPANY	:	Project No. 2206

PROOF OF SERVICE OF BRIEF

I, Ralph Moody, Assistant Attorney General of North Carolina, do hereby certify that I have this day served copy of brief by mail on Mr. Charles Rouse, Attorney for Carolina Power and Light Company, Raleigh, North Carolina; Mr. Randall J. LeBoeuf, Jr., of 15 Broad Street, New York 5, New York, Attorney for Carolina Aluminum Company; Miss Eliza Doby, Box 143, Albemarle, North Carolina, intervenor; Miss Julia Doby, Albemarle, North Carolina, intervenor.

Witness whereof I hereunto set my hand on this 13th day of November 1957.


Ralph Moody
Assistant Attorney General
of North Carolina.

Attachment III

North Carolina
Drought Management
Advisory Council
Activities Report - 2008
Oct. 1, 2008 (Revised Dec. 18, 2008)
North Carolina Division of Water Resources
Department of Environment and Natural Resources

ATTACHMENT III

North Carolina Drought Management Advisory Council Activities Report - 2008

Oct. 1, 2008 (Revised Dec. 18, 2008)
North Carolina Division of Water Resources
Department of Environment and Natural Resources

ATTACHMENT III

North Carolina Drought Management Advisory Council; Annual Report – 2008

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North Carolina Drought Management Advisory Council, Annual Report - 2008

Introduction

This is the fourth Annual Report of the North Carolina Drought Management Advisory Council on the implementation of North Carolina General Statute 143-355.1, which created the council in 2003. The General Assembly amended the statute in 2004 adding a new section requiring an annual report: “(g) (2003-387, s. 2; 2004-195, s. 2.5)” The Council shall report on the implementation of this section to the Secretary, the Governor, and the Environmental Review Commission no later than Oct. 1 each year was added. The report shall include a review of drought advisories issued by the council and any recommendations to improve coordination among local, state, and federal agencies, public water systems and water users to improve the management and mitigation of the harmful effects of drought.

Drought Management Advisory Council

The Drought Monitoring Council was an interagency coordination and information exchange body created in 1992. The council did a credible job of monitoring and coordinating drought responses in 2002 and increased public awareness of its functions and effectiveness. The General Assembly recognized the Drought Monitoring Council’s leadership and performance by giving it an official statutory base and by changing its name to Drought Management Advisory Council (DMAC), reflecting the broader role of the council, which goes beyond monitoring drought conditions.

North Carolina General Statute 143.355.1., ratified 17-July 2003, assigned the DMAC an important new role, the need for which became evident in 2002. A number of local governments indicated that it would be helpful to have official, objective drought status advisories, to give them a reliable basis for their management responses. The new statute assigned that role to the DMAC and specifies the drought advisories to be based on technical data and crafted to fit varying conditions in different parts of the state. This process avoids the problems that some states have experienced in declaring drought warnings statewide, when conditions did not warrant it in all parts of the state.

Section 1 of this act also makes drought response provisions mandatory in local government water supply plans and extends this planning responsibility to all community water systems that serve 1,000 or more connections or 3,000 or more individuals.

The intent of the statute was for the DMAC to continue with essentially the same membership and functions that the Drought Monitoring Council previously exercised, but with new statutory authority and a new responsibility for providing a system of drought advisories when needed. Most importantly, the operation of the DMAC continues the same role as the Drought Monitoring Council did in support of the North Carolina Emergency Operations Plan.

Drought Legislation, Section 16 of Session Law 2008-143

An act to improve drought preparedness and response in North Carolina as recommended by the Environmental Review Commission was signed into law by Gov. Mike Easley on July 31, 2008. Section 16 of SL 2008-143 called for minor changes in the law (2003) establishing the Drought Management Advisory Council. The law now requires that appointees to the council have expertise in water resource evaluation and management related to drought and drought

ATTACHMENT III

North Carolina Drought Management Advisory Council, Annual Report - 2008

impacts. It removes language that previously allowed DENR to expand the membership of the council. DENR can invite representatives of other organizations, including water systems regulated by the NC Utilities Commission, to “participate in the work of the Council.” The DMAC will provide consistent and accurate information on drought conditions in the state to the U.S. Drought Monitor, the Environmental Management Commission, the secretary of the Department of Environment and Natural Resources, the Environmental Review Commission, and the public.

In the matter of DMAC issuing drought classification and response actions by county, SL 2008-143 requires that if the U.S. Drought Monitor of North Carolina shows more than one drought designation in a county, the drought classification for the county is the highest drought designation that applies to at least twenty five percent (25%) of the land area of the county. Drought response actions are based on the drought classification for each county within a drought area that is listed each Thursday on the DMAC Web page (<www.ncdrought.org>).

The law states that the council may recommend to the secretary a drought designation for a county that is different from the designation based on the U.S. Drought Monitor of North Carolina if the depiction of drought does not accurately reflect localized conditions. In recommending a drought designation that differs from the U.S. Drought Monitor designation, the council will consider stream flows, ground water levels, the amount of water stored in reservoirs, weather forecasts, the time of year and other factors that are relevant to determining the location and severity of drought conditions.

Drought Assessment Oct. 2007 -- Oct. 2008

Since the last DMAC Annual Report (#3) in 2007, drought continued to persist and expand in North Carolina. The drought in 2007 was the worst for North Carolina since record keeping began in North Carolina in 1895. In 2007, drought conditions in the state went from normal to record drought in less than year

The year 2007 was recorded as the driest year by the National Weather Service in more than 100 years in North Carolina and was #1 in the 2007 statewide temperature ranks (Figure 1). Records were set in many areas for number of days of low humidity and number of days with temperatures above 90 F (Figure 2).

Forest landowners and many residents in wildfire-prone areas were impacted by the drought. The lack of rainfall left pine straw and other vegetation crispy and dry and fueled far more wildfires than we typically average. As a result, local firefighters and the Division of Forest Resources fought 30 percent more wildfires than North Carolina’s 5,000 wildfire-a-year average. The 7,200 wildfires in 2007 burned more acreage than had burned in any year during the last two decades.

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North Carolina Drought Management Advisory Council, Annual Report - 2008

Figure 1 - January-December 2007 Statewide Temp Ranks

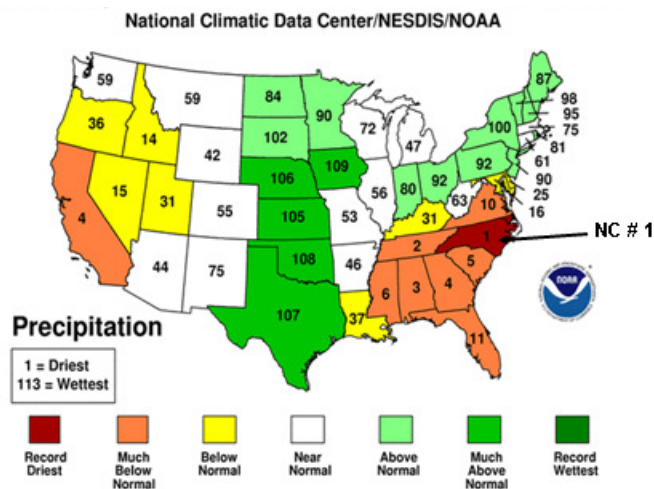
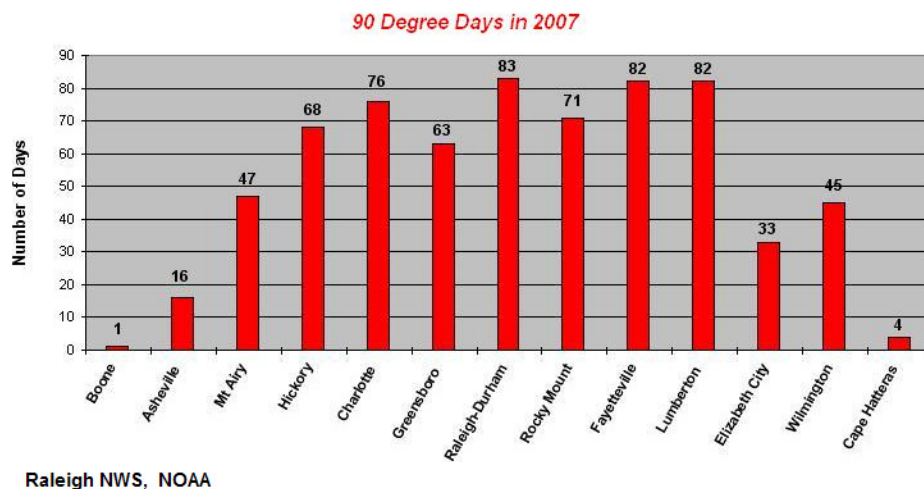


Figure 2 - Days at 90 Degrees or Greater in NC



The NC Dept of Agriculture and Consumers Services (NCDA) have worked to help producers with drought related issues during the fall of 2007 through the year of 2008. Many livestock farmers took advantage the NCDA Hay Relief effort that helped get much needed forage to livestock operations in the western part of the state. As 2008 came around, NCDA efforts

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focused on what farmers could do to minimize their water usage. NCDA staff worked in cooperation with the Rural Center and the Soil & Water Conservation Districts to help farmers clean out ponds, dig new wells, and conserve more water in livestock operations. Staff is also a part of the many legislative activities surrounding water usage and drought management. USDA in partnership with NCDA&CS is now conducting a water usage survey to calculate the water usage by agriculture in the state so that the legislature can make a wise decision on drought management legislation and how it could affect NCDA agricultural economy.

Soil moisture was not a grave problem during the planting season of 2008. However the lack of rains through out the spring and summer months stunted or prohibited crop growth in some areas. Some areas had record low yields while some other areas seemed to make it through the drought because of isolated showers which doused fields at the right times of the growing season.

At one point, as many as 30 cities and towns were forced to confront the realization that they may run out of water or have to ration water. Many of those were within 100 days of running out of water. At one point, as many as 30 cities and towns were forced to confront the realization that they may run out of water or have to ration water. Many of those were within 100 days of running out of water.

In Siler City, officials had to ship in water supplies by truck. Rocky Mount sought and received the state's permission to extend a pipeline to Wilson to keep from running out of water.

In many ways, it was fortunate that in North Carolina we had confronted a serious drought before – just five years earlier. In 2002, we experienced what we thought was the drought to end all droughts.

In October, 2007 Gov. Mike Easley activated the State Emergency React Team at a Level 3 (SERT) of the North Carolina Emergency Operations Plan (NCEOP). In addition the Agriculture Task Force, Economic Impact Task Force, Energy Loss Task Force, and Health Task Force were activated to join in with the Water Sources Task Force that was activated in August 2007. The task forces are part of the Drought Assessment and Response Plan, NCEOP.

The U.S. Drought Monitor of North Carolina on 25-Dec 2007 (<www.ncdrought.org>) the reference for drought classifications and response actions, showed all 100 counties in drought; 78 counties with exceptional drought (D4) conditions with the remaining 22 counties with extreme (D3) or severe (D2) drought. The drought monitor labels drought by intensity, with D1 being the least intense and D4 as being the most intense. D0 signifies no drought but is a watch area either drying out and possibly heading for drought, or recovering from drought but not yet back to normal, suffering long-term impacts such as low reservoir levels or minimum streamflow for the time of year.

The Technical Drought Advisory Team, a sub group of the council participates each Tuesday in a telecom to gather and feed information to the National Drought Monitor author about local drought conditions in North Carolina that are valid on 8 a.m. EST each Tuesday. The team includes DMAC technical experts and National Weather Service offices located in

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Tennessee, South Carolina, and Virginia. The Drought Monitor is published on Thursday morning of each week.

Council Meetings

The DMAC chairman called for meetings of the council on 20-Dec 2007, Mar. 6, 29-May, and 14-Aug 2008 in Raleigh. Average attendance was about 50 representatives including representatives from the Office of the Governor. The total number of people in attendance at the 20-Dec DMAC meeting was approximately 90 people, including Gov. Mike Easley and representatives from the media. Many of the meetings were available on web-casting.

Items on the meeting agenda included assessment and forecast reports about the seasonal drought outlook and the impact of drought on streamflow and ground water levels, lake and reservoir levels, agriculture, forestry and public water systems and special reports from the Office of the Governor.

Press Releases

Press releases were sent out after each DMAC meeting. More than 20 news releases were issued concerning drought conditions and current drought advisories.

On-Going Drought Assessment 2007-2008

1. The technical drought advisory team of the DMAC continued to hold a weekly telecom on each Tuesday to assess drought conditions. Information they pulled together was included in the weekly update reported to the author of the U.S. Drought Monitor that was released to the public each Thursday.
2. The Water Sources Task Force as part of the N.C. Emergency Response Plan was activated by the DMAC at the August 2007 council meeting. They joined the DMAC technical drought advisory team in the weekly telecom and worked with the Public Water Supply Section (PWSS) to identify and monitor the status of water systems considered to be the most vulnerable to drought.
3. The DMAC Web site, www.ncdrought.org provided real-time data and the reference for drought classifications and response actions each week for water users in the state.
4. The DMAC Web site allows users to search a statewide database of local water systems and weekly water use reports. This easy-to-use Web site provides information on total water use in local systems as well as the percentage change in water consumption. About half of the systems we track are reporting this information.
5. At the river basin level, weekly conference calls to coordinate releases from reservoirs, hydroelectric power generation, etc. to conserve as much water as possible and to balance upstream and downstream needs. The Corps of Engineers and the utility companies, owners of the biggest reservoirs, are all working together in this effort.
6. DENR personnel performed weekly, then bi-weekly, drought monitoring in the Neuse, Tar and Cape Fear river basins, beginning in early October 2007. Physical data and

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field observations of the river conditions were collected and analyzed and these results were shared with the Army Corps of Engineers to assist in decision-making regarding the water releases from Jordan Lake and Falls Lake. Drought monitoring was also conducted in the Tar River, beginning in June 2007.

7. DENR personnel performed reconnaissance visits to about 50 sites in the Cape Fear River Basin. Based on these visits, much of the Cape Fear Basin was rescheduled for water quality sampling in 2009.
8. A fish community drought recovery study was initiated in March 2008 for three sites that had either no water or no flow in December 2007. These sites will be sampled monthly until the fish community returns to pre-drought conditions.
9. Additional sampling was conducted in the Little River in Durham and in Mill Creek in Moore County in January 2008 to better document impacts at sites where flow had ceased.
10. DENR staff and personnel from the U.S. Geological Survey monitored hundreds of surface water gauges and 46 groundwater wells to continually measure and assess drought conditions throughout 2007 and 2008.

Drought Response Activities

1. The Water Sources Task Force identified and monitored weekly 102 public water supply systems that area considered to be the most vulnerable to drought. Reference to Tier definitions and a Web site showing status of Tier-level systems.

Tier Definitions

- **Tier-1:** systems are considered to be in a crisis mode (or) have less than 100 days of present supply remaining (or) are likely to be in a crisis if conditions persist because they lack interconnections for emergency water supply.
- **Tier-2:** systems are not in crisis now but could be within the next few months.
- **Tier-3:** systems are not yet in a vulnerable position but are subject to change as the drought continues.

This ranking is a subjective assessment based on best professional judgment and experience of PWSS field staff coupled usually with recent communication with the systems. Systems remain at their highest Tier-level until a resource is online (operating) that will provide an emergency water supply to minimize the system's vulnerability to drought

<http://www.ncwater.org/Drought_Monitoring/reporting/weekstatust123.php>

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2. League of Municipalities made arrangements for DENR and the League staff to have on-site Meetings with (33) Tier-1 and Tier-2 water system officials. .
3. The Water Sources Task Force and PWSS had meetings with all of the Tier-1 systems to help in identifying a near-term water supply solution and funding to obtain an emergency supply of potable water.
4. The North Carolina Emergency Operations Drought and Response Plan were activated at a Level 3 on 25-Oct, 2007, by Gov. Mike Easley. At a Level 3, the NCEO Drought and Response Plan would be carried out with the cooperation of the Division of Emergency Management, Department of Environment and Natural Resources and the DMAC.
5. The remaining task forces were activated in October 2007 and are designed to assess the range of needs that can result from drought. The task forces for Agriculture, Economic Impact, Energy Loss, and Health and the Water Sources Task Force met bi-weekly and made assessment reports of drought impacts and conditions.
6. In fall of 2007, Rocky Mount and Siler City reported to the DMAC that they were having a water supply emergency. Raw water from Jordan Lake, 200,000 + gallons per day, had to be shipped in by truck to the Siler City water treatment plant to maintain an adequate finished water supply to keep chicken processors in operation. The chicken processing operations are a major part of the Chatham County economy.

Rocky Mount sought and received the state's permission to extend a pipeline to Wilson to keep from running out of water. Emergency assistance was provided by DENR, the U.S. Army Corps of Engineers, the Water Sources Task Force, and the N.C. Rural Center with fast-track permitting approvals and crisis drought funding. Additional water was obtained through interconnections between Rocky Mount and Wilson, Goldsboro and Wayne County and Siler City's potable water interconnection with Sanford.
7. DENR continue to track and be in regular contact with water systems most vulnerable to drought and identify their needs and resources, particularly in regard to connection to alternative or backup water sources.
8. On 22-Oct 2007, Gov. Easley requested that all community water systems reduce water-use consumption and start weekly water use reporting to DENR.
<http://www.ncwater.org/Drought_Monitoring/reduction/weeklyreport.php>
9. Regional drought meetings were held in Raleigh, Greensboro and Asheville for local government officials and major water users. The meetings addressed current and future climate and water resource impacts, water conservation, water supply system efficiencies, rate structures and case studies from local water systems.
10. NC Utilities Commission issued an order in November 2007 requiring all of their water utilities to notify customers they must discontinue outdoor water use.

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11. The Division of Pollution Prevention and Environmental Assistance (DPPEA) worked with local water systems to train their business and industries on water conservation approaches and sources of further assistance/information.
12. DPPEA conducted water conservation audits at some major water users or critically impacted facilities.
13. At the request of and in cooperation with the Department of Commerce, developed a brochure and pay envelope stuffer that companies can provide their employees on water conservation at home.
14. DPPEA started contacting home improvement companies (i.e., Home Depot and Lowes) about highlighting and expanding the number of water conservation devices and fixtures in their stores and on their Web sites.
15. Gov. Mike Easley brought 30 of the state's worst hit water systems together on Jan. 14, 2008 in Greensboro to review the status of these systems. Those at the conference reviewed what their plans are if the drought deepens and made sure they have reserve sources of water available. In addition, those water systems that needed assistance for water audits, funding for drought, and related water needs from the state were able to make sure they got the help they needed to have effective emergency plans in place.
16. Tier 1 systems met with Infrastructure Funding Agencies in Valdese that was called by the N.C. Rural Center on Jan 29, 2008.
17. The Division of Water Resources (DWR) reported 30 priority systems were identified for water audits. Twenty water systems requested help conducting water audits of their systems. DWR has obtained services of five engineering firms to conduct the water audits and report their findings to the DWR. Studies began in April, 2008, and 13 have been completed.
18. The NC Utilities Commission order issued in November 2007 requiring all of their utilities to notify customers they must discontinue outdoor water use was modified on May 23, 2008. These restrictions were modified depending on the current drought classification and advisory for their county as shown on DMAC Web page (www.ncdrought.org).
19. DPPEA is working successfully to provide technical help to more than 70 North Carolina organizations including industries, businesses and government agencies to identify ways to reduce and conserve water.
20. The NC Division of Forest Resources initiated a statewide ban on open burning and cancelled all burning permits 14-Feb 2008. The burn ban was lifted on 1-Mar, due to the rains at that time across the state.

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21. State water resource experts have met several times since 25-Feb with water users of the Neuse River basin to discuss the future water usage plans in the basin, which includes a number of public water supply systems including Raleigh and New Bern.
22. On 11-Mar, Gov. Mike Easley announced a three-part legislative package to modernize North Carolina's public water systems, mandate water conservation and efficiency and upgrade the response to water emergencies. The governor also unveiled a new Web site, www.savewaternc.org, aimed at continued water conservation.
23. DWR sponsored a tabletop drought exercise in May to test the abilities of federal, state and local participants to respond to the crisis brought on by an increasingly severe drought. A "Drought Toolbox" was one product of the exercise and a follow-up workshop was conducted for systems in the Neuse River Basin.
24. On 3-Oct 2008, Gov. Mike Easley asked the U.S. Department of Agriculture to declare 59 of North Carolina's 100 counties disaster areas because of drought-related crop losses. Agriculture department loss assessment reports show excessive agricultural losses for at least one major crop, and significant losses on corn, soybeans, hay, and pasture and other forage crops.
25. Water systems continue to respond favorably to requests by Gov. Mike Easley to call for water conservation and water use restrictions and to work to reduce year-round water use. Millions of North Carolina residents, or most of those who receive water from systems the state tracks, are subject to voluntary or mandatory water use restrictions.
26. PWSS Regional offices and DWR staff continue to stay in touch with Tier 1 systems not taking action to help alleviate drought at this time to help in identifying a near-term water supply solution and funding to obtain an emergency supply of potable water.

Critical Local Government Drought Response Projects:

Introduction: The following table summarizes one of DENR's and Drought Management Advisory Council most critical, ongoing drought related activities. In response to the 2007 drought, DENR Staff identified those North Carolina communities that are most at-risk of "running out of water" and then identified the most practical short-term projects that could supply an expedient, supplemental water source to these "at-risk" communities. In order to facilitate the implementation of these supplemental water supply projects, DENR staff working with the League of Municipalities, coordinated and arranged meetings between these identified communities and agencies that could potentially fund their proposed water supply projects. DENR continues to monitor, provide technical assistance and assist with the ultimate completion of these much-needed projects.

Note: The following abbreviations are used in this table to designate the various funding sources:

NCRC – N.C. Rural Center

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PWSS – DENR Public Water Supply Section State Revolving Fund

ARC – Appalachian Regional Commission

USDA – U.S. Dept of Agriculture

<i>Project Description</i>	<i>Tier Rating</i>	<i>Potential Funding</i>	<i>Comments</i>
Bessemer City – Interconnection with Gastonia	1	\$100K funding in 2009 Governor’s Budget.	Bessemer City could not provide the additional funding needed to go along with the State funds.
Boone – ASU Interconnection	1	\$168K from NCRC.	Agreement for interconnection has been approved by both Boone and ASU.
Boone – New intake on South Fork of the New River.	1	Primary funding for this project is expected from USDA.	Intake site has not yet been secured. This should be resolved in May 2009.
Boone – Blowing Rock Interconnection	1	\$1.5M pending approval from NCRC. Application for \$2.2M to PWSS. \$300K from ARC.	Environmental impact analysis will be required.
Hendersonville – Water main with temp pump station on French Broad.	1	\$500K from NCRC. Application for \$2.5M expected to PWSS.	Funds requested from Army Corps not available until 2009. Intake area will need to be reclassified by NC DWQ.
Lenoir – New raw water intake and pump station,	1	\$500K from NCRC. \$5.8M application undergoing review at PWSS. \$300K from ARC.	NCRC approved. Plans for permanent intake are currently in the design phase.
Mars Hill – Weaverville Interconnection	1	\$500K from NCRC. Application for \$600K to NC Commerce. \$300K from ARC. USDA low interest loan for \$600K.	Mars Hill and Weaverville have both passed resolutions in support of this project.
Marshall – 2 new wells, storage tank, & line repair.	1	NC Commerce reviewing application for \$600K. \$300K from ARC. Low interest loan for \$750K to USDA	Funding approved; in design phase project completion 2009.
Robbinsville – 3 new wells & piping.	1	\$193K from NCRC. Possible funding in 2009 Governor’s Budget.	Funding received from NCRC, test wells installed early 2009.

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<i>Project Description</i>	<i>Tier Rating</i>	<i>Potential Funding</i>	<i>Comments</i>
Regional interconnect – Hendersonville, Saluda, Tryon, & Columbus	1	\$1.73M from NCRC. \$1.43M application expected to PWSS. \$300K from ARC.	Columbus, Saluda, and Tryon have all passed resolutions of support.
Valdese – Temp water lines to Lake Rhodhiss.	1	\$40K from NCRC. \$80K from ARC.	In place 2008
Rocky Mount – interconnect with Wilson	1	\$500K from NCRC	Operational early 2008
Siler City – interconnect with Sanford		\$500K from NCRC	Operational 2007
North Wilkesboro – dredging intake pool & Wilkesboro connect	1	\$259K from NCRC approved for dredging, application for Wilkesboro connect	Dredging to be completed in 2008.
Yadkinville – Possible interconnection with Davie County	1	\$100K funding in 2009 Governor’s Budget.	Yadkinville could not provide the additional funding needed to go along with the State funds.
King – Forsyth County interconnect.	2	\$100K funding in 2009 Governor’s Budget.	King to submit application to DENR

Water Reclamation and Reuse Activities:

- DENR personnel developed an expedited permitting process in order to respond to the high level of interest from municipalities and industries in using reclaimed water for non-potable water uses. Additional information on the use of reclaimed water can be found on the Division of Water Quality’s Web site at:

<<http://h2o.enr.state.nc.us/admin/pubinfo/ReclaimedWaterInfoOct07.htm>>

- DENR personnel are engaged in rule revisions that will provide even greater uses for reclaimed water in North Carolina in the future.
- In order to facilitate and encourage the collection and reuse of rain water, DENR personnel are developing a policy that will provide stormwater control and treatment credit for the harvesting and reuse of rain water. This policy is expected to become effective in 2009.

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- DENR staff created a fact sheet on the use of gray water in an effort to address residents' questions concerning the residential use of gray water.

Informational, Outreach, and Educational Activities:

- DENR funded a production company to develop two drought response public service announcements for broadcast television stations across the state. The total cost for these public service announcements was approximately \$100,000.
 - DENR Staff produced and delivered a wide range of educational and water conservation materials for educators, children, and adults. These materials were distributed to a broad audience all across the State.
 - DENR Personnel developed memorandums regarding the amount of allowable reduction of water usage in food service and lodging establishments. These memorandums have been distributed to county health departments.
 - DENR Staff have participated in a variety of drought-related symposiums, outreach events, conferences and forums that are too numerous to list here.
 - DENR Staff have provided numerous drought reports and updates to the news media, concerned citizens, the General Assembly, and the Environmental Management Commission.
 - DPPEA is working successfully to provide technical help to more than 70 North Carolina organizations including industries, businesses and government agencies to identify ways to reduce and conserve water.
1. On 11-Mar, Gov. Mike Easley announced a three-part legislative package to modernize North Carolina's public water systems, mandate water conservation and efficiency and upgrade the response to water emergencies. The governor also unveiled a new Water Conservation Web site <http://www.savewaternc.org/> providing information for citizens, water systems, state agencies, businesses, and industries. The Web site is a joint effort between the state departments of Environment and Natural Resources and Crime Control and Public Safety and the Governor's Office.
 2. DWR sponsored a tabletop drought exercise in May to test the abilities of federal, state and local participants to respond to the crisis brought on by an increasingly severe drought. A "Drought Toolbox" was one product of the exercise and a follow-up workshop was conducted for systems in the Neuse River Basin.
 3. On 3-Oct 2008, Gov. Mike Easley asked the U.S. Department of Agriculture to declare 59 of North Carolina's 100 counties disaster areas because of drought-related crop losses. Agriculture department loss assessment reports show excessive agricultural losses for at least one major crop, and significant losses on corn, soybeans, hay, and pasture and other forage crops.

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4. Water systems continue to respond favorably to requests by Gov. Mike Easley to call for water conservation and water use restrictions and to work to reduce year-round water use. Millions of North Carolina residents, or most of those who receive water from systems the state tracks, are subject to voluntary or mandatory water use restrictions.
5. PWSS Regional offices and DWR staff continue to stay in touch with Tier-1 systems not taking action to help alleviate drought and encouraging in identifying a near-term water supply solution and funding obtaining an emergency supply of potable water.

River Basin Management

The DMAC and the Water Sources Task Force is participating in weekly conference calls with managers of major reservoirs, including the Corps of Engineers private power companies, and the Tennessee Valley Authority, to review specific drought conditions in each basin and discuss changes needed in reservoir management to conserve stored water. These conference calls have resulted in significant adjustments in reservoir release policies, with a resulting increase in the conservation of stored water and a reduction in our risk of depleting reservoirs. These changes are made with the participation of the Division of Water Quality, the U.S. Army Corps of Engineers, and the Wildlife Resources Commission. River basins with on-going telecoms include the Neuse, Catawba, Roanoke, Yadkin, Cape Fear and Tennessee Valley.

In September 2008 the Division of Water Resources sent a message to public water system managers statewide, reminding them of the necessity to monitor water supply and demand, and the requirement to mandate water use restrictions as indicated by their local water supply plans. Also, letters were sent to golf courses concerning water use registration requirements. These messages followed a press release by Gov. Easley asking for local water conservation actions to avoid a state government mandate for mandatory water use restrictions.

The USGS reported record low water levels in May for North Carolina rivers in Western North Carolina and in August 2007 reported the lowest streamflows in more than 110 years for some North Carolina rivers as drought conditions worsened.

DMAC Web Site

The DMAC Web site <www.ncdrought.org> presents a picture of the U.S. Drought Monitor (USDM) for North Carolina that is updated and released on Thursday of each week. The drought conditions reported are valid for 8 a.m. EST for the prior Tuesday of the week.

Drought advisories are based on the weekly USDM for all water users located in or dependent on water resources in the counties of the state experiencing drought conditions. The U.S. Drought Monitor establishes a baseline for hydrological and agricultural drought conditions. North Carolina is fortunate because it has the DMAC to work closely with the U.S. Drought Monitor to adjust designations weekly to better reflect North Carolina's local conditions. The USDM is defined as the official drought map nationally and for North Carolina.

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The DMAC Web site also has a number of tabs that link to available resources of information, some with real-time data about current conditions, news, the DMAC, drought contacts, information and drought education, drought monitor archives, and water conservation tips.

Drought Classification and Status of Water Conservation

The DMAC issues official drought advisories based on drought classification to provide all water users with a reliable basis for managing and calling for drought response actions in their region. The list of counties under drought advisories is updated each week (www.ncdrought.org) to reflect local drought classifications on the weekly U.S. Drought Monitor for North Carolina.

The USDM-NC 24-Apr 2007 released showed severe drought conditions returning to the southern mountains with exceptional drought returning to North Carolina during the first week of October 2007.

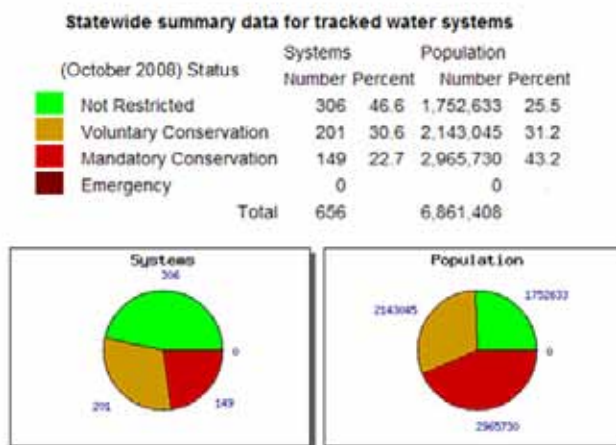
From August 2007, to February 2008, the entire state experienced some level of drought classification. Figure 3 summarizes the percent of the state each week under drought advisories as issued by the DMAC.

A history of the drought monitor classifications for each week is available. Records start in 2000 and include classifications by percent of state and also by county. This drought monitor history can be found at: < <http://www.ncdrought.org/archive/index.php>>

DWR and PWSS maintain a Web site *Water Conservation Level Status* for more than 600 (Figure 3) tracked public water systems statewide. This online, real-time database provides a consistent way to document and track impacts of drought related causes on public water supply systems. To see if your community has enacted water conservation measures, go to:

<http://www.ncwater.org/Drought_Monitoring/reporting/displaystate.php>

Figure 3 – Water Conservation Level Status

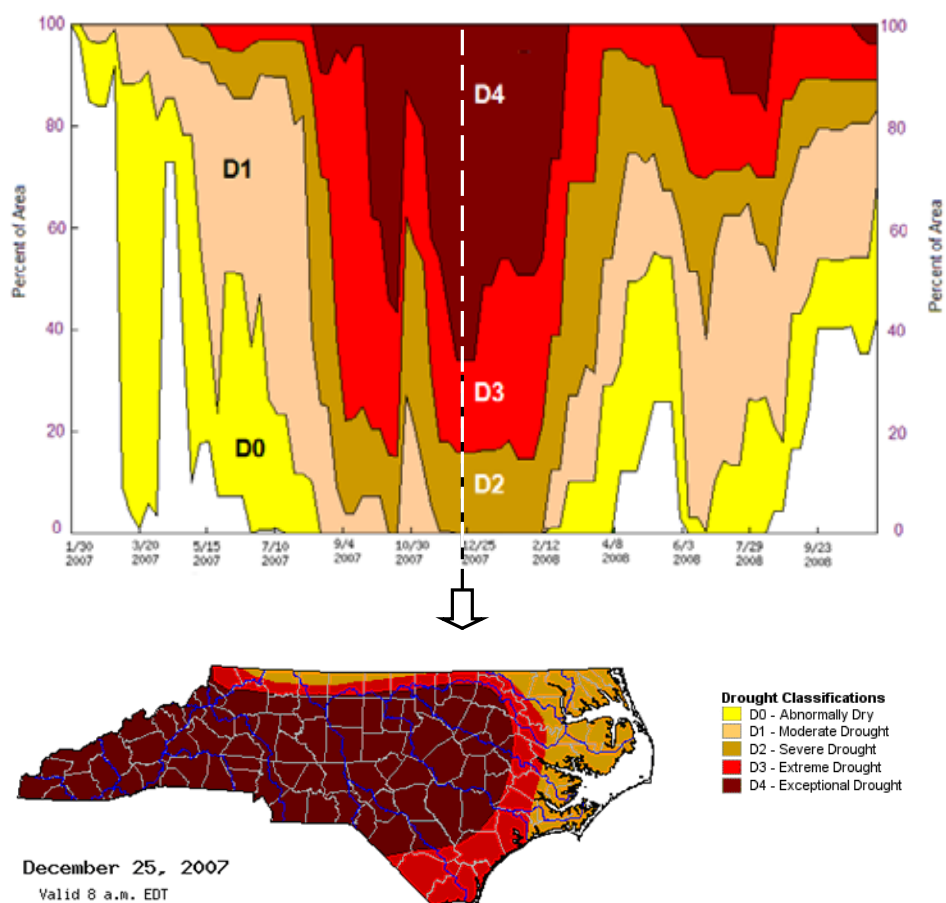


October 2008

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Figure 4 - Weekly Drought Classifications Jan 2007-Nov 2008



The DMAC issues official drought advisories based on drought classification to provide all water users with a reliable basis for managing and calling for drought response actions in their region. The list of counties under drought advisories is updated each week (www.ncdrought.org) to reflect local drought classifications on the weekly U.S. Drought Monitor for North Carolina.

Figure 4, shows severe drought conditions returning to North Carolina with exceptional drought returning in August 2007.

From August 2007, to February 2008, the entire state experienced some level of drought classification and a time when most of the state experienced the worst drought of record in North Carolina. Figure 4 summarizes the percent of the state each week under drought

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advisories as issued by the DMAC for this period. Also Figure 4 includes the depiction of drought classifications in the state for 25-Dec., 2007, when 78 counties were under an exceptional drought (D-4) advisory with 9 counties with extreme drought (D-3) and 13 counties in the coastal plain under a severe drought (D-2) advisory.

Improving Coordination and Drought Depiction

Drought Indicator Wells -- Drought indicator wells are a network of wells that monitor the effects of droughts and other climate variability on groundwater levels in the surficial aquifers (water table). The Division of Water Resources' goal is to increase the number and geographic distribution of drought indicator wells. DWR has 46 actively monitored wells in the network and a short-term goal of adding two wells to that network this fiscal year. The long-term goal is to have at least 60 drought indicator wells. This will allow a much more complete assessment of impending or actual drought conditions in each of the major river basins of the state.

http://www.ncwater.org/Data_and_Modeling/Ground_Water_Databases/Drought_Indicator_Wells/

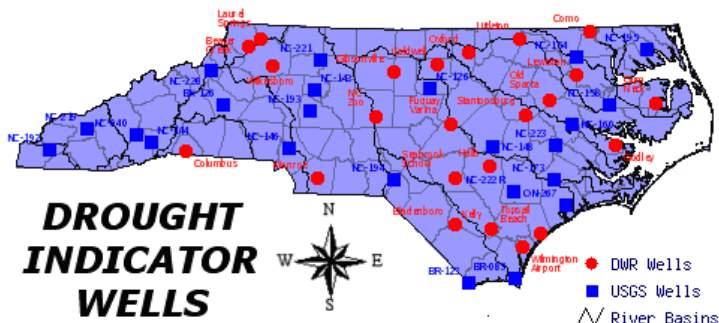


Figure 5

River Basin Drought Management Plans -- As part of the relicensing of hydropower projects in the Catawba-Wataree and Yadkin-Pee Dee river basins, procedures have been established and tested for adjusting operations during periods of low-inflow to conserve the limited water supply during the 2007 drought. The Low-Inflow Protocol (LIP) provides trigger points and procedures for how the projects will be operated as well as water withdrawal reduction measures and goals for other water users during periods of low-inflow. Planning is underway with stakeholders in the Neuse River Basin to work with the Division of Water Resources and others to fund and develop a drought management model for the basin. The Division of Water Resources is working with the U.S. Army Corps of Engineers and stakeholders on updating drought management plans on Falls and Jordan reservoirs.

Water Resources Information -- The Division of Water Resources continues to work with the N.C. State Climate Office, the U.S. Army Corps of Engineers, the N.C. Ground Water Management Section, and the U.S. Geological Survey and have developed a water resources information, storage, analysis, and retrieval system (WRISARS). This program will provide an archive of historical and on-the-spot data about hydrology (including stream flow,

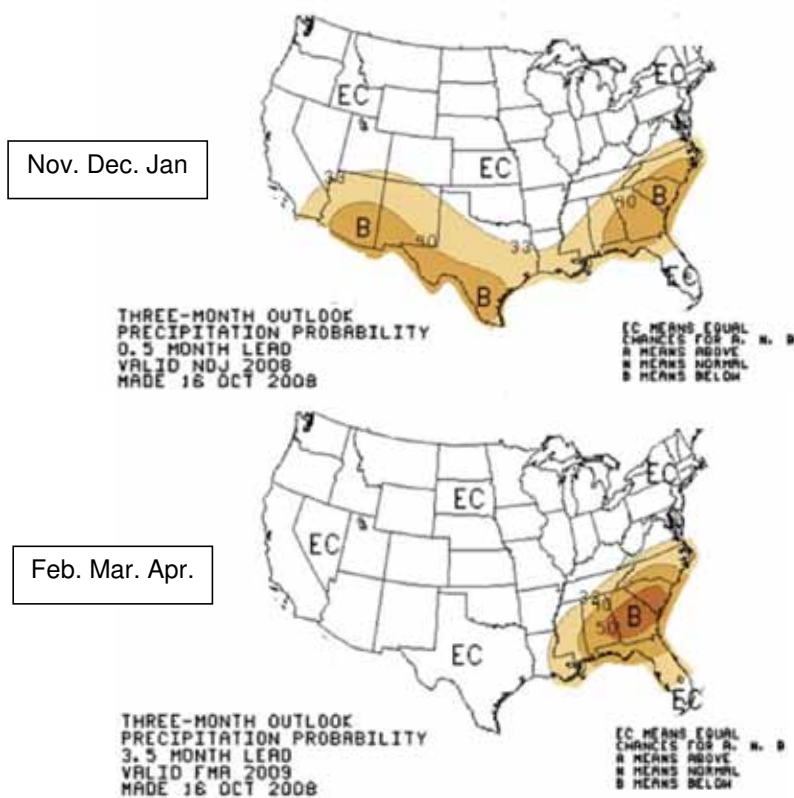
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groundwater and reservoir data), weather and climate, and water use in North Carolina. Products are now available for public use at <http://www.ncwater.org/wrisars/index.php>.

Figure 6 - Outlooks Nov. 2008 through April, 2009

Climatic Prediction Center, NOAA



Attachment IV

Curriculum Vitae
for
David H. Moreau, Ph. D.

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DAVID HUMPHREYS MOREAU

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EDUCATION:

Ph.D., Water Resources and Environmental Engineering, Harvard University, 1967
M.Sc., Environmental Engineering, Harvard University, 1964
M.Sc., Civil Engineering (Environmental), North Carolina State University, 1963
B.Sc., Civil Engineering, Mississippi State University, 1960

EMPLOYMENT HISTORY:

- Chair, Curriculum for the Environment and Ecology, The University of North Carolina at Chapel Hill, 2009-2012
- Director, Water Resources Research Institute of The University of North Carolina, 1983-1995; July 2005-2008; ex-officio Executive Director of the North Carolina Urban Water Consortium, a consortium of eleven cities in North Carolina to conduct research on water supply and wastewater treatment and management processes
- Chairman, Department of City and Regional Planning, University of North Carolina, Chapel Hill, 1997-2002
- Senior Associate Dean for Planning and Programs, College of Arts and Sciences, University of North Carolina, Chapel Hill, 1978-1983
- Professor, Departments of City and Regional Planning and of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, 1976-present
- Associate Professor, Department of City and Regional Planning, University of North Carolina, Chapel Hill, 1971-1976.
- Assistant Professor, Departments of City and Regional Planning and of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, 1968-1971.
- Assistant Professor, Department of Environmental and Systems Engineering, University of Florida, Gainesville, 1966-1968.
- Engineer, Jordan, Kaiser, and Sessions Consulting Engineers, Natchez, Mississippi, periodic employment, 1958-1963.

SELECTED ACTIVITIES:

Statewide Public Service:

Chairman, North Carolina Environmental Management Commission (EMC),
1993-2008. The EMC is North Carolina's administrative commission for water quality, air quality, and water allocation.

Chairman, North Carolina Sedimentation Control Commission, 1991-1993

Service to NRC:

Member, Board of Water Science and Technology, National Research Council, 2007-2010

Chairman, Committee to advise the EPA on implementation of the Total Maximum Daily Load approach across the Mississippi River basin. appointed by the National Research Council, 2008

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Member, Committee on Independent Scientific Evaluation of Progress on Restoration of the Everglades, appointed by the National Research Council, 2007-2011

Member, Committee on Regional Hurricane Protection System for New Orleans, appointed by the National Academy of Science to provide peer review of investigations by the Interagency Performance Evaluation Team of the failure of levees during Hurricane Katrina, 2005-2009

Member, Committee to Review Hydrologic and Economic Analysis by the International Joint Commission on the Great Lakes, Water Science and Technology Board, National Research Council, 2005

Member, Committee on Water Quality Management in the Pittsburgh Region, Water Science and Technology Board, National Research Council, 2002-2004

Member, Committee to Review the Upper Mississippi River-Illinois Waterway Navigation System Feasibility Study, Water Science and Technology Board, National Research Council, 2000-2001

Chairman, Committee to Assess the U.S. Army Corps of Engineers Project Planning Procedures, Water Science and Technology Board, National Research Council, 1996-1999

Significant Consulting Assignments in past five years:

- RTI International, Demand Side Management of Public Water Supply, 2008-2009
- Blue Ribbon Advisory Panel on Reliability of the New York City Water Supply, 2004-2010, Joint Venture between Hazen and Sawyer and CDM

Attachment V

*Water for Electricity
and Public Water Supply
in the Yadkin River Basin,*
David H. Moreau, Ph.D.
(Aug. 26, 2009)

ATTACHMENT V

Water for Electricity and Public Water Supply in the Yadkin River Basin

A statement by David H. Moreau, PhD
August 26, 2009

The purpose of this statement is to demonstrate that some or all waters of the Yadkin River Basin that are now used for hydroelectric power generation may be far more valuable to the State of North Carolina over the next 40 to 50 years if the State is to satisfy the rapid growth of urban water demand that the region has experienced over the past several decades. Very few opportunities remain in North Carolina to develop new reservoirs to meet that demand. The ability to respond to changing values of the resource, including reallocation of storage in reservoirs now used for hydroelectric power, is critical to the State. It is in the public interest that residents of the region be assured that waters of the Yadkin River can be shifted to higher valued uses as demands arise. Making reallocation decisions from hydroelectric to urban use in a timely, reasonable way would be far more likely if the reservoirs of the Yadkin River were owned by the State of North Carolina. Reallocation of storage would be far more difficult if the reservoirs are locked up in a license held by a privately owned company whose primary purpose is to generate and sell electricity.

Growth in Demand

The Yadkin River Basin is strategically located in the heart of a rapidly growing urban megalopolis that stretches from Raleigh, North Carolina to Atlanta, Georgia, even to Birmingham, Alabama. This is one of the fastest growing regions in the United States. Growth in the Metropolitan Statistical Areas of Charlotte-Gastonia-Concord, Atlanta, and Raleigh exceeded 14.4 percent from 2000 to 2007, more than twice the national average. The Charlotte MSA increased by 24 percent from 2000 to 2007, growing to a population of 1.65 million. With an estimated per capita use of 150-160 gallons per day per person (NC State Water Plan for 2001), the metro area water demand is 250-265 million gallons per day.

Growth has not been limited to just a few locations. Statewide growth in the region, as shown in Table 1, demonstrates that the population in North Carolina has increased by 54 percent just in the last 27 years.

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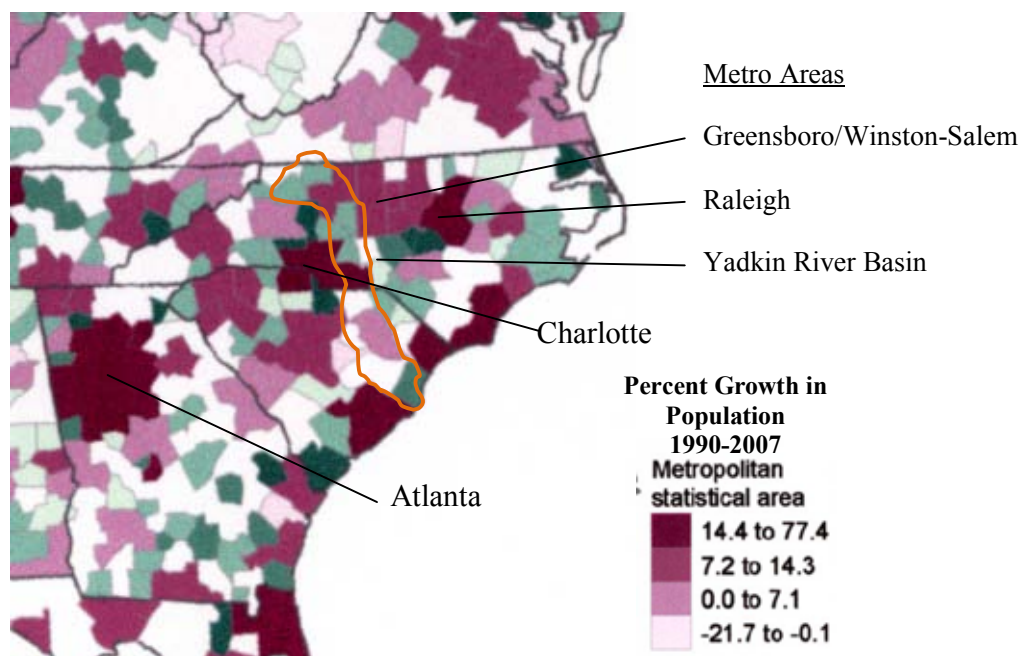


Figure 1. Growth in Metropolitan Statistical Areas in the Southeast 1990-2007

Table 1. Population of Georgia, South Carolina and North Carolina 1980-2007 (population in millions)

	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2007</u>	<u>Percent Increase 1980-2007</u>
GA	5.463	6.478	8.186	9.545	74.72
NC	5.882	6.629	8.049	9.061	54.05
SC	3.122	3.487	4.012	4.408	41.20

That growth has made the region quite vulnerable to droughts, adding substantially to demand while supply is relatively fixed. The extent of the most recent severe drought is shown in Figure 2. It brought all of the cities in the Piedmont into a near crisis mode for managing water supply.

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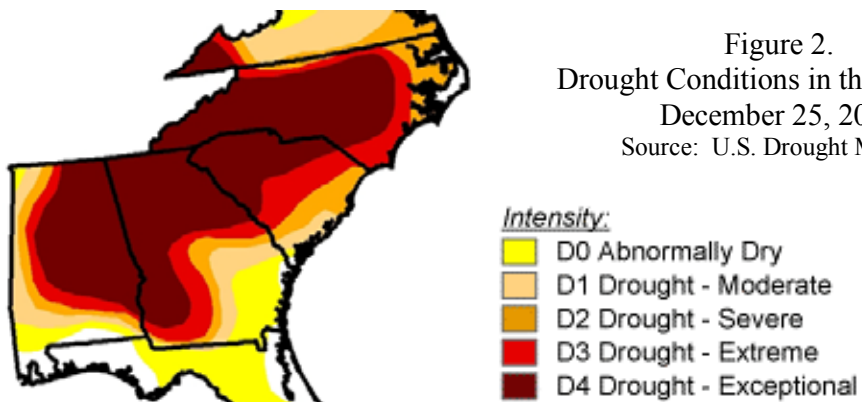


Figure 2.
Drought Conditions in the Southeast
December 25, 2007
Source: U.S. Drought Monitor

Because of the lack of abundant groundwater in the area, the region is heavily dependent on surface supplies.

Options for expanding public water supplies are quite limited. As noted in a report from the Water Resources Research Institute of the University of North Carolina (Moreau, 1992), the rate of expansion of storage in reservoirs in North Carolina has slowed dramatically. Only modest additions to storage have occurred since the early 1980's when Falls and Jordan Lakes were completed. Most of the best reservoir sites in North Carolina have already been developed. That trend is not unique to North Carolina as shown by an analysis of the national dataset on dams (Graf, 1999).

Electric Power Generation

For sure, population growth in the region carries with it growth in demand for electricity as well as growth in demand for public water supply. But hydroelectricity is becoming an increasingly small part of the mix of "fuel" for electricity. When the Narrows, Falls and High Rock reservoirs were built in the period 1917-1926, hydro was a relatively low cost source of electricity and there was very little demand for the water for other uses. Hydro was a far more significant part of the generating mix than it is today.

The decline of hydro as a percent of total electricity generation at the national level over the past 60 years is shown in Figure 3. In 1949 hydro generation accounted for over 30 percent of the total electricity generation. Today it accounts for about six percent. In North Carolina, the decline has been even more pronounced as shown in Figure 4. In just 17 years hydro dropped from over nine percent down to just over two percent of total electricity generation. Alcoa reported in its filings with FERC that the annual average output of the Yadkin Division was

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844,300 MWhr per year over the period 1986-2005. That is about eight tenths of one percent of annual average electric utility output of 105.3 million MWhr for the entire state over the period 1990-2007¹. That is only seven tenths of one percent of the total 1.23 million electric utility output in North Carolina in 2007.

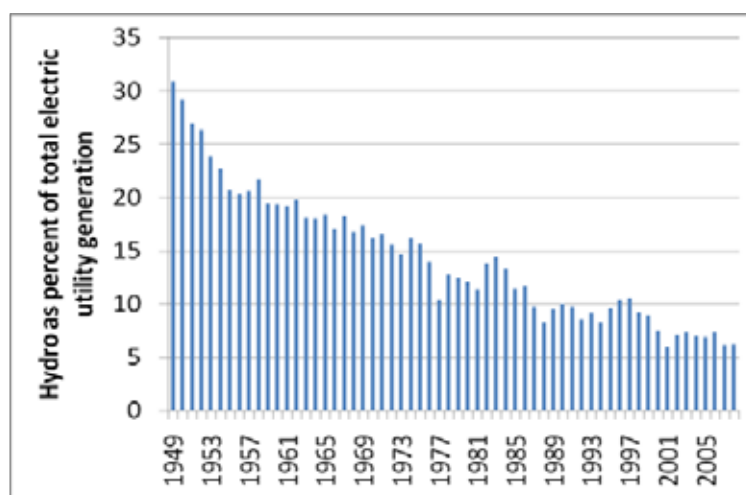


Figure 3. Hydroelectric as a percentage of total electric utility generation in the United States.

Source: Electricity Net Generation: Electric Power Sector 1949-2008

www.eia.doe.gov/emeu/aer/elect.html

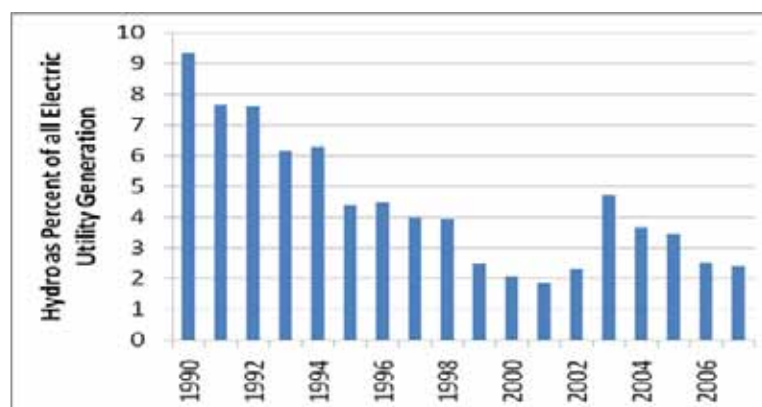


Figure 4. Hydroelectric as a percentage of total electric utility generation in North Carolina

Source: U.S. Department of Energy. Table 5. Electric Power Industry Generation by Primary Energy

Source, 1990 Through 2007 www.eia.doe.gov/cneaf/electricity/st_profiles/sept05nc.xls

¹ Energy Information Administration, eia.doe.gov/cneaf/electricity/st_profiles/sept05nc.xls

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Value of Water for Alternative Uses

The value of water for electric power in the Yadkin River is quite modest. According to the APGI License Application for the Yadkin Project submitted to FERC on April 26, 2006 (Exhibit B), the turbines on the Yadkin operate with hydraulic flows in the range of approximately 7,000 to 10,000 cubic feet per second. That flow through High Rock, Tuckertown, Narrows, and Falls Reservoirs drops through an effective head of about 340 feet to generate 216 MW of electric power. For purposes of calculating an approximate value of that water, take a flow of 8,000 cubic feet per second through the turbines. If the turbines operated at 100 percent efficiency, 8000 cubic feet per second dropping through 340 feet would generate 170 million foot-pounds per second or 238 MW of power. At turbine efficiency at 90 percent, the output would be 214 MWhr. A MWhr of electricity from the Yadkin system has a market value of somewhere between \$50 to \$75. The volume of water used to produce that output would be equivalent to 661 acre-feet or 215 million gallons. That would put the value of the water in the range of \$0.08 to 0.11 per acre-foot or \$0.23 to 0.35 per million gallons.

To put that in some perspective, a typical residential customer of the Charlotte-Mecklenburg Utility Department who uses about 6,000 gallons per month is currently paying \$2.10 per thousand gallons or \$2,100 per million gallons. That same usage in Greensboro would cost a customer \$2.72 per thousand gallons or \$2,720 per million gallons. That price covers the cost of transmission, treatment, and distribution of finished water to customers, but clearly at that price, customers would be willing to pay far more than \$ 0.35 for a million gallons of raw water.

A working paper published by the National Bureau of Economic Research (Brewer, et al, 2007) reviewed experience in western states where water is marketed. The authors reviewed 1,013 transactions in the period 1987-2005 involving the sale of water rights from agricultural uses to urban uses. The median price paid by urban water suppliers was in \$2,643 per acre-foot in constant 1995 dollars; the average price was \$4,366. It is clear that the value of water for public water supplies is orders of magnitude higher than for its use to generate electricity.

Yield for Urban Purposes

There is an abundance of water available for urban purposes in the Yadkin River. As an example, take the 109,500 acre-feet of storage between full pool and normal drawdown of 10

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feet in High Rock Lake. Unregulated inflows to that reservoir can be estimated from U.S. Geological Survey records for a 45 year period 1964-2008. Effects of upstream regulation in Kerr Scott Reservoir can be eliminated by taking the difference between flows at Elkin and Yadkin College. A weighted average of runoff per square mile for that difference and flows in the South Yadkin River at Mocksville provide a reasonable representation of unit runoff values into High Rock. With those inflows, the 109,500 acre-feet of storage would yield in excess of 800 million gallons per day for urban purposes if it were dedicated exclusively to that purpose. While demands of that magnitude are not likely to be realized over the next 50 years, this estimate does underscore the fact that there is a generous supply available for public water supplies if even a portion of the storage in High Rock is reallocated for that purpose. Furthermore, it should be noted that reallocation of a portion of the High Rock for urban uses would not preclude its use for recreation, electric power generation, aesthetics and other benefits to the region.

Concluding Remarks

It is clear from the data and analysis discussed in this statement that North Carolina in general and metropolitan areas in the vicinity of the Yadkin River Basin have experienced extraordinary growth over the past 27 years. The Charlotte-Gastonia-Concord metro area has grown by 24 percent in the last several years. It would not be a stretch to foresee a doubling of the population over the next 50 years. That growth brings a comparable increase in demand for publicly supplied water in areas that have already experienced severe water shortages during droughts.

While a relatively modest amount of electricity is generated by the four facilities in the Yadkin Division of APGI, the value to APGI is substantial as they have generated over \$40 million in revenues in recent years. During those years, they have contributed less than one percent of electricity generated by utilities in North Carolina. Furthermore, the value of water used for generating electricity is several orders of magnitude smaller than its value for public water supply.

The 109,500 acre-feet of storage in High Rock Lake now used for generating electricity would yield something in excess of 800 million gallons per day for urban uses. That is several

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times the current usage in the Charlotte MSA. It is unlikely that all or even a substantial portion of that supply would be needed over the life of the new license, but it is clear that reallocation of storage from electricity to public water supply would be facilitated if the ownership of the license were in public hands rather than being controlled by a private entity.

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Attachment VI

Review of PCB Data
From Badin Lake
John H. Rodgers, Jr., Ph.D.
(July 27, 2009)

ATTACHMENT VI

John H. Rodgers, Jr., Ph.D.
102 Santee Trail
Clemson, SC 29631

July 27, 2009

Review of PCB Data From Badin Lake

This report summarizes our analysis and evaluation of the recent Polychlorinated Biphenyl (PCB) data from Badin Lake in Stanly County, NC. As you know, fish from Badin Lake were sampled in 2008 and fish tissue was analyzed for PCBs using a modern congener-specific analysis (for all 209 congeners). Based on the results from these analyses, the NC Department of Health and Human Services issued a fish consumption advisory for Badin Lake (February 11, 2009). Subsequently, we participated in a sampling event in Badin Lake (April 2, 2009) concurrent with the NC Division of Water Quality (DWQ) and collected sediment samples for analysis of PCB congeners as well as several other analytes. We were also provided information from the NC Division of Waste Management (McDaniel 2009) regarding the PCBs that were used at the Alcoa Badin Works Plant in Stanly County. Based upon the specific Aroclors or commercial blends of PCB congeners used at the Alcoa facility, we could analyze the congener-specific data for relationships between the PCBs in the fish tissue, sediments and those associated with the Alcoa facility.

PCBs are a family of industrial chlorinated chemical compounds that include 209 possible forms, or "congeners". Commercial PCBs are usually a mixture of 50 or more congeners. The laboratory methods for analyzing specific congeners require very sensitive techniques, and therefore laboratories often "qualify" data as estimated concentrations for various reasons. These reasons can include values that are higher or lower than the calibration range of the analytical instrument, concentrations that are below method reporting limits but above detection limits, quantitative interference, and detection of the compound in laboratory method blanks. Although data may be qualified for these various reasons, they represent detected chemicals at estimated concentrations and can be useful for interpreting general trends or patterns in environmental samples, such as fish tissue and sediments. Data that require no laboratory qualification (or are "unqualified") are those that can be clearly quantified by the laboratory (not estimated) and meet all quality assurance/quality control standards set by the laboratory without reservation. In this analysis of the Badin Lake fish tissue and sediment data, we initially considered unqualified PCB congener data separately, and then included the qualified data in our assessment to be thorough in our analysis since the data were limited (7 sediment samples and 30 fish samples).

Initially, we (Dr. Matt Huddleston and I) compared the PCB congeners and concentrations in the fish tissue with those in sediment samples from the southwest arm (near the Alcoa facility), the northwest arm, and the northeast arm of Badin Lake. Based upon our analysis, we reached the following conclusions.

When considering the unqualified congener data only (these are data that met all laboratory QA/QC standards without reservation):

1. **There is a relationship between PCB congeners in sediments from the southwest arm of the lake and PCBs in fish from Badin Lake.** All PCB congeners detected in the

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sediments from the southwest arm of Badin Lake, with the exception of congener no. 2, were also detected in fish tissues regardless of the collection location for the fish. Even the fish collected outside of the southwest arm of Badin Lake contained PCB congeners found in the sediments from the southwest arm.

When considering all of the congener data (actual and estimated concentrations):

2. **Congeners detected in the fish tissue provided further evidence of sediments as a source of PCBs.** The PCB congeners measured in the sediments of Badin Lake are essentially the same congeners measured in the fish tissue collected throughout the lake. Many congeners not detected in sediments were also not detected in fish tissues. This is additional information implicating sediments as a source of PCBs in fish tissues.
3. **PCB congeners detected in sediments from the southwest arm of the lake (near the Alcoa facility) have concentrations significantly greater (on the order of 10 to 100 times greater) than sediments from other parts of the lake.** These congeners were also present in fish sampled from the southwest arm. This is the pattern that would be expected if the sediments were a primary source of PCBs in fish tissues. Since sediments and fish do not accumulate or metabolize PCBs or congeners in the same manner, we would expect to find some differences. In other words, PCBs in sediments and fish change and breakdown differently over time, even within different sediment types (mud, sand, etc.) and different fish species. **Despite the expected differences, the pattern of detected PCB congeners common to sediments and fish in Badin Lake is apparent.**
4. **PCB congeners in sediments from the southwest arm of Badin Lake co-occur more frequently with congeners detected in fish sampled throughout the lake than do congeners in sediments from other parts of the lake.** As part of the data analysis, we ranked PCB congener concentrations from high to low for each fish tissue and sediment sample to determine if the congeners measured at the highest concentrations were common to both fish and sediments. Of the ranked PCB congeners measured in sediments from the southwest arm, there were 14 co-occurrences of ranked PCB congeners in each of the fish sampling locations (southwest arm, northwest arm and northeast arm of the lake). Of the ranked PCB congeners measured in sediments collected from near Narrows Dam, 12 congeners also occurred in fish collected from the southwest arm, 11 co-occurred in fish collected from the northwest arm, and 12 co-occurred in fish collected from the northeast arm of the lake. When compared to ranked PCB congeners measured in sediments from the northwest arm of Badin Lake, only 6 congeners co-occurred in fish tissue samples collected from each arm of the Badin Lake. In summary, the PCB congeners with the highest concentrations in sediments from the southwest arm of Badin Lake co-occur more frequently with congeners in fish tissue samples than do congeners measured in sediments from other parts of the lake.
5. **Fish sampled from the southwest arm of Badin Lake were more consistently contaminated by PCBs than fish collected from other parts of the lake.** In the samples from the initial study, the highest PCB concentrations were detected in a few fish from the northwest arm; however, PCB concentrations were more uniform in fish from the southwest arm. PCB concentrations in fish tissue collected from the northeast arm of

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Badin Lake were generally lower than concentrations in fish from the southwest and northwest arms.

In summary, there is a close match between PCB congeners detected in the sediments of Badin Lake and those found in fish tissue in this study. The pattern observed between congeners measured in fish tissue collected throughout the lake and those measured in sediments from the southwest arm of the lake would be expected if the sediments were a primary source of PCBs in fish tissues.

Subsequently, we compared the predominant PCB congeners in the sediment and the fish with the congeners present in the Aroclors associated with the Alcoa facility (McDaniel 2009).

When considering the unqualified congener data only:

- 1. The Alcoa-related PCB congeners # 3, 4, 8, and 12 occur in sediment from the southwest arm (near the Alcoa facility) and in fish tissue sampled in the southwest, northwest, and northeast arms of the lake.**

When considering all of the congener data (actual and estimated concentrations):

- 2. Most of the Alcoa-related PCB congeners were detected in fish tissue and sediment samples in Badin Lake.** Of the 76 PCB congeners associated with Alcoa operations, 18 were either not analyzed in fish tissue or were combined with other congeners for analysis of sediments. Of the remaining 58 congeners that were analyzed individually, 57 occurred in fish tissue, 55 occurred in sediments, and 54 occurred in both fish tissue and sediments (>93% match).
- 3. Based on analysis of all of the PCB data, approximately 32 of the congeners associated with Alcoa Aroclors measured in fish tissue also exist at elevated concentrations (on the order of 10 to 100 times greater) in the southwest arm of Badin Lake when compared to concentrations in other parts of the lake.**
- 4. When PCB congeners were ranked from highest to lowest concentration as described above, many of the congeners with the highest concentrations are associated with the Alcoa Aroclors and occur in both fish tissue and sediments.** Eleven of the Alcoa-related congeners were detected in more than 60% of the fish tissue samples (Table 1). In sediment samples, approximately 20 of the 53 potentially present congeners (some congeners were analyzed together and not distinguished) are associated with Aroclors used by Alcoa.

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Table 1. Occurrence of PCB congeners associated with the Alcoa facility detected in fish tissue samples from Badin Lake.

PCB Congener #	Occurrence in Fish Tissue Samples (n=30)	Aroclors Associated with the Alcoa Facility
187	100%	1260; 1254
153	100%	1260; 1254; 1248
129	100%	1260; 1254; 1248
118	100%	1260; 1254; 1248; 1242
99	100%	1260; 1254; 1248; 1242
110	90%	1260; 1254; 1248; 1242
66	90%	1254; 1248; 1242; 1232; 1221; 1016
52	87%	1254; 1248; 1242; 1232; 1221; 1016
61	83%	1254; 1248; 1242; 1232; 1221; 1016
180	77%	1260; 1254
44	63%	1254; 1248; 1242; 1232; 1221; 1016

In summary, there is a relationship between the PCBs used at the Alcoa facility and the PCBs contained in the sediments and fish in Badin Lake. We have congener specific analytical data for the PCBs in the sediments and the fish. Information regarding the PCBs used at the Alcoa Badin Works Facility was provided by the NC Division of Waste Management.

With more samples and analyses, we could further examine the strength of the relationships apparent in the current data and confirm whether or not there is an ongoing source of PCBs in Badin Lake.

If any questions arise, please contact me.

Sincerely,

John H. Rodgers, Jr.

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Attachment VII

Curriculum Vitae
for
John H. Rodgers Jr., Ph.D.

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4/2009

CURRICULUM VITAE

John H. Rodgers, Jr.

BIRTHDATE: February 1, 1950

BIRTHPLACE: Dillon County, South Carolina, U.S.A.

SSN: Available on request

MARITAL DATA: Wife's maiden name - Martha W. Robeson
Children - Daniel Joseph
(Born January 16, 1978)
Frank Clifford
(Born July 7, 1985)

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PRESENT POSITION: Professor
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EDUCATION:

Virginia Polytechnic Institute and State University, Blacksburg, VA,
Ph.D. Degree, Botany, Aquatic Ecology, 1977.

Clemson University, Clemson, SC,
M.S. Degree, Botany, Plant Ecology, 1974.

Clemson University, Clemson, SC,
B.S. Degree, Botany, 1972.

PROFESSIONAL EXPERIENCE:

Clemson University (1998-present):

Professor, Department of Forestry and Natural Resources
Director, Ecotoxicology Program
2003 – Present.

Director, Clemson Institute of Environmental Toxicology
Chair, Department of Environmental Toxicology
Professor, Department of Environmental Toxicology
Co - Director, Clemson Environmental Institute
1998 - 2003.

University of Mississippi: (Department of Biology)

Professor, Department of Biology,
1989 - 1998.
Director, Ecotoxicology Program,
1995 – 1998.
Adjunct Research Professor, Research Institute for
Pharmaceutical Sciences,
1989 - 1998.
Director, Biological Field Station,
1990 – 1995.
Director, Center for Water and Wetland Resources,
1993 – 1995.
Associate Director, Biological Field Station,
1989 - 1990.

University of North Texas:
(Division of Environmental Sciences,
Department of Biological Sciences)
Director, Water Research Field Station,
1987 - 1989.
Associate Professor, Department of Biological Sciences,

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1985 - 1989.

Associate Director, Institute of Applied Sciences,

1982 - 1988.

Assistant Professor, Department of Biological Sciences,

1982 - 1985.

Research Scientist II, Institute of Applied Sciences,

1979 - 1981.

East Tennessee State University:

(Department of Environmental Sciences,

Aquatic Ecology Section)

Assistant Professor, 1978 - 1979.

Virginia Polytechnic Institute

and State University:

(Biology Department, Center for

Environmental Studies)

Postdoctoral Research Associate, 1977 - 1978.

Research Assistant- Energy Research and

Development Administration, 1975 - 1977.

Clemson University (1972-1974):

(Botany Department)

Research Assistant - Water Resources Research

Institute, 1972 - 1974.

Laboratory Teaching Assistant – Plant Physiology,

Plant Ecology, Biological Oceanology, Botany, 1972 - 1974.

**MILITARY
SERVICE:**

1972 - 1975. U.S. Air Force Reserve, Second Lieutenant,

U.S. Air Force Reserve, First Lieutenant,
1975 - 1978.

U.S. Air Force Reserve, Captain,
1978 - 1984.

U.S. Air Force (Active Duty),
June 1 - August 29, 1976.

U.S. Air Force, Honorable Discharge, 1984.

Pilot Certificate - 34 hours, Single engine aircraft.

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RESEARCH SUPPORT:

Clemson University (1972-1974):

Research Assistantship, Water Resources Institute, Project No. B-053-SC (\$42,000), 1972 - 1974. Impact of Thermal Effluent from a Nuclear Power Plant on Reservoir Productivity.

Thesis Parts Award, USAEC, The E.I. DuPont de Nemours & Co., Savannah River Laboratory (Thermal Effects Laboratory), Aiken, S.C., 1973-1975. Effects of Elevated Temperatures on Periphyton Productivity in Lotic Aquatic Ecosystems.

Savannah River Laboratory, Research Assistantship, Research Contract USAEC Funding (\$50,000), 1973-1975. Impacts of Ash from Coal Combustion on Swamp Receiving Systems.

Virginia Polytechnic Institute and State University:

Research Assistantship, Research Contract, American Electric Power Corporation Funding (\$93,000), 1974-1975. Thermal Tolerances and Electivities of Fish Adjacent to a Coal-Fired Power Plant.

Research Assistantship, Research Contract, Energy Research and Development Administration Funding (\$112,000), 1975 - 1976. Structural and Functional Responses of Aquatic Communities to Power Generation.

Research Assistantship, Research Contract, Energy Research and Development Administration Funding (\$132,000), 1976 - 1977. Responses of Aquatic Communities to Perturbations Associated with Power Generation.

Co-principal Investigator, Research Contract, Water Resources Research Institute Funding (\$68,000), 1977 - 1979. Environmental Tolerances of *Corbicula fluminea* from the New River, Virginia.

East Tennessee State University:

Principal Investigator, Research Contract, ETSU Research Development Committee Funding (\$3,270), 1978 - 1979. Primary Production and Nutrient Dynamics in the Watauga River, Tennessee.

Oak Ridge Associated Universities Travel Contract, 1978 - 1979. Impacts of Power Production on Aquatic Ecosystems of Savannah River Laboratory.

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University of North Texas:

Co-Principal Investigator, Research Contract, Chemical Manufacturers' Association Funding (\$80,000), 1979 - 1980. Modeling the Fate of Chemicals in Aquatic Environments.

Principal Investigator, Research Contract, NTSU Faculty Research Grant Funding (\$4,000), 1979 - 1980. Biotransformation of Xenobiotics in Aquatic Systems.

Co-principal Investigator, Research Contract, International Paper Company Funding (\$149,530), 1980 - 1981. Impacts of Paper Mill Effluent on Aquatic Ecosystems.

Co-principal Investigator, Research Contract, Victor Equipment Company Funding (\$5,000), 1980. Optimization of Packaged Waste Treatment System for Metal Removal.

Co-principal Investigator, Research Contract, International Paper Company Funding (\$171,830), 1980 - 1981. Investigation of Pre- and Post-Operational Effects of a Paper Mill on Aquatic Systems.

Principal Investigator, Research Contract, NTSU Faculty Research Grant Funding (\$4,620), 1980 - 1981. Predicting Bioconcentration of Chemicals by Aquatic Organisms.

Co-principal Investigator, Research Contract, Chemical Manufacturers' Association Funding (\$30,000), 1981. Validation of Chemical Fate Models for Aquatic Ecosystems.

Co-principal Investigator, Research Contract, U.S. Environmental Protection Agency Funding (\$305,866), 1981 - 1983. Development of a Decision Support System for Integrated Management of Nuisance Aquatic Vegetation.

Principal Investigator, Research Contract, NTSU Faculty Research Grant Funding (\$3,600), 1981-1982. Fate and Effects of the Herbicide, Endothall, in Aquatic Systems.

Co-principal Investigator, Research Contract, Chemical Manufacturers' Association Funding (\$59,985), 1981 - 1982. Studies of Fate and Effects of Chemicals in Aquatic Ecosystems.

Co-principal Investigator, Research Contract, International Paper Company Funding (\$113,000), 1982. Effects of Paper Mill Effluent on Aquatic Ecosystems.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$24,500), 1982. Ecosystem Study of Pat Mayse Lake, A Southwestern Reservoir.

Co-principal Investigator, Research Contract, International Paper Company Funding (\$348,926), 1982 - 1985. Further Studies of Effects of Paper Mill Effluent on Aquatic

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Ecosystems.

Principal Investigator, Research Contract, NTSU Faculty Research Grant Funding (\$3,500), 1982 - 1983. Proximate Oxygen Demand of Aquatic Plants.

Co-principal Investigator, Research Contract, U.S. Environmental Protection Agency Funding (\$199,500), 1982 - 1983. Validation of Decision Support Systems for Integrated Management of Nuisance Aquatic Vegetation.

Co-principal Investigator, Research Contract, American Petroleum Institute (\$83,809), 1981 - 1982. Bioavailability of Petroleum-Derived Chemicals in Aquatic Ecosystems.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$25,000), 1983. Further Studies: Pat Mayse Lake, A Southwestern Reservoir.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$1,000), 1983. Remote Sensing of Aquatic Vegetation in Pat Mayse Lake.

Co-principal Investigator, Research Contract, Shell Development Company Funding (\$17,000), 1983. Impact of Petroleum Compounds on Aquatic Organisms.

Principal Investigator, Research Contract, NTSU Faculty Research Grant Funding (\$4,500), 1983 - 1984. Threshold Responses of Aquatic Vegetation to Herbicides.

Co-principal Investigator, Research Contract, Shell Development Company Funding (\$29,758), 1984. Inter-Laboratory Comparison of Bioassays Using Freshwater and Marine Organisms.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$20,000), 1984. Water Quality Monitoring and Aquatic Vegetation in Pat Mayse Lake.

Principal Investigator, Research Contract, Pennwalt Corporation Funding (\$11,500), 1984. Comparative Study of Two Aquatic Herbicides.

Principal Investigator, Research Contract, Shell Oil and Chemical Company Funding (\$14,000). Aquatic Toxicology Studies for the Petrochemical Industry.

Principal Investigator, Research Contract, Dallas County Utility and Reclamation District Funding (\$12,000), 1984 - 1985. Eutrophication Potential in an Impoundment Receiving Wastewater.

Co-principal Investigator, Research Contract, Shell Development Company Funding (\$31,797), 1985. Development of Data on Proper Selection of Bioassay Species.

Co-principal Investigator, Research Contract, Texas Instruments, Inc. Funding

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(approximately \$12,000, equipment), 1985. Development of Expert Systems for Water Quality Management.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$24,500), 1985. Development of a Water Quality Model and Lake Management Strategy for Pat Mayse Lake.

Co-principal Investigator, Research Foundation Award, Shell Research Foundation (\$15,000), 1985. The Response of Marine and Freshwater Species to Xenobiotics.

Principal Investigator, Research Contract, NTSU Faculty Research Grant Funding (\$2,700), 1986 - 1987. Experimental Analysis of Bioassay Methods.

Co-principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$168,693), 1986 - 1987. Ecological Analysis of the Lake Ray Roberts Project Site.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding, (\$68,000), 1986 - 1987. Coupling an Environmental Fate and Effects Model for 2, 4-D and Water Hyacinth.

Co-principal Investigator, Research Contract, Shell Research Foundation Funding (\$15,000), 1986. Osmoregulation in Marine Bioassay Species.

Principal Investigator, Research Contract, American Petroleum Institute Funding (\$8,000), 1986. Evaluation of Marine Bioassay Species.

Principal Investigator, Research Contract, American Petroleum Institute and U.S. Environmental Protection Agency Funding (\$10,000), 1986. A Workshop on Culture and Life History of *Mysidopsis* sp.

Co-principal Investigator, Research Contract, Shell Research Foundation Funding (\$20,000), 1987. Sediment Organic Carbon Content in Aquatic Systems of the U.S.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$24,500), 1987 - 1988. Endothall Fate and Effects on *Myriophyllum spicatum* in Pat Mayse Lake, Texas.

Co-principal Investigator, Research Contract Hoechst-Roussel Agri-Vet (Hoechst-Celanese) Co. Funding (\$185,000), 1987 - 1988. Development of Mesocosms and Water Research Field Station.

Co-principal Investigator, Research Contract, City of Dallas Funding (\$319,964), 1987 - 1989. Ecological Survey and Study of the Trinity River, Texas.

Co-principal Investigator, Research Contract, Hoechst-Roussel Agri-Vet (Hoechst-

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Celanese) Co. Funding (\$325,000), 1988 - 1989. Fate and Effects of Tralomethrin in Mesocosms.

Co-principal Investigator, Research Contract, Hoechst Roussel Agri Vet (Hoechst--Celanese) Co. Funding (\$185,000), 1988 - 1989. Further Development of Mesocosms and Water Research Field Station.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$24,500), 1988 - 1989. Further Development of a Water Quality Model and Lake Management Strategy for Pat Mayse Lake.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$24,550), 1988 - 1989. Research on SONAR in Pat Mayse Lake.

Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$107,000), 1988-1989. Water Research Field Station-Coupling a Herbicide Fate and Effects Model.

Principal Investigator, Research Contract, Pennwalt Corporation (\$2,000), 1988-1989. Degradation of Endothall by Chlorine.

Co-principal Investigator, Research Contract, Mobay Corporation (\$852,000), 1988-1990. Fate and Effects of Cyfluthrin in Mesocosms.

Co-principal Investigator, Research Contract, Shell Development Corporation (\$55,000) 1989-1990. Bioavailability of Sediment-sorbed Chemicals to Freshwater Organisms.

University of Mississippi:

Principal Investigator, Research Contract U.S. Army Corps of Engineers - Tulsa District Funding (\$24,500), 1988-1989. Limnology and Aquatic Botany of Pat Mayse Lake, Texas.

Principal Investigator, Research Contract, Shell Development Company Funding (\$50,000), 1989-1990. Evaluation of Sediment Toxicity Testing Procedures.

Co-principal Investigator, Research Contract Soil Conservation Service Funding (\$50,000), 1990-1991. Wetlands for Interception and Processing of Pesticides in Agricultural Runoff.

Co-principal Investigator, Research Contract Tennessee Valley Authority Funding (\$171,410), 1990-1991. Analysis of Aquatic Herbicides in Lake Guntersville, Alabama for the Aquatic Plant Management Program.

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Principal Investigator, Research Contract, Ciba Giegy Corporation Funding (\$31,000), 1990. Effects of Atrazine on Aquatic Vascular Plants.

Co-principal Investigator, Research Contract, Dow-Elanco Corporation Funding (\$40,000), 1990. Analysis of Fluridone in Florida Aquatic Plant Management Programs.

Principal Investigator, Research Contract, U.S. Environmental Protection Agency - Gulf of Mexico Program (\$17,565) 1990-1991. Assistance with the Citizen's Advisory Group of the Gulf of Mexico Program.

Co-principal Investigator, CHP International, Inc. (U.S. Peace Corps) Funding (\$22,000), 1990. Aquaculture Training Sessions for Volunteers for Africa.

Co-principal Investigator, University of Mississippi Funding (\$1,000), 1989-1990. Water Systems for an Aquatic Toxicology Laboratory.

Principal Investigator, Internal Equipment Funding, University of Mississippi Associates Funding (\$25,000), 1990-1991. Aquisition of an Ion Chromatograph/High Performance Liquid Chromatograph.

Principal Investigator, U.S. Army Corps of Engineers, Waterways Experiment Station Funding (\$250,000), 1990-1993. Development of Controlled Release Herbicides for Aquatic Use.

Principal Investigator, American Petroleum Institute Funding, (\$250,000), 1990 -1992. Reference Toxicants and Reference Sediments for Sediment Toxicity Testing.

Principal Investigator, Research Contract, Tennessee Valley Authority Funding (\$168,000), 1991-1992. Aquatic Herbicides in Guntersville Reservoir, Alabama - National Demonstration Project.

Co-principal Investigator, Research Contract, U.S. Department of the Army, Vicksburg District, Corps of Engineers Funding (\$96,036), 1991-1992. Monitoring Water Quality at Arkabutla, Enid, Grenada, and Sardis Lakes.

Principal Investigator, Research Contract, ABC Laboratories, Inc. and Zoecon Corporation Funding (\$10,000), 1991. Outdoor Microcosm Study of an Insect Growth Regulator.

Co-principal Investigator, Research Contract, Shell Development Company Funding (\$192,000), 1991-1993. Development of a Model Stream Facility and Evaluation of the Environmental Safety of a Surfactant.

Principal Investigator, Research Contract, U.S. Army Waterways Experiment Station Funding (\$25,000), 1991-1992. Evaluation of New Herbicide Delivery System for Control

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of Aquatic Plants.

Principal Investigator, Research Contract, U.S. Army Waterways Experiment Station Funding (\$64,000), 1992-1993. Evaluation of New Herbicide Delivery Systems for Control of Aquatic Plants.

Principal Investigator, Research Contract, American Petroleum Institute Funding (\$100,000), 1992-1993. New Sediment Bioassays and Reference Sediments. Principal Investigator, Mississippi State Department Of Wildlife, Fisheries, and Parks Funding (\$6,000), 1991-1993. Cooperative Agreement for Assistance with Walleye Culture.

Co-Principal Investigator, Research Contract, U.S. Army Corps of Engineers Funding (\$100,848), 1992-1993. Monitoring of Water Quality at Arkabutla, Sardis, Enid, and Grenada Lakes.

Principal Investigator, Mississippi State Department of Wildlife, Fisheries and Parks Funding (\$3,000), 1992-1993. Cooperative Agreement for Assistance with Walleye Culture.

Principal Investigator, Research Contract, U.S. Army Waterways Experiment Station Funding (\$30,000), 1992-1994. Mobility and Bioavailability of Sediment Associated Contaminants.

Principal Investigator, Research Contract, U.S. Army Waterways Experiment Station Funding (\$25,000), 1992-1993. Effects of Food Quantity on Fathead Minnow Survival, Growth and Reproduction.

Principal Investigator, Research Contract, Eastman Kodak and the Silver Coalition Funding (\$53,183), 1992-1994. Evaluations of the Bioavailability and Toxicity of Silver in Sediments.

Principal Investigator, Research Contract, Shell Development Company Funding (\$150,000), 1992-1993. Ecological Evaluation of a Non-ionic Surfactant in Model Stream Mesocosms.

Principal Investigator, Research Contract, Shell Development Company Funding (\$30,342), 1993-1994. Assistance with Development and Construction of Constructed Wetlands for Tertiary Treatment of Refinery Effluent.

Principal Investigator, U.S. Department of Agriculture/ Cooperative State Research Service Funding (\$1,377,400), 1994-1995. Center for Water and Wetland Resources (Year 4).

Co-Principal Investigator, Research Contract, International Paper Company Funding (\$99,631), 1994-1995. Extensive Ecological and Toxicological Evaluation of the

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Arkansas River at Pine Bluff, AR.

Co-Principal Investigator, Research Contract, International Paper Company Funding (\$99,631), 1994-1995. Extensive Ecological and Toxicological Evaluation of the Yazoo River near Vicksburg, MS.

Principal Investigator, Research Contract, Shell Development Company Funding (\$150,000), 1994-1995. Ecological Evaluation of a Homologous Non-ionic Surfactant in Model Stream Mesocosms.

Principal Investigator, Research Contract, Shell Development Company Funding (\$144,242), 1994-1996. Evaluation of Constructed Wetlands for Tertiary Treatment of Refinery Effluent.

Principal Investigator, Research Contract, Texaco, Inc. Funding (\$20,000), 1995-1996. Evaluation of a Constructed Wetland for Removal of Ammonia from a Refinery Effluent.

Principal Investigator, Research Contract, Texaco, Inc. Funding (\$20,000), 1995-1996. Evaluation of a Constructed Wetland for Removal of Trace Metals from a Refinery Effluent.

Clemson University (1998-present):

Principal Investigator, Assistance with Design and Construction of a Wetland for Wastewater Treatment Sponsored by Shell Oil Products from 4/1/98 to 4/1/00 (\$10,000).

Principal Investigator, Evaluation of the Tombigbee River. Sponsored by Weyerhaeuser, Inc. 1/98 – 1/02 (\$22,000).

Principal Investigator, Constructed Wetland for Wastewater Treatment at IP's Mansfield, LA Facility, Sponsored by International Paper Company 8/98 – 12/00 (\$18,250).

Principal Investigator, Investigations of Pesticide Toxicity, Sponsored by Applied Biochemists, Inc. 1/00 – 1/01 (\$10,000).

Principal Investigator, Wetlands for Wastewater Treatment at Savannah River Site Sponsored by DOE thru SCUREF (SC Universities Research and Education Foundation) from 1/14/99 to 2/28/00 (\$28,088).

Principal Investigator, A-01 Outfall Constructed Wetlands Sponsored by DOE thru Westinghouse Savannah River thru SCUREF from 7/11/99 to 9/30/00 (\$624,730).

Principal Investigator, Design and Construction of a Wetland for Effluent Treatment. Sponsored by International Paper Company 6/00 – 7/01 (\$25,000).

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Principal Investigator, Evaluation of Foam Products. Flexible Products, Inc Funding from 9/99 – 1/01 (\$15,000).

Principal Investigator, US Department of Interior Funding (\$43,106), 2002-2004. Renovating Water for Conservation and Reuse.

Co-Principal investigator, US Department of Agriculture Funding (\$539,677), 2002-2004. Adhesion-Specific Nanoparticles for Removal of *Campylobacter jejuni* from Poultry.

Principal Investigator, Duke Energy Corporation Funding (\$54,473). 2001. Evaluation of the Oconee Nuclear Station Conventional Waste Treatment System.

Principal Investigator, Chevron Texaco Inc. Funding (\$24,000), 2001-present. Evaluation of Best Management Practices for Stormwater and Other Contaminated Waste Streams.

Principal Investigator, US Department of Energy Funding (\$26,024). 2001-2003. A01 Constructed Wetland Treatment Facility Redox Probe Maintenance and Consultation for the Savannah River Site (from WSRC through SCUREF).

Principal Investigator, U.S. Department of Interior Funding (\$43,106). 2002-2003. Renovating Water for Conservation and Reuse.

Principal Investigator, Sustainable Universities Initiative (\$7,000). 2002-2003. A Constructed Wetland Treatment System: A Green and Sustainable Solution to Prevent Water Pollution on Campus.

Principal Investigator, Duke Energy Corporation in Cooperation with Progress Energy Funding (\$187,000). 2003-2004. Treatment of Mercury, Selenium and Other Targeted Constituents in FGD Wastewater: A Constructed Wetland Pilot Study.

Principal Investigator, Chevron Corporation Funding (\$33,600). 2003-2004. Panama Storm Water Treatment Wetland.

Principal Investigator, Griffin Corporation Funding (\$20,0000). 2002-2003. Response of Aluminum from Boat Pontoons to Komeen Exposures in Lake Murray, SC Water (with Sediments and *Hydrilla*).

Principal Investigator, Alabama Power Company Funding (\$75,000). 2004-2006. Development of Strategies for Controlling Nuisance Growths of *Lyngbya* in Alabama Power Company Reservoirs.

Principal Investigator, Department of Energy Funding (\$125,000) 2004-2005. Designing constructed wetlands to treat gas storage produced waters.

Principal Investigator, Duke Energy Corporation in Cooperation with Progress Energy

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Funding (\$105,000). 2004-2005. Continuing Studies of Treatment of Mercury, Selenium and Other Targeted Constituents in FGD Wastewater Using a Constructed Wetland Treatment System.

Principal Investigator, U.S. Department of Energy Funding (\$300,000) 2005-2008. Innovative Techniques for Remediation of Nontraditional Waters for Reuse in Coal-Fired Power Plants.

Principal Investigator, Duke Energy Corporation and ENTRIX Funding (\$100,000) 2006-2007. Further Evaluations of Constructed Wetland Treatment Systems for Flue Gas Desulfurization Waters.

Co-Principal Investigator, Chevron-Texaco Funding (\$50,000) 2006-2007. Evaluation of Boron Biogeochemistry in Constructed Wetlands.

Co-Principal Investigator, Monsanto Company Funding (\$300,000) 2006-2008. Potential Effects of Glyphosate Formulations on Amphibians.

Principal Investigator, Florida Department of Environmental Protection Funding (\$60,000) Effects of Invasive Algae in Crystal River, FL and Potential Control Strategies to Protect the Florida Manatee.

Co-Principal Investigator, Chevron-Texaco Funding (\$50,000) Specifically Designed Constructed Wetland Treatment Systems for Produced Water in Chad.

Principal Investigator, Duke Energy Corporation and ENTRIX Funding (\$30,000) 2007-2008. Additional Evaluations of Constructed Wetland Treatment Systems for Flue Gas Desulfurization Waters.

Co-Principal Investigator, Clemson University Funding (\$50,000) 2006-2008. Evaluation of Constructed Wetland Treatment Systems for Parking Lot Stormwater (with Dr. Rockie English).

Principal Investigator, Applied Biochemists, Inc. Funding (\$36,000) 2006. Approaches for Mitigation of Risks from Harmful Algal Blooms.

Co-Principal Investigator, Chevron-Texaco Funding (\$50,000) Specifically Designed Constructed Wetland Treatment Systems for Specific Produced Water (San Ardo, CA).

Co-Principal Investigator, U.S. Department of Energy Funding (\$800,000) Evaluation of Constructed Wetland Treatment Systems for Produced Waters.

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HONORS AND AWARDS:

Phi Sigma Doctoral Research Award, April, 1977.

Sigma Xi Doctoral Research Award, May, 1978.

Who's Who in the South and Southwest, 1979.

Personalities of the South, 1981.

International Who's Who, 1981.

Directory of Distinguished Americans, 1981.

Men of Achievement (International Biographical Center), 1981.

Phi Kappa Phi Honor Society, 1982.

Gordon Research Conference Travel Award, 1982.

NTSU President's Award to the Institute of Applied Sciences, 1985.

Mortar Board NTSU "Top Prof" Teaching Award, 1985.

Elected to NTSU Graduate Faculty, 1987.

Co-author - Best Student Paper (Burton Suedel and Phil Clifford), published in 1992 in *Environmental Toxicology and Chemistry*.

Certificate of Appreciation, 1993 Mississippi Region 7 Science and Engineering Fair. 1993.

Designated "Distinguished Southerner" by Editors Of *Southern Living*. Article on Water Watchdogs In April, 1994 edition of *Southern Living*.

Co-author - Best Student Paper (Arthur Dunn), Mid-South Aquatic Plant Management Society. Birmingham, AL. 1994.

Certificate of Appreciation, Environmental Biology Review Panel, U.S. EPA, January, 1995.

President, Oxford Exchange Club – Prevention of Child Abuse, 1996-1998.

Board of Directors, Society of Environmental Toxicology and Chemistry, 1989-1991;

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1995-2001. Executive Committee 1997-2000. Vice President 1998-1999. President 1999-2000.

Member, Expert Advisory Committee, Canadian Network of Toxicology Centres. Environment Canada and Health and Welfare, 1992-2000.

Chair, Expert Advisory Committee, Canadian Network of Toxicology Centres, Environment Canada and Health and Welfare, 1996-1999.

Who's Who Among America's Teachers, 7th ed. 2002. p. 400.

Certificate of Appreciation for Outstanding Service to the Society of Environmental Toxicology and Chemistry, 2003.

RESEARCH AND TEACHING INTERESTS:

Teaching Interests:

I have taught General Botany, General Biology Environmental Biology, Assessment of Water Quality, Water Quality Management, Environmental Analysis, Aquatic Toxicology, Limnology, Microbial Ecology, Radioisotopes, and Research Techniques, Aquatic Botany, Aquatic Microbiology, Sediment Toxicology, and Analysis of Biological Data, Ecological Risk Assessment, Plant Physiology, and Water Chemistry. My teaching interests also include: Plant Ecology, Wetland Ecology, and Phycology.

Research Interests:

Effects of heated effluents and other perturbations on primary productivity of vascular and non-vascular plants in terrestrial and aquatic systems.

In situ measurements of assimilatory sulfate reduction by periphytic organisms (algae, bacteria, and fungi), sulfur content and cycling in aquatic systems.

Physical models of aquatic systems as tools for the study of acute and chronic effects of industrial and power plant effluents on structural and functional aspects of aquatic microbial communities with emphasis on photosynthesis and sulfate assimilation.

Production, decomposition and role in nutrient cycling of aquatic macrophytes.

Impact of ash from industrial and power production processes on receiving systems and indigenous biota.

Decomposition and role of autochthonous and allochthonous detritus in aquatic and terrestrial systems with emphasis on the influences of macro-invertebrates, bacteria and

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fungi.

Invasion rates, population dynamics and elemental accumulation of the Asiatic Clam (*Corbicula fluminea*).

Extracellular products and other organic compounds as regulating factors of structural and functional aspects of aquatic microbial communities.

Benthic metabolism and physical and biological sediment characterization (using SCUBA-implemented techniques) as an index of eutrophication rates.

Electron transport system activity of benthic microflora as a pollution monitoring tool.

Serum enzymes of fish as an indicator of the quality and quantity of mixed effluents and their effects on receiving systems.

Ecosystem responses to stress in aquatic systems; Ecological risk assessment.

Relationships between carbon quantity and quality in ecosystems.

Responses of microbes (algae, bacteria, and fungi) to magnetic fields.

Ecological impacts associated with pulp and paper mills.

Biology and ecology of *Taxodium distichum* (Bald cypress) swamps in the Southwest.

Development of models for integrated control of nuisance aquatic vegetation and aquatic ecosystem management.

Microcosms and mesocosms as tools for ecological and environmental research.

Reservoir limnology and eutrophication.

Secondary aquatic plant products and biocontrol of aquatic plants.

Bioavailability of xenobiotic chemicals (e.g. pesticides) to aquatic organisms.

Sediments as sources and sinks for contaminants in aquatic ecosystems.

Population biology and physiological ecology of aquatic plants.

Artificial Intelligence in ecological problem solving.

Constructed wetlands for rehabilitation and wastewater treatment.

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Metal speciation and bioavailability.

ORGANIZATIONS:

American Society of Limnology and Oceanography, Ecological Society of America, American Water Resources Association, North American Benthological Society, Water Pollution Control Federation, Phi Sigma Society Alpha Psi (VPI&SU) Chapter, Sigma Xi (VPI&SU) Chapter, American Institute of Biological Sciences, American Association for Advancement of Science, Phi Kappa Phi (NTSU) Chapter, Aquatic Plant Management Society, Society of Environmental Toxicology and Chemistry.

OTHER PROFESSIONAL ACTIVITIES:

Consulting Aquatic Ecologist Microbiology Department, Clemson University, 1973-1975.

Investigator on Facilities Use Agreement #15 at Savannah River Laboratory in conjunction with Clemson University and VPI & SU, 1973-1975.

Consulting Aquatic Ecologist to American Electric Power Service Corporation, Canton, Ohio, 1974 - 1975.

Investigator on Facilities Use Agreement #28 at Savannah River Laboratory in conjunction with University of Texas, School of Public Health and VPI&SU, 1975 - 1979.

Consulting Microbial Ecologist to Bioengineering Research and Development Group, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1977.

Consulting Aquatic Ecologist to Virginia State Water Control Board, Richmond, 1977.

Invited lecturer in Plant Ecology and Environmental Biology, Botany Department, Clemson University, 1977.

Consulting Aquatic Ecologist to Center for Environmental Studies VPI&SU, 1978 - 1979.

Participant in Savannah River National Environmental Research Park meeting on Aquatic Research, Aiken, S.C., 1978.

Grant Proposal Review for the Division of Environmental Biology of the National Science Foundation, 1978 - 1987.

Consulting Aquatic Ecologist to Tennessee Eastman Company, Kingsport, Tennessee,

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1978 - 1979.

ETSU Research Development Committee Presidential Appointment 1978 - 1979.

Consulting Aquatic Ecologist to Victor Equipment Company, Denton, Texas, 1980 -1983.

Review of publications for American Society for Testing and Materials.

Consulting Aquatic Ecologist to Environmental Biology Group, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1980.

Gordon Research Conference Participant (Environmental Sciences - Water), 1980.

Participant in Workshop on the role of aquatic microcosms in evaluating ecosystem effects of chemicals under the Toxic Substances Control Act (USEPA sponsored), 1980.

NTSU representative to Texas Systems of Natural Laboratories. (Presidential Appointment), 1981 - 1986.

Consulting Aquatic Ecologist to Environmental Systems Branch, U.S. Environmental Protection Agency, 1981.

School of Community Service Computing Services Advisory Council (Dean's Appointment), 1981-1986.

NTSU Biosafety Committee (Presidential Appointment), 1980 - 1987.

Peer Review of Research Program for Environmental Systems Branch of the U.S. Environmental Protection Agency (with H.T. Odum), 1981.

Participant in Workshop on Modeling the Fate of Chemicals in the Aquatic Environment (USEPA sponsored), Pellston, MI, 1981.

Co-chaired session on Microcosm Testing in Aquatic Toxicology at the Society of Environmental Toxicology and Chemistry's Annual Meeting, Washington, D.C., 1981.

Elected to Editorial Board of Environmental Toxicology and Chemistry, 1981- 1983.

Research advisor to the Ecosystem Branch of the U.S. Environmental Protection Agency, Las Vegas, 1982.

Gordon Research Conference Participant (Environmental Sciences-Water), 1982.

President, Sigma Xi, NTSU Club, 1982-1983.

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Chair, Employment Service Committee of the Society of Environmental Toxicology and Chemistry, 1982 - 1984.

Review of manuscripts for Ecological Society of America, 1981 - present.

College of Arts and Sciences Committee on Interdisciplinary Research (Dean's Appointment), 1983.

Department of Biological Sciences Radiation Safety Officer, 1983 - 1987.

Participant, Workshop on Bioavailability of Chemicals from Dredged Materials (U.S. Army Corps of Engineers sponsored) Vicksburg, Mississippi, 1984.

Consulting Aquatic Ecologist to the City of Reno, Nevada, 1983 - Mitigation of Impacts of Population Growth and Development on Lake Tahoe, Truckee River and Pyramid Lake.

Consulting Aquatic Ecologist to the Las Colinas Development, 1983 - Impacts of Development on the Trinity River and Watershed.

School of Community Services Committee on Resources and Nontraditional Education (Dean's Appointment), 1983 - 1984.

Peer review of research programs of the Narragansett Bay, R.I., U.S. Environmental Protection Agency Research Laboratory (elected chairman of the review team), 1984.

North Texas State University Committee on Science and Technology (Presidential Appointment), 1984.

President, J.K. G. Silvey Society, North Texas State University, 1983 - 1984.

Invited Attendee, Society of Petroleum Industry Biologists, Annual Meeting, Houston, Texas, 1984.

Chair of the Annual Meeting of the Society of Environmental Toxicology and Chemistry, St. Louis, Missouri, Nov. 10-14, 1985.

Participant - Workshop on the Bioavailability of Sorbed Chemicals (U.S. Environmental Protection Agency and American Petroleum Institute sponsored) Florissant, Colorado, 1984.

Faculty Committee Member, Cooperative Education Program of the Institute of Applied Sciences, 1984.

Faculty Representative for the Sciences, elected to NTSU Faculty Senate, 1986.

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Served as Chairman of Placement Committee of Aquatic Plant Management Society, 1987.

Peer review of research programs of the Gulf Breeze, FL., U.S. Environmental Protection Agency Research Laboratory (with H. Bergman and K. Solomon), 1987.

Consulting aquatic ecologist to the City of Dallas (Water Utilities), Algal Workshop, 1987.

Consulting aquatic toxicologist to the American Petroleum Institute, Bioavailability of Chemicals Sorbed to Sediments, 1987.

Consulting aquatic ecologist to the Association of Central Oklahoma Governments, Use Attainability Study of Crutcho Creek and the North Canadian River, 1987.

Chair, Professional Opportunities Committee (Placement) of the Aquatic Plant Management Society, 1987.

Co-chair (with L. Goodman), Workshop on Mysid Culture and Testing, at the Eighth Annual Meeting of the Society of Environmental Toxicology and Chemistry, Pensacola, FL, 1987.

Co-chair, sessions on Perspectives of Water Quality-Based Permitting and Field Validation of Laboratory Results, at the Eighth Annual Meeting of the Society of Environmental Toxicology and Chemistry, Pensacola, FL, 1987.

Appointed to the South Carolina Aquatic Plant Management Commission, 1987.

Presented short courses on Aquatic Plant Management in Texas, 1987.

Presented seminars at short courses on Aquatic Plant Management in Florida, Ft. Lauderdale and Orlando, FL, 1987.

Advisor on American Petroleum Institute Study of Bioavailability of Sediment Bound Chemicals (with P. Chapman and C. Missimer), 1987 - 1988.

Participated in a Workshop on Mesocosm Research Sponsored by USEPA, Duluth, MN, 1987.

Promotion review team member for P.R. Parrish, Environmental Research Laboratory, Gulf Breeze, FL, 1987.

Chair, session on Sediment Criteria Development and Testing at the South Central Chapter Meeting of the Society of Environmental Toxicology and Chemistry, Houston, TX, 1987.

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Scientific Advisory Group, Proctor and Gamble Corporation, Cincinnati, Ohio, 1988,

Scientific Advisory Group, Botanical Research Institute of Texas (BRIT). Fort Worth, TX, 1988.

Adjunct Faculty, University of Guelph. Guelph, Ontario, Canada, 1988-1990.

Invited participant, North American Benthological Society Annual Meeting. Blacksburg, VA, May 22, 1990.

Invited participant, Association of Southeastern Biologists Special Workshop on Teaching the Limnology Laboratory. Baltimore, MD, April 20, 1990.

Invited participant, Aquatic Plant Management Meeting. Mobile, AL, July 16, 1990.

Chair, Education Committee of the Society of Environmental Toxicology and Chemistry, 1989-1991.

Chair, Professional Opportunities Committee of the Aquatic Plant Management Society, 1989-1991.

Chair, Discussion session on Wetlands Toxicology At the Society of Environmental Toxicology and Chemistry Annual Meeting. Washington, D.C., November 12, 1990.

Member, Aquatic Effects Dialogue Group of the Conservation Foundation, 1989-1991.

Member, Advisory Group to the World Wildlife Fund, 1989-1991.

Consulting Aquatic Ecologist and Toxicologist to Proctor and Gamble Company. Cincinnati, OH, 1989-1991.

Served on a discussion panel on the Future of Aquatic Plant Management with emphasis on regulatory issues regarding herbicides at the 25th Annual Meeting of the Aquatic Plant Control Research Program - U.S. Army Corps of Engineers. Orlando, FL, November 26-30, 1990.

Served on a discussion panel on the Future of Aquatic Plant Management with Emphasis on Simulation Technology and Modeling at the 25th Annual Meeting of the Aquatic Plant Control Research Program - U.S. Army Corps of Engineers. Orlando, FL, November 26-30, 1990.

Consulting Aquatic Toxicologist, U.S. Environmental Protection Agency, Ecorisk Program evaluation. 1990-1991.

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Consulting Aquatic Toxicologist, International Paper Company. 1990-1991.

Consulting Aquatic Toxicologist, State of Mississippi. 1990-1991.

Consulting Aquatic Toxicologist, Environment Canada, Health and Welfare Canada - Canadian Network of Toxicology Centers, Expert Advisory Committee. 1991- 2001.

Consulting Aquatic Toxicologist, Ecorisk Forum on the Rocky Mountain Arsenal Refuge Technical Expert Advisory Panel. 1991-1992.

Consulting Biologist and Ecotoxicologist, Arkansas Department of Higher Education and Arkansas State University Ph.D. Program Development. 1991- 1998.

Invited participant, Tiered Testing Issues for Freshwater and Marine Sediments, sponsored by U.S. EPA Office of Water and Office of Research and Development. Washington, D.C., September 16-18, 1992.

Invited speaker, Workshop on the Bioavailability and Toxicity of Copper, sponsored by the University of Florida, Center for Aquatic Plants. Gainesville, FL, September 2-3, 1992.

Peer reviewer for U.S. EPA, Framework for Ecological Assessment, Risk Assessment Forum. Washington, D.C., 1992 (EPA/130/R-92/001 - February 1992).

Invited speaker, 4th Annual Meeting of the Soil and Water Conservation Society. Baltimore, MD, August 9-12, 1992.

Participant, U.S. EPA Workshop on Bioaccumulation of Hydrophobic Chemicals. Washington, D.C., June, 1992.

Invited lecturer and participant, Young Scholars Program, NSF funded. Oxford, MS, 1992.

Counselor for summer interns with the Minorities Science Program, University of Mississippi funded. Oxford, MS, 1992.

Peer Review, Biology Peer Review Panel, U.S. EPA. Knoxville, TN, January, 1993.

Conference Co-organizer, First International Conference on Transport, Fate, and Effects of Silver in the Environment. University of Wisconsin, Madison, WI, August 8-10, 1993.

Chair, Exhibits Committee, 14th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Houston, TX, November, 1993.

Consulting Aquatic Ecologist and Toxicologist to Weyerhaeuser Corporation. Columbus,

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MS, 1994 – 1999.

Member, Student Scholarship Committee, Mid-South Aquatic Plant Mangement Society. 1994 – 1997.

OSHA Safety Course. Norco, LA, 1994. Joint Agency Task Force Member, Guntersville Project. Guntersville, AL, April, 1994.

Featured speaker, Seminar on Pollution Prevention for Silver Imaging Systems. Lake Buena Vista, FL. May, 1994.

Conference Organizer, Second International Conference on Transport, Fate and Effects of Silver in the Environment. University of Wisconsin, Madison, WI, September 11-14, 1994.

Chair - Subcommittee, National Institute of Environmental Health Sciences (NIEHS) - Superfund Hazardous Substances Basic Research Program. Research Triangle Park, NC, October 16-19, 1994.

Discussion Panel Participant, 2nd International Conference on Environmental Fate and Effects Of Bleached Pulp Mill Effluents. Vancouver, B.C., Canada, November, 1994.

Genetic Toxicology Course (Audit). Oxford, MS, 1995.

Board of Directors, Society of Environmental Toxicology and Chemistry (elected), 1995.

Participant, U.S. EPA Environmental Biology Review Panel. Fort Worth, TX, January, 1995.

Participant, Society of Environmental Toxicology and Chemistry Workshop on Wetlands. Butte, MT, August, 1995.

Conference Organizer, Third International Conference on Transport, Fate and Effects of Silver in the Environment. Washington, D.C., August, 1995.

Featured Speaker, 1995 Scholars Conference, University of Mississippi. Oxford, MS, October, 1995.

Participant, Society of Environmental Toxicology and Chemistry Workshop on Whole-Effluent Toxicology. Pellston, MI, October, 1995.

Invited Participant, Round Table Discussion of Surfactant Toxicity in Aquatic Systems. Thornton, England, May, 1996.

Keynote Speaker, Mid-South Society of Environmental Toxicology and Chemistry

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(inaugural meeting). Memphis, TN, May, 1996.

Invited Speaker on Endocrine Disruption, Seminar on Emerging Water Issues, International Paper Company. Memphis, TN, June, 1996.

Instructor, Short Course on Constructed Wetlands, U.S. Army Waterways Experiment Station. Berkeley, CA. July, 1996.

Short Course on Constructed Wetland Design and Monitoring. Houston, TX, July, 1996.

Conference Organizer, Fourth International Conference on Transport, Fate and Effects of Silver in the Environment. Madison, WI, August, 1996.

Friends of Lake Keowee (FOLKS), Board of Directors (elected) and Member of the Technical Committee, 2003-present.

Bob C. Campbell Geology Museum, Clemson University, Board of Directors Member, 2003-present.

Associate Editor, Journal of Toxicology and Environmental Health Part B : Critical Reviews. 1999-2006.

Chair, Science Advisory Panel for the California Environmental Protection Agency – Aquatic Pesticides Committee, 2002-present.

Member, Science Advisory Panel, USDA Jimmy Carter Plant Materials Center, Americus, GA. 2003-present.

Member, Science Advisory Panel for the USEPA/ SETAC Whole Effluent Toxicity Testing Committee, 1998-2004.

Member, Science Advisory Panel for Proposal and Research Review, Water Environment Federation, 2001-present.

Member, Science Advisory Panel for the National Council for Air and Stream Improvement – Long Term Receiving Water Studies, 1999-present.

Member, Board of Directors – Aquatic Plant Management Society, (elected) 2003-2006.

Co-editor (with Dr. J.W. Castle), Special Issue of Environmental Geoscience on Constructed Wetland Treatment Systems

Member, Board of Directors – South Carolina Aquatic Plant Management Society, (elected) 2007-2009.

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Chair, Peer Review Panel, Canadian Foundation for Innovation 2009

BOOKS, BOOK CHAPTERS, AND MONOGRAPHS

M.Sc. Thesis: Rodgers, J.H., Jr. 1974. Thermal Effects on Primary Productivity of Phytoplankton, Periphyton, and Macrophytes in Lake Keowee, S.C. Botany Department, Clemson University. 88 pp.

Bi- weekly in situ determinations of Carbon-14 assimilation rates were made using SCUBA and chambers in a reservoir receiving thermal effluent from a nuclear power plant. Emphasis was placed upon relative contributions of each group of plants to the overall lake productivity and statistical correlations of productivity with water temperatures (1972-1974).

Ph.D. Dissertation: Rodgers, J.H., Jr. 1977. Aufwuchs Communities of Lotic Systems: Nontaxonomic Structure and Function. Biology Department and Center for Environmental Studies, VPI&SU. 336 pp.

Six model streams were constructed to assess effects of typical industrial and municipal effluents on primary productivity, assimilatory sulfate reduction and structural aspects of assemblages of attached microorganisms. Net microbial productivity of aufwuchs and primary productivity were estimated by assimilatory (S35) sulfate reduction and carbon-14 fixation, respectively, with heterotrophic productivity being the difference. Concurrent laboratory studies verified the efficacy of these procedures. The ability of methods to discern perturbations was tested. Direct correlations between structural measurements and functions were ascertained by regression analysis. Field investigations of aufwuchs communities were inconclusive due to variability and the heterogeneous distribution of aufwuchs communities (1974 - 1977).

Guthrie, R.K., D.S. Cherry, and J.H. Rodgers, Jr. 1974. The Impact of Ash Basin Effluent on Biota in the Drainage System. *Proc. Seventh Mid-Atlantic Industrial Waste Conference*: pp. 17-43. Drexel University, Philadelphia, Pa.

Dickson, K.L., J. Cairns, Jr., J.R. Clark and J.H. Rodgers, Jr. 1978. Evaluating Pollution Stress on Ecosystems. In: K.C. Flynn and W.T. Mason (eds.) *The Freshwater Potomac - Aquatic Communities and Environmental Stress*. The Interstate Commission on the Potomac River Basin, Rockville, Maryland. pp. 80 - 83.

Rodgers, J.H., Jr., D.S. Cherry, K.L. Dickson, and J. Cairns, Jr. 1979. Invasion, Population Dynamics and Elemental Accumulation of *Corbicula fluminea* in the New

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River at Glen Lyn, Virginia. In: *Proc. First International Corbicula Symposium* J.C. Britton (ed.). Texas Christian University Research Foundation Publishers, Fort Worth, TX, pp. 99-110.

Rodgers, J.H., Jr., K.L. Dickson, and J. Cairns, Jr. 1979. A Review and Analysis of Some Methods Used to Measure Functional Aspects of Periphyton. In: R.L. Weitzel (ed.) *Methods and Measurements of Periphyton Communities: Review*. American Society for Testing and Materials, Philadelphia, Pennsylvania (ASTM STP 690), pp. 142-167.

Rodgers, J.H., Jr., D.S. Cherry, R.L. Graney, K.L. Dickson, and J. Cairns, Jr. 1980. Comparison of Heavy Metal Interactions in Acute and Artificial Stream Bioassay Techniques for the Asiatic Clam (*Corbicula fluminea*). In: J.G. Eaton, P.R. Parish, and A.C. Hendricks (eds.) *Aquatic Toxicology*. American Society for Testing and Materials, Philadelphia, PA. (ASTM STP 707), pp. 266-280.

Cherry, D.S., J.H. Rodgers, Jr., R.L. Graney, and J. Cairns, Jr. 1980. *Dynamics and Control of the Asiatic Clam in the New River, Virginia*. Bulletin 123, Virginia Water Resources Research Center. Virginia Polytechnic Institute and State University, Blackburg, VA. 72 pp.

Dillon, C.R. and J.H. Rodgers, Jr. 1980. *Thermal Effects on Primary Productivity of Phytoplankton, Periphyton, and Macrophytes in Lake Keowee*. S.C. Technical Report No. 81, Clemson University Water Resources Research Institute, Clemson, S.C. 115 pp.

Rodgers, J.H., Jr., J.R. Clark, K.L. Dickson, and J. Cairns, Jr. 1980. Nontaxonomic analyses of structure and function of aufwuchs communities in lotic microcosms. In: J.P. Geisy, Jr. (ed.) *Microcosms in Ecological Research*. USDOE (CONF-781101) pp. 625-643.

Lee, C.M., H. Bergman, W. Wood, and J.H. Rodgers, Jr. 1982. Workshop Summary and Conclusions. In: K.L. Dickson, A.W. Maki and J. Cairns, Jr. (eds.) *Modeling the Fate of Chemicals in the Aquatic Environment*, Ann Arbor: Ann Arbor Science Publ. pp. 397-407.

Cairns, J., Jr., A.L. Buikema, Jr., D.S. Cherry, E.E. Herricks, R.A. Matthews, B.R. Neiderlahner, J.H. Rodgers, Jr. and W.H. Van der Schalie. 1982. *Biological Monitoring in Water Pollution*. Pergamon Press: New York. 116 pp.

Rodgers, J.H., Jr., M.E. McKevitt, D.O. Hammerland, K.L. Dickson and J. Cairns, Jr. 1983. Primary production and decomposition of submergent and emergent aquatic plants of two Appalachian rivers. In: T.D. Fontaine III and S.M. Bartell (eds.) *Dynamics of Lotic Ecosystems*. Ann Arbor Science Publ. pp. 298-301.

Staples, C.A., K.L. Dickson, F.Y. Saleh, and J.H. Rodgers, Jr. 1983. A microcosm study

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of lindane and naphthalene partitioning for model validation. In: W. Bishop, R.D. Caldwell, and B.B. Heidolph (eds.) *Aquatic Toxicology and Hazard Assessment*. STP 802 ASTM Publications, Philadelphia, PA. pp. 26-41.

Rodgers, J.H., Jr. K.L. Dickson, and M.J. Defoer. 1983. Bioconcentration of lindane and naphthalene in bluegills (*Lepomis macrochirus*). In: W. Bishop, R.D. Cardwell, and B.B. Heidolph (eds.) *Aquatic Toxicology and Hazard Assessment*. STP 802. ASTM Publications, Philadelphia, PA. pp. 300-311.

Saleh, F.Y., K.L. Dickson, and J.H. Rodgers, Jr. 1984. Transport Processes of Naphthalene in the Aquatic Environment. In: L. Pawlowski, A.J. Verdier, and W.J. Lacy (eds.) *Chemistry for Environmental Protection*. Elsevier Publisher. pp. 119-131.

Vance, B.D. and J.H. Rodgers, Jr. 1984. *General Botany*, 2nd Ed. Hunter Textbooks, Inc., Winston - Salem, NC. 93 pp.

Staples, C.A., K.L. Dickson, J.H. Rodgers, Jr., and F.Y. Saleh. 1985. A Model for Predicting the Influence of Suspended Sediments on Bioavailability of Neutral Organics in the Water Compartment. In: R.D. Cardwell, R.C. Bahner and R.E. Purdy (eds.) *Aquatic Toxicology and Hazard Assessment*. ASTM STP 845, ASTM Philadelphia, PA. pp. 417-428.

Dickson, K.L. and J.H. Rodgers, Jr. 1985. Assessing the Hazards of Effluents in the Aquatic Environment. In: H. Bergman, A. Maki and R. Kimerle (eds.) *Assessing the Hazards of Effluents to Aquatic Life*. Pergamon Press.

Rodgers, J.H., Jr., K.L. Dickson, F.Y. Saleh, and C.A. Staples. 1987. Bioavailability of Sediment-bound Chemicals to Aquatic Organisms; Some Theory, Evidence and Research Needs. In: K.L. Dickson, A.W. Maki and W.A. Brungs (eds.) *Fate and Effects of Sediment-Bound Chemicals in Aquatic Systems*. Pergamon: Elmsford, N.Y. pp. 245-266.

Anderson, J., W. Birge, J. Gentile, J. Lake, J.H. Rodgers, Jr. and R. Swartz. 1987. Biological Effects, Bioaccumulation, and Ecotoxicology of Sediment-associated Chemicals. In: K.L. Dickson, A.W. Maki, and W.A. Brungs (eds.) *Fate and Effects of Sediment-Bound Chemicals in Aquatic Systems*. Pergamon: Elmsford, N.Y. pp. 267-296.

Rodgers, J.H. Jr., P.A. Clifford and R.M. Stewart. 1991. Enhancement of HERBICIDE, the Aquatic Herbicide Fate and Effects Model. In: *Proceedings, 25th Annual Meeting, Aquatic Plant Control Research Program*. Misc. Paper A-91-3. pp. 279-282. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Rodgers, J.H. Jr. 1991. Herbicide Registration for Aquatic Use: A Look to the Future. In: *Proceedings, 25th Annual Meeting, Aquatic Plant Control Research Program*. Misc.

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Paper A-91-3. pp. 245-248. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Graney, R.L., J.H. Kennedy and J.H. Rodgers, Jr. (eds.). 1993. *Aquatic Mesocosm Studies in Ecological Risk Assessment*. Lewis Publishers, Boca Raton, FL. 723 pp.

Rodgers, J.H., Jr., A.W. Dunn and A.B. Jones. 1993. Triclopyr Concentrations in Eurasian Watermilfoil: Uptake Under Differing Exposure Scenarios. In: *Proceedings, 28th Annual Meeting, Aquatic Plant Control Research Program*. Misc. Paper A-94-2. pp. 249-259. U.S. Army Waterways Experiment Station, Baltimore, MD. November 15-18, 1993.

Rodgers, J.H., Jr. and A.W. Dunn. 1994. TVA - Guntersville Reservoir Herbicide Monitoring Survey 1991-1992. A Report to the Tennessee Valley Authority and U.S. Army Corps of Engineers Joint Agency Program. 116 p.

Solomon, K., D. Bright, P. Hodson, K.-J. Lehtinen, B. McKague and J. Rodgers, Jr. 1999. Evaluation of ecological risks associated with the use of chlorine dioxide for the bleaching of pulp. Report prepared for the Alliance for Environmental Technology. 86 pp.

Rodgers, J.H., Jr. and J.F. Thomas. 2004. Evaluations of the Fate and Effects of Pulp and Paper Mill Effluents from a Watershed Multistressor Perspective: Progress to Date and Future Opportunities. In: *Pulp and Paper Mill Effluent Environmental Fate and Effects*. D. L. Borton, T. J. Hall, R.P. Fisher, and J.F. Thomas (eds.). DEStech Publications, Lancaster, PA. pp.135-146.

PAPERS AND PUBLICATIONS:

Rodgers, J.H., Jr., G.L. Powell, and J.F. Geldard. 1973. Triple-label Liquid Scintillation Radioassay: Possible or Impossible? Seventh Annual Regional Meeting (Oct . 5) Wilmington, N.C. 43 pp.

Rodgers, J.H., Jr. and R.S. Harvey. 1976. The Effect of Current on Periphyton Productivity Determined Using Carbon-14. *Water Res. Bull.* 12(6): 1109-1118.

Cherry, D.S., R.K. Guthrie, J.H. Rodgers, Jr., K.L. Dickson, and J. Cairns, Jr. 1976. Responses of Mosquito Fish (*Gambusia affinis*) to Ash Effluent and Thermal Stress. *Trans. Am. Fish Soc.* 105(6):686-694.

Rodgers, J.H., Jr., D.S. Cherry, J.R. Clark, K.L. Dickson, and J. Cairns, Jr. 1977. The

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Invasion of Asiatic Clam, *Corbicula manilensis* (Philippi), in the New River, Virginia. The Nautilus 91(2):43-46.

Rodgers, J.H., Jr., D.S. Cherry, and R.K. Guthrie. 1978. Cycling of Elements in Duckweed (*Lemna perpusilla* Torrey) of an Ash Settling Basin and Swamp Drainage System. Water Research 12:765-770.

Rodgers, J.H., Jr., K.L. Dickson, and J. Cairns, Jr. 1978. A Chamber for *In Situ* Measurement of Primary Productivity and Other Functional Processes of Periphyton in Lotic Systems. Arch. Hydrobiol. 84(3):389-398.

Clark, J.R., J.H. Rodgers, Jr., K.L. Dickson, and J. Cairns, Jr. 1980. Using Artificial Streams to Evaluate Perturbation Effects on Aufwuchs Structure and Function. Water Res. Bull. 16(1):100-104.

Graney, R.L., D.S. Cherry, J.H. Rodgers, Jr., and J. Cairns. 1982. The Influence of Thermal Discharges and Substrate Composition on the Population Structure and Distribution of the Asiatic Clam, *Corbicula fluminea*, in the New River, Virginia. The Nautilus 94(4):130-135.

Matthews, R.A., A.L. Buikema, J. Cairns, Jr. and J.H. Rodgers, Jr. 1982. Biological Monitoring Part IIA Receiving System Functional Methods, Relationships and Indices. Water Res. 16:129-139.

Saleh, F.Y., K.L. Dickson, and J.H. Rodgers, Jr. 1982. Fate of Lindane in the Aquatic Environment: Rate Constants of Physical and Chemical Processes. Environ. Toxicol. Chem. 1:289-297.

Dickson, K.L. and J.H. Rodgers, Jr. 1982. Assessing the Hazards of Effluents in the Aquatic Environment. In: H.L. Bergman, R.A. Kimerle and A.W. Maki (eds.) Environmental Hazard Assessment of Effluents. New York: Pergamon Press.

Rodgers, J.H., Jr., K.L. Dickson, F.Y. Saleh, and C.A. Staples. 1983. Use of Microcosms to Study Transport, Transformation and Fate of Organics in Aquatic Systems. Environ. Toxicol. Chem. 2:155-167.

Reinert, K.H. and J.H. Rodgers, Jr. 1984. Influence of Sediment Types on the Sorption of Endothall. Bulletin of Environmental Contamination and Toxicology. 32:557-564.

Rodgers, J.H., Jr., K.H. Reinert, and M.L. Hinman. 1984. Water Quality Monitoring in Conjunction with the Pat Mayse Lake Aquatic Plant Management Program. In: Proceedings, 18th Annual Meeting, Aquatic Plant Control Research Program. November 14-17, 1983. Raleigh, NC. U.S. Army Corps of Engineers. Misc. Paper A-84-4. pp.17-24.

Reinert, K.H., S. Stewart, M.L. Hinman, J.H. Rodgers, Jr., and T.J. Leslie. 1985. Release

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of Endothall from AQUATHOL GRANULAR AQUATIC HERBICIDE. Water Research 19:805-808.

Reinert, K.H., J.H. Rodgers, Jr., M.L. Hinman, and T.J. Leslie. 1985. Compartmentalization and Persistence of Endothall in Experimental Pools. Ecotoxicology and Environmental Safety 10:86-96.

Reinert, K.H., J.H. Rodgers, Jr., T.J. Leslie, and M.L. Hinman. 1986. Static Shake-Flask Biotransformation of Endothall. Water Research. 20:255-258.

Reinert, K.H. and J.H. Rodgers, Jr. 1984. Validation Trial of Predictive Fate Models Using and Aquatic Herbicide (Endothall). Environmental Toxicology and Chemistry 5:449-461.

Saleh, F.Y., K.L. Dickson, J.H. Rodgers, Jr. and C.A. Staples. 1985. Fate of Naphthalene in the Aquatic Environment. Environmental Toxicology and Chemistry 6: 449-461.

Jop, K.M., J.H. Rodgers, Jr., P.B. Dorn and K.L. Dickson. 1985. Use of Hexavalent Chromium as a Reference Toxicant in Aquatic Toxicity Tests. In Tim Poston and R. Purdy (eds.) *Aquatic Toxicology and Environmental Fate* ASTM STP 921, American Society for Testing and Materials, pp. 390-403.

Dorn, P.B., J.H. Rodgers, Jr., K.M. Jop, J.C. Raia and K.L. Dickson. 1987. Hexavalent Chromium as a Reference Toxicant in Effluent Toxicity Tests. Environmental Toxicology and Chemistry 6:435-444.

Reinert, K.H., P.M. Rocchio, and J.H. Rodgers, Jr. 1986. Parameterization of Predictive Fate Models: A Case Study. Environmental Toxicology and Chemistry 6:99-104.

Jop, K.M., J.H. Rodgers, Jr. E.E. Price, and K.L. Dickson. 1986. Renewal Device for Test Solutions in Daphnia Toxicity Tests. Bull. Environ. Contam. Toxicol. 36: 95-100.

Hall, W.S., K.L. Dickson, F.Y. Saleh, J.H. Rodgers, Jr., D. Wilcox and A. Entazami. 1986. Effects of Suspended Solids on the Acute Toxicity of Zinc to *Daphnia magna* and *Pimephales promelas*. Water Res. Bull. 22(6):913-920.

Jop, K.M., T.F. Parkerton, J.H. Rodgers, Jr., K.L. Dickson, and P.B. Dorn. 1987. Comparative Toxicity and Speciation of Two Hexavalent Chromium Salts in Acute Toxicity Tests. Environ. Toxicol. and Chem. 6:697-703.

Hall, W.S., K.L. Dickson, F.Y. Saleh and J.H. Rodgers, Jr. 1986. Effects of Suspended Solids on the Bioavailability of Chlordane To *Daphnia magna*. Arch. Environ. Contam. Toxicol. 15:529-534.

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Statistical Approach to Assess Factors Affecting Water Chemistry Using Monitoring Data. Wat. Res. Bull. 24:1017-1026.

Dorn, P.B. and J.H. Rodgers, Jr., 1990. Variability associated with identification of toxics in NPDES effluent toxicity tests. Environ. Toxicol. and Chem. 8: 893-902.

Reinert, K.H. and J.H. Rodgers, Jr. 1987. Fate and persistence of aquatic herbicides. Reviews of Environmental Contamination and Toxicology 98:61-98.

Reinert, K.H., M.L. Hinman, and J. H. Rodgers, Jr. 1988. Fate of Endothall During the Pat Mayse Lake (Texas) Aquatic Plant Management Program. Archives of Environmental Contamination and Toxicology 17:195-199.

Davis, T.M., B.D. Vance, and J.H. Rodgers, Jr. 1988. Productivity Responses of Periphyton and Phytoplankton to Bleach-kraft Mill Effluent. Aquatic Toxicology 12:83-106.

Rodgers, J.H., Jr., P.A. Clifford, and R. M. Stewart. 1988. Development of A Coupled Herbicide Fate and Target Plant Species Effects Model (FATE). Proceedings, 22nd Annual Meeting, Aquatic Plant Control Research Program.

Parkerton, T.F., S.M. Stewart, K.L. Dickson, J.H. Rodgers, Jr., and F.Y. Saleh. 1988. Evaluation of the Indicator Species Procedure for Deriving Site-Specific Water Quality Criteria for Zinc. Aquatic Toxicol and Hazard Assess.:10th Vol, ASTM STP 971. Philadelphia. pp. 423-435.

Cassidy, K. and J.H. Rodgers, Jr. 1988. Response of Hydrilla (*Hydrilla verticillata* (L.f.) Royle) to Diquat and a Model of Uptake Under Nonequilibrium Conditions. Environ. Toxicol. Chem. 8:133-140.

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Rodgers, J.H., Jr. and A.W. Dunn. 1992. Developing Design Guidelines for Constructed Wetlands to Remove Pesticides from Agricultural Runoff. Ecol. Engineering 1:83-95.

Suedel, B.C. and J.H. Rodgers, Jr. 1991. Variability of Bottom Sediment Characteristics of the Continental United States. Water Res. Bull. 27:101-109.

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- Suedel, B.C. and J.H. Rodgers, Jr. 1994. Responses of *Hyalella azteca* and *Chironomus tentans* to Particle Size Distribution and Organic Matter Content of Formulated and Natural Freshwater Sediments. *Environ. Toxicol. Chem.* 13(10):1639-1648.
- Suedel, B.C., E. Deaver and J.H. Rodgers, Jr. 1995. Experimental Factors That May Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. *Arch. Environ. Contam. Toxicol.* 30(1):40-46.
- Suedel, B.C., E. Deaver and J.H. Rodgers, Jr. 1995. Formulated Sediment as a Reference and Dilution Sediment in Definitive Toxicity Tests. *Arch. Environ. Contam. Toxicol.* 30(1):47-52.
- Kline, E.R., R.A. Figueroa, J.H. Rodgers, Jr. and P.B. Dorn. 1996. Effects of a Nonionic Surfactant (C₁₄₋₁₅ AE-7) on Fish Survival, Growth and Reproduction in the Laboratory and in Outdoor Stream Mesocosms. *Environ. Toxicol. Chem.* 15(6):997-1002.
- Rodgers, J.H., Jr., N.O. Crossland, E.R. Kline, W.B. Gillespie, Jr., R.A. Figueroa and P.B. Dorn. 1996. Design and Construction of Model Stream Ecosystems. *Ecotoxicol. and Environ. Safety* 33:30-37.
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- Suedel, B.C. and J.H. Rodgers, Jr. 1996. Toxicity of Fluoranthene to *Daphnia magna*, *Hyalella azteca*, *Chironomus tentans* and *Stylaria lacustris* in Water-Only and Whole Sediment Exposures. *Bull. Environ. Contam. Toxicol.* 57:132-138.
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- Hawkins, W.B., J.H. Rodgers, Jr., W.B. Gillespie, Jr., A.W. Dunn, P.B. Dorn and M.L. Cano. 1997. Design and Construction of Wetlands for Aqueous Transfers and Transformations of Selected Metals. *Ecotoxicol. And Environ. Safety* 36: 238-248.
- Gillespie, W.B., Jr., J.H. Rodgers, Jr., and N.O. Crossland. 1996. Effects of a Nonionic Surfactant (C₁₄₋₁₅ AE-7) on Aquatic Invertebrates in Outdoor Stream Mesocosms. *Environ. Toxicol. Chem.* 15(8): 1412-1422.

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Rodgers, J.H., Jr., P.L. Rogers and E. Deaver. 1994. Responses of Aquatic Invertebrates to Silver Compounds. Platform presentation at the 15th Annual Meeting of

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Rodgers, J.H., Jr. 1995. Use of Copper for Aquatic Plant Management. Presented at the 14th Annual Meeting of the Mid-South Aquatic Plant Management Society. (October 11-13) Sheffield, AL.

Deaver, E. and J.H. Rodgers, Jr. 1995. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Presented at the 14th Annual Meeting of the Mid-South Aquatic Plant Management Society. (October 11-13) Sheffield, AL.

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Moore, M.T., W.B. Gillespie, Jr., and J.H. Rodgers, Jr. 1998. Constructed wetlands to mitigate agricultural pesticide runoff. 19th Annual Meeting, Society of Environmental Toxicology and Chemistry, Nov., Charlotte, NC. p.284.

Mastin, B.J. and Rodgers, J.H., Jr. 1998. Characterization and assessment of *Lyngbya*-dominated cyanobacteria "blooms" in the SB-1 Reservoir Springhill, Louisiana. Biology Department University of Mississippi.

Maciorowski, A.F., Reinert, K., and Rodgers, J.H., Jr. 1998. Ethics in Ecological Risk Assessment: An Overview. publ. abstr. 19th annual meeting Society of Environmental

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Bohannon, A.L., Moore, M.T., Cooper, M., and Rodgers, J.H. Jr. 1998. Effects of Chlorpyrifos on Macroinvertebrates in Constructed Wetlands. Publ. abstr. 19th annual meeting Society of Environmental Toxicology and Chemistry. Nov. Charlotte, NC.

Dorn, P.B., Tattersfield, L.J., Raney, K.H., and Rodgers, J.H. Jr. 1998. Development of Effects Data for Alcohol Ethoxylate Surfactants using Stream Mesocosms. Publ. abstr. 19th annual meeting Society of Environmental Toxicology and Chemistry. Nov. Charlotte, NC. p. 175.

Huggett, D.B., Muller, S.L., Bohannon, A.L., and Rodgers, J.H. Jr., Adams, D.L., Deardorff, T.L. 1998. Toxicity Assessment of Historically Contaminated Sediments. Publ. abstr. 19th annual meeting Society of Environmental Toxicology and Chemistry. Nov. Charlotte, NC. p.209.

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Rodgers, J.H., Jr., Fisher, R.P., and Festa, J.L. 1998. Development of a North American research strategy to assess potential reproductive effects of pulp mill effluents on fish-focus on hormone-mediated effects and assessment. Publ. abstr. 19th annual meeting Society of Environmental Toxicology and Chemistry. Nov. Charlotte, NC. p. 233

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Winfield, L., S. D'Surney and J.H. Rodgers, Jr. 2001. Development of a short-term screening method to assess RDX Bioavailability and phytotoxicity. Presented at the 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-15 November 2001, Baltimore.

Rodgers, J.H., Jr., L.W. Ausley, D. Burton, D.L. Denton, P.B. Dorn, W. L. Goodfellow, J.

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Gully, T.J. Norberg-King, and W.T. Waller. 2001 TMDL's: After point sources, what can we do next? Presented at the 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-15 November 2001, Baltimore. P. 59.

Johnson, A.R., and J.H. Rodgers, Jr. 2001. Scaling in Ecotoxicity: theory, evidence and research needs. Presented at the 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-15 November 2001, Baltimore. P. 84.

Mastin, B.J., G.M. Huddleston and J.H. Rodgers, Jr. 2001. Partitioning of copper to Scirpus californicus organic matter: effects on toxicity to Ceriodaphnia dubia. Presented at the 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-15 November 2001, Baltimore. P. 157.

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Sherrard, R.M. C.L. Murray-Gulde, and J.H. Rodgers, Jr. 2001. Comparative toxicity of chlorothalonil and chlorpyrifos: Ceriodaphnia dubia and Pimephales promelas. Presented at the 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-15 November 2001, Baltimore. P. 338.

Mastin, B.J., Rodgers, J.H., Jr. 2001. Design and performance of constructed wetlands for treatment of stormwater. Constructed Wetlands for Water Quality Improvement, Clemson University, Departments of Plant Pathology and Physiology, and Department of Industrial Engineering.

Mastin, B.J. Rodgers, J.H., Jr., Deardorff, T.L. 2001. Risk evaluation of cyanobacterial-dominated algal blooms in a North Louisiana reservoir. Annual meeting Society of Environmental Toxicology and Chemistry, Carolinas Chapter.

Mastin, B.J., Huddleston, G.M. III, Rodgers, J.H., Jr. 2001. Partitioning of copper to Scirpus californicus organic matter: Effects on toxicity to Ceriodaphnia dubia. Presented at the 22nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-15 November 2001, Baltimore.

Rodgers, J.H. Jr. 2001. Strategies for Risk Characterizations of Contaminated Sediments. Invited speaker. Conférence De Prestige Cirtox. Centre interuniversitaire de recherché en toxicologie (CIRTOX). Université de Montréal. May 31, 2001. (invited plenary lecture)

Winfield, L.E., D.Surney, S.J. and Rodgers, J.H., Jr. 2001. Development of a short-term method to assess RDX bioavailability and phytotoxicity. Accepted for presentation

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during 22nd Annual Meeting of Society of Environmental Toxicology and Chemistry. Nov. 2001. Baltimore, MD.

Winfield, L.E., D'Surney, S.J., and Rodgers, J.H., Jr. 2001. The growth response of selected terrestrial plants to RDX exposure. Invited speaker for special symposium. Annual Meeting of the American Phytopathology Society. Aug. 2001. Salt Lake City, UT.

Murray-Gulde, C., Heatley, J.E., Karanfil, T., Rodgers, Jr., J.H. and Myers, J.E. (in press). Performance of a Hybrid Reverse Osmosis-Constructed Wetland Treatment System for Brackish Produced Water. Water Research

Rodgers, J.H., Jr. 2002. Case Study: A TMDL for copper. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

Rodgers, J.H., Jr., J.E. Heatley, and C.L. Murray-Gulde. 2002. Toxicity of five copper-containing algaecides to selected algae and animal species. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

Murray-Gulde, C.L., J. Bearr, J. Gallagher, J. Heatley, G.M. Huddleston III, and J.H. Rodgers, Jr. 2002. Design and evaluation of a constructed wetland treatment system for decreasing the concentration and bioavailability of copper in a wastestream. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

Mastin, B.J. and J.H. Rodgers, Jr. 2002. Discerning toxic fractions of crankcase oil and diagnostic responses of freshwater testing organisms. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

Murray-Gulde, C.L., G.M. Huddleston III, and J. H. Rodgers, Jr. 2002. Comparison of a microcosm-scale and full-scale constructed wetland treatment system designed to treat a copper-contaminated wastewater. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

Murray-Gulde, C.L. and J.H. Rodgers, Jr. 2002. Contributions of *Scirpus californicus* in a constructed wetland system receiving copper contaminated wastewater. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

Gallagher, J.S., G.M. Huddleston III, and J.H. Rodgers, Jr. 2002. Toxicity of lake sediments to *Hyalella azteca* Sausure and *Ceriodaphnia dubia* Richard following copper-herbicide applications. Presented at the 23rd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2002, Salt Lake City, UT.

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Johnson, A.R. and J.H. Rodgers, Jr. 2003. Scaling in ecotoxicology: theory, evidence and research needs. Presented at the 7th International Conference on Aquatic Ecosystem Health and Management Society, Sep., 2003. Lyon, France.

Huddleston, G.M., J.C. Arrington, and J.H. Rodgers, Jr. 2003. Winter removal of BOD and solids from an industrial effluent using constructed wetlands. Presented at the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2003, Austin, TX.

Garber, K.V., J.S. Gallagher, J.H. Rodgers, Jr., and A.R. Johnson. 2003. Measuring and modeling changes over time of fecal coliform densities in aquatic systems. Presented at the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2003, Austin, TX.

Stag, C.L. and J.H. Rodgers, Jr. 2003. Identification of toxic fractions of a formulated produced water and diagnostic responses of *Ceriodaphnia dubia*. Presented at the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2003, Austin, TX.

Duke, B.M., and J.H. Rodgers, Jr. 2003. Comparative toxicity of a copper containing algaecide to four algal species. Presented at the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2003, Austin, TX.

Gallagher, J.S., K.V. Garber and J. H. Rodgers, Jr. 2003. Mitigating risks of domestic wastewater using model constructed wetlands: Influence of HRT and loading. Presented at the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2003, Austin, TX.

Rodgers, J.H., Jr. 2003. After the TMDL, what do we do? Presented at the TMDL Short Course at the 24th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov., 2003, Austin, TX.

Rodgers, J.H., Jr., C.L. Murray-Gulde and G.M. Huddleston, III. 2003. Expanding functional roles of vascular aquatic plants: *Schoenoplectus californicus* as an example. Presented at the 43rd Annual Meeting of the Aquatic Plant Management Society, July, 2003. Portland, Maine.

Rodgers, J.H., Jr. 2003. Role of *Schoenoplectus californicus* in constructed wetlands for treatment of metals at Savannah River Site. Presented at the Annual Review Meeting of the USDA/ARS Jimmy carter Plant Materials Center. June, 2003. Americus, GA.

Rodgers, J.H., Jr. 2003. Using copper containing algicides and herbicides in aquatic systems. Presented at the Annual Meeting of the Mid-West Aquatic Plant Management Society. March, 2003. Columbus, OH.

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Rodgers, J.H., Jr. and J. Thomas. 2003. Evaluation of the fate and effects of pulp and paper mill effluents from a watershed multistressor perspective: Progress to date and future opportunities. Presented at the 5th International Conference on the Fate and Effects of Pulp and Paper Mill Effluents and the 7th International Water Association Symposium on Forest industry Wastewaters. June, 2003. Seattle, WA.

Rodgers, J.H., Jr. 2003. Expanding functional roles for *Schoenoplectus californicus* in constructed wetlands for treating metals. Presented (invited) at the Annual Meeting of the South Carolina Aquatic Plant Management Society. August, 2003. Monks Corner, SC.

Rodgers, J.H., Jr. 2003. *Schoenoplectus californicus*: Expanding role in constructed wetlands for treating metals. Presented at the Annual Meeting of the MidSouth Aquatic Plant Management Society. Oct. 2003. Auburn University, AL.

Johnson, B.M., L.E. Ober, J.W. Castle, and J.H. Rodgers, Jr. 2005. Treating Natural Gas Storage Produced Waters Using Constructed Wetland Treatment Systems. Presented at the International Symposium on Phytotechnology (U.S. EPA), March, 2005. Atlanta, GA.

Eggert, D., J.H. Rodgers, Jr., G.M. Huddleston III, C. Gulde, and F.D. Mooney. 2005. Design Constructed Wetland Treatment Systems for Flue Gas Desulfurization Wastewaters. Presented at the International Symposium on Phytotechnology (U.S. EPA), March, 2005. Atlanta, GA.

Rodgers, J.H., Jr., R. Jones, M. Duke, S. Lankford and W. Anderson. 2005. *Lyngbya* Growth and Control: We Are Working On It? Presented at the Annual Meeting of the Aquatic Plant Management Society. July, 2005. San Antonio, TX.

Duke, B.M., O.R. Tedrow and J.H. Rodgers, Jr. 2005. Site-specific Management of Problematic Algae Using a Copper-containing Algaecide. Presented at the Annual Meeting of the Aquatic Plant Management Society. July, 2005. San Antonio, TX.

Rodgers, J.H., Jr., R. Jones, M. Duke, S. Lankford and W. Anderson. 2005. *Lyngbya* Growth and Control: We Are Working On It? Presented at the 27th Annual Meeting of the South Carolina Aquatic Plant Management Society. August, 2005. Myrtle Beach, SC.

Duke, B.M., O.R. Tedrow and J.H. Rodgers, Jr. 2005. Site-specific Management of Problematic Algae Using a Copper-containing Algaecide. Presented at the 27th Annual Meeting of the South Carolina Aquatic Plant Management Society. August, 2005. Myrtle Beach, SC.

Johnson, B.M., L.E. Ober, J.W. Castle, and J.H. Rodgers, Jr. 2005. Treating Natural Gas Storage Produced Waters Using Constructed Wetland Treatment Systems. Presented at the Annual Meeting of the American Association of Petroleum Geologists, September,

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2005. Morgantown, WV.

Rodgers, J.H., J.W. Castle, B.M. Johnson, and L.E. Ober. 2005. Progress of Design of Hybrid Constructed Wetland Treatment Systems for Natural Gas Storage Produced Waters. Presented at the Annual Meeting of the Gas Storage Technology Consortium (U.S. DOE), August, 2005, Pittsburg, PA.

Castle, J.W., J.H. Rodgers, Jr., B.M. Johnson, and L.E. Ober. 2005. A Demonstration-Scale Hybrid Construction Wetland Treatment System for Gas Storage Produced Waters. Presented at the Annual Meeting of the Gas Storage Technology Consortium (U.S. DOE), August, 2005, Pittsburg, PA.

Deardorff, T.L. and J.H. Rodgers, Jr. 2006. The efficacy of a constructed wetland for the pulp and paper industry: From the laboratory to a full-scale trial. Presented at the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-7, 2006, Montreal, CANADA. (ABSTRACTS p. 218).

Damiri, B.R. and J.H. Rodgers, Jr. 2006. Responses of *Typha latifolia* to aqueous boron exposures. Presented at the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-7, 2006, Montreal, CANADA. (ABSTRACTS p.243).

Eggert, D.A., W.C. Bridges and J.H. Rodgers, Jr. 2006. *Ceriodaphnia dubia* exposed to mercuric nitrate: Assessment of sample size and statistical analysis for a 7d static/renewal toxicity test. Presented at the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-7, 2006, Montreal, CANADA. (ABSTRACTS p. 246).

Duke, B.M., O.R. Tedrow and J.H. Rodgers, Jr. 2006. Development of a planktonic algal bioassay using site water and copper containing algaecides. Presented at the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-7, 2006, Montreal, CANADA. (ABSTRACTS p. 245).

Kushner, L.R., J.H. Rodgers, Jr. and D.A. Eggert. 2006. Potential toxicity of aqueous exposures of cadmium, chromium, lead and zinc to *Ceriodaphnia dubia*. Presented at the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-7, 2006, Montreal, CANADA. (ABSTRACTS p. 301).

Johnson, B.M., D.A. Eggert and J.H. Rodgers, Jr. 2006. Treatment of Arsenic, Mercury, Nitrogen and Selenium in Flue Gas Desulfurization Water Using Pilot-Scale Constructed Wetland treatment Systems. Presented at the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nov. 5-7, 2006, Montreal, CANADA. (ABSTRACTS p. 301).

Rodgers, J.H., Jr. 2007. Do algae spill their guts after treatment with algaecides?: A test of the "leaky cell" hypothesis. Presented at the 8th Annual Meeting of the Northeast

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Aquatic Plant Management Society, Jan.16-17, 2007. West Dover, Vermont.

Johnson, B.M. and J.H. Rodgers, Jr. 2007. Responses of sentinel non-target species to copper-containing algaecides. Presented at the 8th Annual Meeting of the Northeast Aquatic Plant Management Society, Jan.16-17, 2007. West Dover, Vermont.

Rodgers, J.H., Jr. 2007. Do algae spill their guts after treatment with algaecides?: A test of the “leaky cell” hypothesis. Presented at the 28th Annual Meeting of the South Carolina Aquatic Plant Management Society, Aug. 16-18, 2006. Springmaid Beach, SC.

Rodgers, J.H., Jr. 2006. Adaptive Water Resource Management and Harmful Algal Blooms. Presented at the Annual Meeting of the Texas Aquatic Plant Management Society. Sep. 11-13, 2006. Jasper, TX.

Rodgers, J.H., Jr. 2006. Selecting and managing plants for constructed wetland treatment systems. Presented at the 30th Annual Meeting of the Florida Aquatic Plant Management Society, Oct.30- Nov.2, 2006. St. Petersburg, FL.

Rodgers, J.H., Jr. and J.W. Castle 2006. Demonstration-scale constructed wetland system for treatment of produced waters from underground gas storage. Presented at the Gas Storage Technology Consortium Technology Transfer Workshop, Oct. 4, 2006. San Francisco, CA.

Rodgers, J.H., Jr. 2007. Do algae spill their guts after treatment with an algaecide?; A test of the “leaky cell” hypothesis. Presented at the 27th Annual Meeting of the MidWest Aquatic Plant Management Society, March 3-5, 2007. Milwaukee, WI.

Johnson, B.M. and J.H. Rodgers, Jr. 2007. Responses of sentinel non-target species to copper-containing algaecides. Presented at the 27th Annual Meeting of the MidWest Aquatic Plant Management Society, March 3-5, 2007. Milwaukee, WI.

Rodgers, J.H., Jr. 2007. Toxicology of herbicides. Presented at the 26th Annual Meeting of the Western Aquatic Plant Management Society, March 25-27, 2007. Coeur d’Alene, ID.

Rodgers, J.H., Jr. 2006. Do algae spill their guts after treatment with an algaecide?; A test of the “leaky cell” hypothesis. Presented at the 25th Annual Meeting of the MidSouth Aquatic Plant Management Society, October 24-26, 2006. Orange Beach, Alabama.

Dorman, L., J.W. Castle and J.H. Rodgers, Jr. 2007. Performance of a pilot-scale constructed wetland for simulated ash basin water. Presented at the Clemson Hydrogeology Symposium, April 17, 2007. Clemson, SC.

Iannacone, M., J.W. Castle and J.H. Rodgers, Jr. 2007. Evaluation of equalization basins as initial treatment for flue gas desulfurization waters. Presented at the Clemson

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Hydrogeology Symposium, April 17, 2007. Clemson, SC.

Cross, E., J.W. Castle, G.M. Huddleston and J.H. Rodgers, Jr. 2007. Design and construction, and acclimation of a demonstration-scale constructed wetland treatment system for natural gas storage produced waters. Presented at the Clemson Hydrogeology Symposium, April 17, 2007. Clemson, SC.

Bennett, D., J.W. Castle and J.H. Rodgers, Jr. 2007. Boron removal in constructed wetland treatment systems for irrigation waters: A process study. Presented at the Clemson Hydrogeology Symposium, April 17, 2007. Clemson, SC.

Eggert, D.E., C. Hensman and J.H. Rodgers, Jr. 2007. Performance of Pilot-Scale Constructed Wetland Treatment Systems for Flue Gas Desulfurization Waters. Presented at the 68th Annual International water Conference, Oct. 21-25, 2007. Orlando, FL.

C.Murray-Gulde, F.D. Mooney, G.M. Huddleston, III, J.H. Rodgers, Jr. and D. Eggert. 2007. Designing Constructed Wetlands for Mitigating Risks from Flue Gas Desulfurization Wastewater. Presented at the 68th Annual International water Conference, Oct. 21-25, 2007. Orlando, FL.

J.H. Rodgers, Jr. 2008. Why Herbicides and Algaecides Kill Plants and Algae and Not Fish. Presented at the 2008 Bassmaster Classic Conservation Workshop. Feb 23, 2008. Greenville, SC.

J.H. Rodgers, Jr., B.M. Johnson, V. Molina, and W. Bishop. 2008. Choosing an Efficacious Algaecide: Development of a Decision Support System. Presented at the 28th Annual Meeting of the Midwest Aquatic Plant Management Society. Mar. 1-3, 2008. Sandusky, OH.

Bishop, W. and J.H. Rodgers, Jr. 2008. Effective Control of *Lyngbya wollei*: Variance in Response to Algaecides. Presented at the 28th Annual Meeting of the Midwest Aquatic Plant Management Society. Mar. 1-3, 2008. Sandusky, OH.

Pham, M.P.T., J. Horner, S. Chandler, J.W. Castle, J.H. Rodgers, Jr., and J.E. Myers. 2008. Design and construction of pilot-scale wetland treatment systems for beneficial reuse of produced water, Africa. Presented at the 16th Annual David S. Snipes / Clemson Hydrogeology Symposium. Apr. 2-4, 2008. Clemson, SC.

Huddleston, G.M.III, J.E. Heatley, J. Wrysinski, B.M. Johnson, D.A. Eggert and J.H. Rodgers, Jr. 2008. Assessment of pesticide attenuation using mesocosm-scale agricultural drainage ditches. Presented at the 16th Annual David S. Snipes / Clemson Hydrogeology Symposium. Apr. 2-4, 2008. Clemson, SC.

Pham, M.P.T., J. Horner, S. Chandler, J.W. Castle, J.H. Rodgers, Jr., and J.E. Myers.

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2008. Design and construction of pilot-scale wetland treatment systems for beneficial reuse of produced water, Africa. Presented at the 57th Annual Meeting of the Southeastern Section of the Geological Society of America. Apr. 10-11, 2008. Charlotte, NC.

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ATTACHMENT VII

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J. Horner, P. Pham, J.W. Castle, J.H. Rodgers, Jr., C. Murray-Gulde and J.E. Myers. 2008. Performance of a pilot-scale constructed wetland treatment system for beneficial reuse of oil field produced water. Presented at the 29th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Nov. 16-20, 2008. Tampa, FL.

Bishop, W.M., B.M. Johnson and J.H. Rodgers, Jr. 2009. Targeted management of problematic algae. Presented at the 10th Annual Meeting of the Northeast Aquatic Plant Management Society. Jan. 19-21, 2009. Saratoga Springs, NY.

J.H. Rodgers, Jr., B.M. Johnson and W.M. Bishop. 2009. Do algae spill their guts when treated with algaecides?: A look at the data and implications for decision making. Presented at the 10th Annual Meeting of the Northeast Aquatic Plant Management Society. Jan. 19-21, 2009. Saratoga Springs, NY.

B.M. Johnson and J.H. Rodgers, Jr. 2009. A risk and management assessment for *Lyngbya wollei* in Kings Bay/Crystal River, Florida. Presented at the 10th Annual Meeting of the Northeast Aquatic Plant Management Society. Jan. 19-21, 2009. Saratoga Springs, NY.

J.H. Rodgers, Jr., B.M. Johnson and W.M. Bishop. 2009. Do algae spill their guts when treated with algaecides?: A look at the data and implications for decision making. Presented at the 29th Annual Meeting of the Midwest Aquatic Plant Management Society. March 1-4, 2009. Lisle, IL.

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Bishop, W.M., B.M. Johnson and J.H. Rodgers, Jr. 2009. Targeted management of problematic algae. Presented at the 29th Annual Meeting of the Midwest Aquatic Plant Management Society. March 1-4, 2009. Lisle, IL.

B.M. Johnson and J.H. Rodgers, Jr. 2009. A risk and management assessment for *Lyngbya wollei* in Kings Bay/Crystal River, Florida. Presented at the 29th Annual Meeting of the Midwest Aquatic Plant Management Society. March 1-4, 2009. Lisle, IL.

Rodgers, J.H., Jr., J.W. Castle, J. Horner, M. Spacil, D. Eggert, B. Alley, A. Beebe, P. Pham, Y. Song, J.E. Myers, C. Murray Gulde, M. Huddleston, and D. Mooney. 2009. Constructed wetland treatment systems for renovation of energy produced water for beneficial reuse. Presented at the 17th Annual David S. Snipes/Clemson Hydrogeology Symposium. April 2, 2009. Clemson, SC.

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Spacil, M. and J.H. Rodgers, Jr. 2009. Treatment of selenium in simulated refinery effluent using a pilot-scale constructed wetland treatment system. Presented at the 17th Annual David S. Snipes/Clemson Hydrogeology Symposium. April 2, 2009. Clemson, SC.

Attachment VIII

Badin Lake
Fish Consumption Advisory
Photos

ATTACHMENT VIII

1



2



ATTACHMENT VIII

3



www.epi.state.nc.us/epi/fish

www.ncdhhs.gov/espanol



Attachment IX

Petition for Contested Case Hearing filed by APGI with the North Carolina Office of Administrative Hearings regarding the Badin Lake fish advisory in that contested case, entitled *Alcoa Power Generating Inc. v. N.C. Dep't of Health & Human Services & its Div. of Pub. Health*, No. 09-DHR- 2505 (North Carolina Office of Administrative Hearings, filed April 9, 2009)

ATTACHMENT IX

PLEASE PRINT CLEARLY OR TYPE

STATE OF NORTH CAROLINA

COUNTY OF STANLY

IN THE OFFICE OF
ADMINISTRATIVE HEARINGS

ALCOA POWER GENERATING INC.,

PETITIONER,

v.

NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN
SERVICES and its DIVISION OF PUBLIC HEALTH,

RESPONDENT.

PETITION
FOR A
CONTESTED CASE HEARING

Petitioner Alcoa Power Generating Inc. ("APGI") hereby asks for a contested case hearing as provided for by North Carolina General Statute § 150B-23, regarding and in response to the fact that, on or after February 11, 2009, Respondent North Carolina Department of Health and Human Services ("DHHS") and its Division of Public Health ("DPH") issued a Fish Consumption Advisory (the "Advisory") concerning the consumption of catfish and largemouth bass caught in the waters of Narrows Reservoir (also referred to as "Badin Lake") located in Stanly, Montgomery and Davidson Counties (the "Lake"). The version of the Advisory posted on the internet can be found as the first of the site-specific advisories listed at <http://www.epi.state.nc.us/epi/fish/current.html>. Additional facts and allegations in support of this petitioner are stated in attached additional pages.

Because of these facts, the State agency or board has:

- ☒ deprived me of property;
☐ ordered me to pay a fine or civil penalty; or
☒ otherwise substantially prejudiced my rights;

AND

- ☒ exceeded its authority or jurisdiction;
☒ acted erroneously;
☒ failed to use proper procedure;
☒ acted arbitrarily or capriciously; or
☒ failed to act as required by law or rule.

Date: April 9, 2009

Your phone number: (919) 899-3000

Print your full address: P.O. Box 109, Raleigh, North Carolina 27602

Print your name: Charles D. Case

Your signature: Charles D. Case

You must mail or deliver a COPY of this Petition to the State agency or board named on line (3) of this form. You should contact the agency or board to determine the name of the person to be served.

CERTIFICATE OF SERVICE

I certify that this Petition has been served on the State agency or board named below by depositing a copy of it with the United States Postal Service with sufficient postage affixed OR by delivering it to the named agency or board:

Emery Edwards Milliken, North Carolina Department of Health and Human Services, Division of Public Health
 (name of person served)

2001 Mail Service Center
 (street address/p.o. box)

Raleigh
 (city)

N.C.
 (state)

27699-2001
 (zip code)

This the 9th day of April, 2009.

Charles D. Case
 (your signature)

When you have completed this form, you MUST mail or deliver the ORIGINAL AND ONE COPY to the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714.

ATTACHMENT IX

**ATTACHMENT TO THE
PETITION FOR CONTESTED CASE HEARING
FILED BY ALCOA POWER GENERATING INC. v.
NC DEPARTMENT OF HEALTH AND HUMAN SERVICES
AND ITS DIVISION OF PUBLIC HEALTH
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This document is attached to (and made a part of) a petition for contested case hearing filed by Petitioner Alcoa Power Generating Inc. (“APGI”) against respondent North Carolina Department of Health and Human Services (“DHHS”) and its Division of Public Health (“DPH”). As noted therein, the Petition requests a contested case hearing to contest and otherwise appeal a fish consumption advisory (the “Advisory”) issued by DPH and DHHS on or after February 11, 2009. The version of the Advisory posted on the internet can be found as the first of the site-specific advisories listed at <http://www.epi.state.nc.us/epi/fish/current.html>.

Summary and Overview

The Advisory purports to communicate to the public the presence of chemicals in catfish and largemouth bass (“Covered Fish”) located in the waters of Narrows Reservoir (also referred to as “Badin Lake”) located in Stanly, Montgomery and Davidson Counties, and, purportedly on that basis, indicates that members of the public should either limit their consumption of those Covered Fish, or avoid eating the Covered Fish altogether. In addition, DHHS and DPH (“Respondent”), based on the Advisory, are arranging for the manufacture of signs (“Advisory Signs”) that will repeat the substance of the information contained in the Advisory, and are also arranging for the posting of those Advisory Signs at various locations around Badin Lake. By virtue of the issuance of the Advisory and the posting of the Advisory Signs, and the impacts of those actions as discussed herein, APGI is an aggrieved person within the meaning of G.S. 150B-2(6) and other provisions of the Administrative Procedure Act (“APA”), because the Advisory and Advisory Signs directly and indirectly affect Petitioner substantially in its property and has otherwise substantially prejudiced APGI’s rights.

APGI is appealing the Advisory because Respondent changed its evaluation criteria and held Badin Lake to a different standard than other North Carolina lakes and rivers that have been tested and shown to have similar conditions. Specifically, DPH has never before issued a fish advisory based on the findings in a single fish with slightly elevated levels, but that is what DPH did with largemouth bass in Badin Lake. The failure to use consistent evaluation criteria calls into question the confidence the public will place in fish advisories issued by DPH. For the reasons set out below and elsewhere herein, a fish advisory was not warranted and has, upon information and belief, created misimpressions and unnecessary and unjustified concerns among the public and also potentially harms APGI without justification.

While APGI respects Respondent’s duty and desire to protect the public health and inform the public of purported risks, APGI does not believe that an arbitrary and misleading Advisory can or should be allowed to go unchallenged. This Advisory adversely affects the public’s ability to fully utilize the recreational benefits of Badin Lake without undue concern. By failing to use procedures to gather and analyze data that are well-established and have been used consistently for fish advisories at other lakes within the State, the Respondent has done a disservice to the citizens of Stanly, Montgomery, and Davidson Counties (as well as other North Carolinians) who wish to use and enjoy Badin Lake without undue apprehension.

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Background

APGI owns and operates the hydroelectric dam that created Badin Lake (“Dam”) pursuant to a license granted to it (“FERC License”) by the Federal Energy Regulatory Commission (“FERC”) for the Yadkin Hydroelectric Project No. 2197 (“Project”). The Dam is one of four (4) dams and the associated impoundments along the Yadkin River included in the Project. APGI also owns certain lands and property rights that it purchased for the creation of Badin Lake and that are now either submerged under or adjacent to Badin Lake. These lands are included within the boundary of the Project and are covered by the FERC License (the “Project Lands”). APGI has certain responsibilities under the FERC License and the related statutory provisions, rules and regulations (the “FERC Requirements”) including by way of example, but not by way of limitation, providing reasonable public access for recreational and other activities on the lakes within the Project including Badin Lake.

The inaccuracies and impacts of the Advisory and the Advisory Signs on APGI arise because of errors that Respondent made in reaching the decision to issue the Advisory. Among other things, Respondent:

- (a) as part of the public process stated in writing that it would base the decision to issue the Advisory on the average level of concentration, then failed to follow its self-described standards and procedures in the issuance of the Advisory. Specifically, Respondent issued, at the beginning of the process leading to the Advisory, a document entitled a “Communication Plan,” a copy of which is attached hereto as Exhibit A (the “Advisory Plan”), and failed to follow the standards and procedures set forth in its own Advisory Plan;
- (b) improperly selected and applied a testing method that has never before been used in evaluating fish from other waters in the State;
- (c) took the unprecedented action -- which it had never before done, upon information and belief -- of issuing the Advisory as it pertains to largemouth bass based on a slightly elevated level of contamination in a single largemouth bass, as it did in issuing this Fish Advisory, particularly where, as here, all of the other largemouth bass that were caught and sampled contained levels significantly below the stated levels of concern;
- (d) failed to follow its own well-established practice that Respondent has used consistently in its consideration and issuance of other similar fish advisories throughout the State for other lakes, including, without limitation, the fact that Respondent has, upon information and belief, typically issued fish advisories in the past based on average level of contamination in the fish tissue, as DPH had committed to do in this case, but then refused to follow this prior course of conduct or its previously issued Communication Plan, and followed a different approach;

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(e) based the decision to issue the Advisory on an *ad hoc* approach to data interpretation, which was not appropriate given the monitoring and testing procedures used;

(f) applied a new and different standard and issued the Advisory without any basis or explanation as to why they reached what appears to be an arbitrary and capricious determination, and despite other instances where similar levels of contamination have been detected in tissue from fish caught in other lakes, rivers, streams or other surface waters, with no fish advisory being issued as a result;

(g) issued the Advisory without basing its decision on standards that were adequate to support a delegation of authority to the Respondent from the General Assembly; and

(h) in effect, held Badin Lake to a different standard than other lakes and rivers in North Carolina.

Because of these and other errors and shortcomings in the process that Respondent followed, it exceeded its authority or jurisdiction; acted erroneously; failed to use proper procedure; acted arbitrarily and capriciously; failed to act as required by law or rule (including its own guidance); and acted without supporting substantial evidence, all contrary to the requirements of the APA.

Misimpressions of the quality of the Badin Lake environment created as a result of the issuance of the Advisory and posting of the Advisory Signs based on such inadequate, arbitrary and unsupported data and conclusions can be expected to impact use of Badin Lake by the public. While language was included in the Advisory Signs at APGI's urging to attempt to mitigate this misimpression, it will not, upon information and belief, be sufficient to avoid those impacts entirely.

In addition to the immediate impacts that the Advisory and the Advisory Signs will have, as outlined above, they also threaten to have an adverse impact on future decision-making processes involving Badin Lake and Dam. For example, APGI is in the process of seeking a long-term renewal of the FERC License ("FERC Renewal"). The issuance of the FERC Renewal is conditioned upon APGI receiving a Water Quality Certificate for Project discharges, including discharges from Badin Lake, under Section 401 of the Clean Water Act ("401 Certification"). In order for APGI to receive the FERC Renewal, the Division of Water Quality ("DWQ") within the North Carolina Department of Environment and Natural Resources must either issue or deny the 401 Certification by May 7, 2009, or waive its right to do so. APGI has already entered into a settlement agreement with 22 other parties, but the numerous benefits of that agreement including the commitments to increased recreational access opportunities are contingent upon a FERC Renewal as provided in the agreement. APGI's timely receipt of the 401 Certification is important to APGI's receipt of the ultimate long-term FERC Renewal and APGI's operation of Badin Lake and Dam and the benefits to the public that flow therefrom.

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Under Section 401 of the Clean Water Act, a state may condition a certification with “appropriate requirement[s] of State law.” There is no standard promulgated as a rule pursuant to Chapter 150B that is applicable to PCB content of sediment or fish tissue, nor any rule governing how PCB data pertaining to sediment or fish tissue should be interpreted. Nevertheless, DWQ has referenced Respondent’s data and conclusions (culminating in the issuance of the Advisory) as having some role in its process. Thus, Respondent’s actions in issuing the Advisory have already had an adverse impact on DWQ’s consideration of APGI’s application for the 401 Certification and, upon information and belief, could well have additional adverse effects on that process, including APGI’s receipt of the 401 Certification in a timely fashion. It is APGI’s belief and position that the Advisory is not relevant to the issuance of the 401 Certification. Nevertheless, DWQ has already recited the issuance of the Advisory as a basis for putting the consideration of the 401 Application temporarily on hold, and for seeking additional information in response to the Advisory; this was done by letter from Coleen H. Sullins, DWQ Director, to APGI, dated February 24, 2009 (“DWQ Information Request”), a copy of which is attached hereto and labeled Exhibit B. Among other things, paragraph 2 on page 2 of the DWQ Information Request recites that, in order to address whether the concentrations of PCBs that are the subject of the Advisory:

are related to a discharge, staff of [DWQ] will be comparing congeners [sic] of the PCBs in the fish tissue to the congeners [sic] of the PCBs in sediment found at the old Alcoa site. Until this analysis is done, this information is not available for the [DWQ] director’s decision and therefore [APGI’s 401 Certification] application will remain on hold until that information is available and DWQ has the opportunity to review it in the context of our 401 Water Quality Certification decision.

This delay in DWQ’s processing of APGI’s 401 Certification application that has already occurred is directly attributable to the issuance of the Advisory. In addition, it has required the expenditure of time and resources to respond to the request for information, and the delay has resulted in there being less time for final action by DWQ on APGI’s 401 Certification application, which must be acted on no later than May 7, 2009, in order for DWQ to grant the 401 Certification, as required for the FERC Renewal.

In addition, given the reference in DWQ’s Information Request to the Advisory, it appears, upon information and belief, that DWQ might rely on the Advisory, or the data produced in support of the Advisory, in reaching a final decision on the 401 Certification. Any such action, notwithstanding APGI’s position regarding the lack of relevance, could or might materially and adversely affect the 401 Certification process including possible conditions that may be included in the 401 Certification. This, in turn, could well adversely impact APGI’s timely receipt of the FERC Renewal.

ATTACHMENT IX



**Communication Work Plan
Badin Lake Fish Tissue Exposure Investigation**

September 17, 2008

Prepared by:

Occupational & Environmental Epidemiology Branch
Epidemiology Section
Division of Public Health
North Carolina Department of Health & Human Services

ATTACHMENT IX

Communication Work Plan Badin Lake Fish Tissue Exposure Investigation

Objective:

Disseminate to appropriate audiences information gathered through Badin Lake (Stanly & Montgomery Counties, NC) Exposure Investigation (EI). EI is for fish tissue sampling and analysis for polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) to determine potential adverse health effects to persons ingesting Badin Lake fish.

Study overview:

PCBs and PAHs have been detected in sediments and PCBs have been detected in fish collected from Badin Lake in past years. Prior sediment and fish sampling has been limited to the southwest portion of the lake. The Occupational and Environmental Epidemiology and Branch (OEEB) of the N.C. Division of Public Health has proposed an EI through its Health Assessment, Consultation, and Education program to collect fish from three trophic levels (three types of fish) throughout the lake. Fish tissue will be analyzed for PCBs and PAHs. OEEB will evaluate detected levels of PCBs and PAHs in the fish tissue for potential adverse human health effects to persons ingesting those fish. Communication of study results will be provided to county officials, recreational fishermen on Badin Lake, and the public.

Site:	Badin Lake, Stanly and Montgomery Counties, NC
Source:	Sediments contaminated with PCBs and PAHs
Exposure route:	Ingestion of fish tissue
Contaminants:	PCBs and PAHs in fish tissue
Potentially exposed population:	Recreational fishermen on Badin Lake

Dates:

Fish tissue sampling – August - September 2008

Communication of study results – Anticipated time frame January -February 2009

DHHS Team:

1. Sandy Mort – Exposure Investigation Coordinator, Risk Assessor
2. Rick Langley – Medical Epidemiologist, Risk Assessor
3. Ken Rudo – Toxicologist, Risk Assessor
4. Mercedes Hernandez-Pelletier – Health Educator, Develop fact sheets and coordinate communication outreach

Audience:

1. County health departments
2. Recreational users of Badin Lake
3. Recreational and subsistence fishers of Badin Lake
4. Public
5. Local industry associated with Badin Lake
6. NC Wildlife Resource Commission
7. Environmental groups

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Anticipated communication products:

1. Exposure investigation results final report
2. Recommendations for fish consumption advisories for Badin Lake
3. Fact sheets, PCBs and PAHs
4. Press release
5. Public meeting to discuss study results
6. Fish advisory signs posted at Badin Lake fishing areas, if testing shows a potential for adverse health effects

Proposed timeline – Badin Lake Fish Tissue Exposure Investigation:

Activity	Responsible	Communication	Due date
Collect fish tissue samples	S. Mort, OEEB; J. DeBerardinis, DENR/DWQ	▪ Update NCDHHS, NCDENR, SCHD, Local industry on status (telephone, e-mail)	August – September 2008
Analytical services	SGS Environmental Services, Wilmington, NC	▪ Update NCDHHS, NCDENR, SCHD, Local industry on status (telephone, e-mail); ▪ Provide analytical data report to NCDHHS, NCDENR, SCHD, Local industry (e-mail)	September – October 2008
Risk assessment	S. Mort, R. Langley, K. Rudo, OEEB	▪ Provide draft document for comments to NCDHHS, NCDENR, SCHD, Local industry (e-mail); ▪ Provide 2 weeks for above groups to review of draft document (e-mail)	November - December 2008
EI Final Report	S. Mort., OEEB	▪ Send draft Final Report to ATSDR (www). Send ATSDR/NCDHHS Final Report to NCDHHS, NCDENR, SCHD, Local industry (e-mail)	December 2008 – January 2009
Health consult	S. Mort, R. Langley, K. Rudo, M. Hernandez-Pelletier, OEEB	▪ See communications products above, provided to NCDHHS, NCDENR, SCHD, Local industry (e-mail, telephone, public meetings, web postings, press releases, documents)	January – February 2009

NCDHHS = North Carolina Department of Health & Human Services, Raleigh NC

NCDENR = North Carolina Department of Environment & Natural Resources, Raleigh NC

ATSDR = Agency for Toxic Substances & Disease Registry, Atlanta GA

OEEB = NCDHHS Occupational & Environmental Epidemiology Branch, Raleigh NC

SCHD = Stanly County Health Department

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Health risk communication objectives:

1. Inform county and public of why the Exposure Investigation was undertaken.
2. Explain results of study.
3. Explain why alteration of patterns of ingestion of fish caught at Badin Lake (may) be necessary. Identify sensitive populations.
4. Explain why it is in their best interest to alter their ingestion patterns of fish.

Outcome/Message Matrix:

Total PCB Concentration (mg/kg) ^{1,2,3}	Consumption Message
< 0.05	Unlimited consumption
0.05 – 0.10	Limit to one meal per week
0.11 – 0.50	Limit to one meal per month
≥ 0.50	Do not eat

¹ PCB, Polychlorinated Biphenyls

² Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260

³ Mean of PCB in each trophic level by location

Total PAH Concentration (mg/kg) ^{1,2,3}	Consumption Message ⁴
< 0.02	Unlimited consumption
0.02 – 0.08	Limit to one meal per week
0.09 – 0.35	Limit to one meal per month
≥ 0.35	Do not eat

¹ PAH, Polycyclic Aromatic Hydrocarbons

² Draft DHHS PAH limits based on USEPA 2000a, Table 5-3 PAH screening value for carcinogenic effects of benzo(a)pyrene

³ Mean of PAH concentration in each trophic level by location

⁴ Includes loss factor due to cooking

Reference:

USEPA 2000a. USEPA Office of Water. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. Volume 1, Fish Sampling and Analysis, Third Edition. EPA 823-B-00-007

ATTACHMENT IX



North Carolina Department of Environment and Natural Resources
Division of Water Quality

Beverly Eaves Perdue
Governor

Coleen H. Sullins
Director

Dee Freeman
Secretary



February 24, 2009

Mr. Gene Ellis
Licensing and Property Manager
Alcoa Power Generating Inc.
Yadkin and Tapoco Divisions
P.O. Box 576
Badin, NC 28009-0576

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Dear Mr. Ellis:

RE: Additional information needed for 401 Water Quality Certification for APGI hydroelectric license

DWQ # 2007-0812 version 2, Davidson, Rowan, Montgomery and Stanly Counties

On January 15, 2009, the Division of Water Quality (DWQ) conducted a public hearing for the abovementioned project. In response to that hearing, the division has received information from a variety of interested parties concerning your application dated May 9, 2008 and the additional information received on August 29, 2008 and October 2, 2008 for the above referenced project. Based on an initial review of this information, the DWQ has determined that your application was incomplete and/or provided inaccurate information as discussed below. The DWQ will require additional information in order to process your application to impact protected wetlands and/or streams on the subject property in accordance with 15A NCAC 2H .0507(a). We will place this project on hold as incomplete until we receive this additional information. Please provide the following information so that we may continue to review your project.

Additional Information Required:

1. Dissolved oxygen sag – Commentors from the public hearing have asked whether sufficient sampling is being done or is being planned (after turbine upgrades) along river transects below the dams to detect any DO sag which may reduce the effectiveness of turbine improvements. Please clarify where DO samples were taken and are planned to be taken downstream of the dams to address this issue.

1

1617 Mail Service Center, Raleigh, North Carolina 27699-1617
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-807-6492 \ Customer Service: 1-877-623-6748
Internet: www.ncwaterquality.org
An Equal Opportunity \ Affirmative Action Employer

One
North Carolina
Naturally

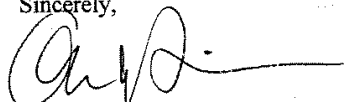
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2. As you know, the Department of Health and Human Services has released their recent study on fish tissue analysis for PCBs in Badin Lake. In order to address whether these concentrations of PCBs are related to a discharge, staff of the Division of Solid Waste Management in DENR will be comparing congeners of the PCBs in the fish tissue to the congeners of the PCBs in sediment found at the old Alcoa site. Until this analysis is done, this information is not available for the director's decision and therefore the application will remain on hold until that information is available and DWQ has the opportunity to review it in the context of our 401 Water Quality Certification decision.
3. As you know, the division plans to conduct some water and sediment sampling from the discharges from the dams. Until that sampling is done and analyzed, that information is also not available to the director and the application will remain on hold until that information is available and DWQ has the opportunity to review it in the context of our 401 Water Quality Certification decision.
4. A question has arisen during the review of the water sample from the Badin Lake discharge as to how the water sample was handled for processing after the sample was taken. Please clarify how the sample was handled during preservation and provide documentation on sample preparation.
5. Please provide data and a map showing all known locations of PCBs at the Alcoa site and in the nearby cove of Badin Lake.
6. Please provide copies of the lab sheets for the sediment sampling in Badin Lake.
7. Please provide copies of the 2007 and 2008 dissolved oxygen data that you reference in your response to the public hearing.
8. Please address the following questions related to the discharge sampling from Badin Lake –
 - a. What was the depth of the water withdrawal from the lake when the sample was taken?
 - b. What is the approximate zone of influence from the withdrawal? In other words when the sample was taken, what is your estimate of the area from which the water was being withdrawn?
 - c. What is the depth of sediment that has accumulated at the dam and what are its characteristics with respect to approximate particle sizes?

Please contact the DWQ in writing within three weeks of the date of this letter to verify that you have received this letter and that you remain interested in continuing to pursue permitting of your project and will be providing the DWQ the requested information at a later date. If we do not hear from you within three weeks, we will assume that you no longer want to pursue this project and we will consider the project as withdrawn. Also please be aware that staff (including the hearing officers) are still reviewing the record and we expect that additional information may be requested in a follow-up letter to you once that review is completed.

This letter only addresses the application review and does not authorize any impacts to wetlands, waters or protected buffers. Please be aware that any impacts requested within your application are not authorized (at this time) by the DWQ. Please call Mr. John Dorney of my staff at 919-733-9646 if you have any questions regarding or would like to set up a meeting to discuss this matter.

Sincerely,



Coleen H. Sullins

CBK/jrd

cc: File Copy

Filename: 20070812ver2Alcoa(Davidson, etc)on hold letterFeb242009

2

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Attachment X

Order Granting Motion to Amend
Scheduling Order (July 27, 2009)
(Fish Advisory Case)

ATTACHMENT X

STATE OF NORTH CAROLINA

COUNTY OF STANLY

FILED

2009 JUL 28 A 7:18

IN THE OFFICE OF
ADMINISTRATIVE HEARINGS

09 DHR 2505

ALCOA POWER GENERATING, INC. OFFICE OF

Petitioner,

vs.

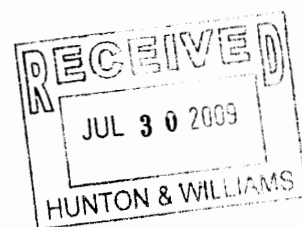
NORTH CAROLINA DEPARTMENT OF
HEALTH AND HUMAN SERVICES, and
its DIVISION OF PUBLIC HEALTH.

Respondent,

and

STANLY COUNTY, NORTH CAROLINA,

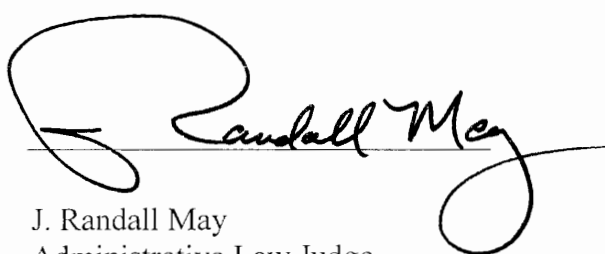
Intervenor-Respondent.

**ORDER GRANTING
MOTION TO AMEND
SCHEDULING ORDER**

The Court entered a scheduling order in this matter on April 17, 2009. Petitioner and Respondent in this matter filed a Joint Motion to Amend Scheduling Order (Motion) requesting time to explore settlement of the matter, including the entry of possible stipulations between the parties. Respondent-Intervenor Stanly County indicates that it agrees to the stay requested in the motion.

The Court hereby GRANTS the Motion and stays this matter pending the outcome of the 401 appeals (as defined in the Motion), or until the parties notify the Court that they have reached a settlement of the matter, or until any of the Parties inform the Court that this matter cannot be resolved amongst themselves and should be rescheduled for discovery and hearing.

ORDERED.

This the 27 day of July, 2009.

 J. Randall May
 Administrative Law Judge

ATTACHMENT X

On this date mailed to:

Charles D. Case, Esq.
Craig A. Bromby, Esq.
Jason S. Thomas, Esq.
Hunton & Williams LLP
Attorneys at Law
P.O. Box 109
Raleigh, NC 27602
ATTORNEY FOR PETITIONER

John P. Barkley, Esq.
Assistant Attorney General
North Carolina Department of Justice
Health & Public Assistance Section
P.O. Box 629
Raleigh, NC 27602-0629
ATTORNEY FOR RESPONDENT

Thomas N. Griffin III, Esq.
Mary Katherine H. Stukes Esq.
Parker Poe Adams & Bernstein, LLP
Three Wachovia Center
Suite 3000
401 South Tryon Street
Charlotte, NC 28202
ATTORNEYS FOR INTERVENOR-RESPONDENT

This the 28th day of July, 2009


Office of Administrative Hearings
6714 Mail Service Center
Raleigh, N.C. 276998-6714
Phone: 919-431-3000
Fax: 919-431-3100

Attachment XI

N.C. 401 Water Quality Certification No. 003173
(issued to APGI) (May 7, 2009), and accompanying
documentation, including one-page DENR release

ATTACHMENT XI

Beverly Eaves Perdue, Governor



Dee Freeman, Secretary

N.C. Department of Environment and Natural Resources

Release: Immediate
Date: May 7, 2009

Contact: Susan Massengale
Phone: (919) 807-6359

WATER QUALITY CERTIFICATION WITH CONDITIONS ISSUED TO ALCOA

RALEIGH – The state Division of Water Quality today issued a water quality certification to Alcoa Power Generating Inc. with conditions to ensure that operation of the hydroelectric generating system will protect state water quality standards, including guaranteed financial support for upgrades related to water quality improvements. This certification does not address issues raised in Gov. Perdue's intervention in the FERC relicensing procedure.

DWQ's review for the certification considered potential water quality impacts from all aspects of the hydroelectric operation that includes facilities at Badin Lake Dam, Falls Dam, High Rock Reservoir and the Tuckertown hydroelectric complex. The evaluation included water quality testing of discharges from the dams; potential movement of sediments and contaminants as a result of the operation of the dams; and low-flow conditions and other potential impacts to aquatic life.

To protect surface water quality in the Yadkin River system, the 401 Water Quality Certification includes the following requirements:

- Sediment removal at the city of Salisbury raw water intake facilities to promote the continued functioning of the intake and use of the waters as related to the designated use for water supply.
- Monitoring of the discharge from the four power generating stations to ensure compliance with water quality standards.
- Monitoring of sediment in the Badin Lake swim/picnic area and Badin Lake boat access area down to the Badin Lake dam for heavy metals, PCBs and poly-aromatic hydrocarbons to ensure that the project operation does not result in the downstream transport of contamination.
- Plan to monitor and regulate reservoir levels and flows of power-generating station operations. The plan must include low-flow protocols for the lakes in the APGI Yadkin River system project in case of drought.
- A plan to increase dissolved oxygen levels in order to meet water quality standards done in accordance with the settlement agreement schedule. An additional in-depth engineering study will be done this summer by APGI to demonstrate the effect of recent turbine upgrades.
- A continuing compliance provision (reopener clause) to ensure that the Division of Water Quality can modify the 401 Certification if water quality-related problems develop in the future that can be remedied in the 401 Certification.
- Portions of the Relicensing Settlement Agreement that are relevant to water quality along with additional site-specific conditions.
- A surety bond in the amount of \$240 million to guarantee that financial resources are available to make improvements to the hydroelectric turbine system in order to improve dissolved oxygen levels in the discharges.

The 401 Certification and hearing officer's report can be found online at <http://h2o.enr.state.nc.us/admin/pubinfo/DWQPubInfoNewsReleases.htm>.

###

Office of Public Affairs
Phone: (919) 715-4112
1601 Mail Service Center, Raleigh, NC 27699-1601

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Diana Kees, Director
FAX (919) 715-5181
diana.kees@ncmail.net

ATTACHMENT XI



North Carolina Department of Environment and Natural Resources
Division of Water Quality

Beverly Eaves Perdue
Governor

Coleen H. Sullins
Director

Dee Freeman
Secretary

May 7, 2009

Mr. William Bunker
Alcoa Power Generating Inc.
V.P. Hydro Operations - Yadkin Division
P.O. Box 576
Badin, NC 28009-0576

Re: Yadkin Hydroelectric Project
Stanly County
DWQ # 2007-0812; FERC Project No. 2197

APPROVAL of 401 Water Quality Certification with Additional Conditions

Dear Mr. Bunker:

The Division staff have reviewed your application, supporting documentation, additional information and public comments and attached hereto is a copy of Certification No. 003173 issued to Alcoa Power Generating, Inc. dated May 7, 2009. Please note that this Certification requires Alcoa Power Generating Inc. to submit a surety bond (or equivalent instrument) to address the need for financial assurance that the improvements related to improvement in water quality will be completed. Please see condition #7 for the specifics of the requirements.

Please note that this Certification is not transferable except after notice to the Division. This Certification does not affect the legal requirements to obtain any other federal, state or local permits including (but not limited to) permits which may be required by the Division of Land Resources, the Division of Waste Management and any other permits required by the Division of Water Quality..

Please contact John Dorney at 919/733-9646 or me at 919/807-6357 if you have questions regarding this Certification.

Sincerely,

Coleen H. Sullins

CHS/jrd/ijm

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Attachments: Certificate of Completion
Surety Bond Form

cc: Becky Fox, EPA, 1307 Firefly Road, Whittier, NC 28789
Alan Johnson, DWQ, Asheville Regional Office
DLR Mooresville Regional Office
File Copy
Central Files
David Treme, Office of the City Manager, Town of Salisbury, P.O. Box 479, Salisbury, NC 28145
Steve Reed, N.C. Division of Water Resources
Ms. Kimberly Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E.,
Washington, DC 20426
Andy Lucas, County Manager's office, Stanly County, 1000 N. First Street, Suite 10, Albemarle, NC 28001
Thomas N. Griffin, III, Three Wachovia Center, Suite 3000, 401 South Tryon Street, Charlotte,
NC 28202-1935
Todd Ewing, NC Wildlife Resources Commission
Rob McDaniel, Hazardous Waste Section, Division of Waste Management
Sandy Mort, DHHS
Commentors from Public Notice
W. Max Walser, Commissioner Davidson County

Filename: **Certification 003173**

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NORTH CAROLINA 401 WATER QUALITY CERTIFICATION

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H, Section .0500 to Alcoa Power Generation Incorporated (APGI) to relicense the Yadkin Project (High Rock, Tuckertown, Narrows (Badin) and Falls reservoirs) on the Yadkin River in Stanly County, North Carolina, pursuant to an application originally filed on the May 10, 2007, withdrawn on May 8, 2008 and subsequently refiled on May 8, 2008 and additional correspondence received August 27, 2007, October 19, 2007, June 20, 2008, October 1, 2008, March 9, 2009, February 16, 2009, March 17, 2009, April 3, 2009 and April 15, 2009.

The application and supporting documentation provides adequate assurance that the proposed work will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application, the supporting documentation, and conditions hereinafter set forth.

This approval is only valid for the purpose and design submitted in the application. If the project is changed, written notification to DWQ and a new application for a new Certification may be required. If the property is sold, the new owner must be given a copy of the Certification and is thereby responsible for complying with all conditions of this Certification. Any new owner must notify the Division and request that the Certification be issued in its name. For this approval to be valid, compliance with the conditions listed below is required.

Conditions of Certification:

Sediment and Erosion Control for any project-related construction:

1. During any project-related construction, erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:
 - a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
 - b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
 - c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
 - d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

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2. No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas. All construction activities, including the design, installation, operation, and maintenance of sediment and erosion control Best Management Practices, shall be performed so that no violations of state water quality standards, statutes, or rules occur;
3. Sediment and erosion control measures shall not be placed in wetlands or waters to the maximum extent practicable. If placement of sediment and erosion control devices in wetlands and waters is unavoidable, they shall be removed and the natural grade restored within six months of the date that the Division of Land Resources has released the project;

Continuing Compliance:

4. APGI shall conduct project operations and any construction activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with section 303(d) of the Clean Water Act) and any other appropriate requirements of State law and federal law. If the Division determines that such standards or laws are not being met by the operation of the Yadkin Project (including the failure to sustain a designated or achieved uses of High Rock, Tuckertown, Badin and Falls Lakes related to water quality of the discharge or sediment levels of toxicants) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, the Division may reevaluate and modify this Certification to include conditions appropriate to assure compliance with such standards and requirements in accordance with 15A NCAC 2H.0507(d). Before modifying the Certification, the Division shall notify APGI and the Federal Energy Regulatory Commission (FERC), provide public notice in accordance with 15A NCAC 2H.0503 and provide opportunity for public hearing in accordance with 15A NCAC 2H.0504. Any new or revised operating conditions shall be provided to APGI in writing, shall be provided to the FERC for reference in any License issued pursuant to the Federal Power Act, and shall become conditions of the License to operate the Yadkin Hydroelectric Project.

Other conditions:

5. Sediment removal at City of Salisbury water supply intake

APGI shall allow access to and provide for dredging operations to remove sand and other debris that may accumulate at the City of Salisbury's water supply intake whenever the accumulation of sand and other debris makes use of the intake inoperable. If this condition conflicts with any existing arrangements between APGI and other parties, then additional written approval is from DWQ to resolve this conflict.

ATTACHMENT XI

6. Additional monitoring conditions

- 6.1. The Fish Sampling Work Plan for Narrows Reservoir dated December 14, 2007 as prepared by URS Corporation shall be conducted by APCI. DWQ shall approve the timing of this sampling.
- 6.2. APCI shall provide yearly monitoring of the discharges from the four lakes for pollutants to include heavy metals and organic pollutants including volatile organic compounds, acid-extractable compounds, base-neutral compounds, and PCBs using a priority pollutant scan analyzed in accordance with 40 CFR Part 136. Test results shall be reported to DWQ, Wetlands Unit and the Mooresville Regional Office of DWQ within 90 days of sampling using DWQ Form – A MR=PPA1 or in a form approved by the Director. This monitoring shall be done annually for at least five years unless the monitoring detects levels of pollutants that violate water quality standards. At the end of five years, APCI may submit a request for approval to modify the monitoring requirements. If this monitoring reveals levels of contaminants that are of concern with respect to water quality standards, then the Continuing Compliance Clause (condition 4 above) shall be invoked and a plan developed by APCI for DWQ's written approval to address these concerns. Sensitivity levels for these analyses must be at least those used by DWQ's Central Laboratory.
- 6.3. APCI shall provide yearly monitoring for lake sediment in a series of transects from the Alcoa Badin Works Plant site to the discharge from the dam for those heavy metals and compounds including PCBs and PAHs that are present in the sediment in the swimming area as reported in the Badin Lake Swim/Picnic Area and Badin Boat Assess Sediment Assessment, Stanly County. This monitoring shall be done annually for at least five years unless the monitoring detects movement of these contaminants from the cove toward the dam. Sensitivity levels for these analyses must be at least those used by DWQ's Central Laboratory. At the end of the five years, APCI may submit a request for approval to modify the monitoring requirements. If movement of these toxicants is detected, then APCI shall submit a plan for written DWQ approval that ensures that the contaminant movement shall be stopped and that water quality and uses are not degraded.

- 7.0 Performance/surety bond – APCI or its parent company Alcoa, shall provide a surety bond (or equivalent instrument) in favor of the State of North Carolina, executed by a surety approved by the Commissioner of Insurance. This bond shall be in the amount of \$240 million to cover all water quality improvement costs including costs associated with modifications at High Rock, Tuckertown, Narrows (Badin) and Falls Lake dams for turbine improvements, including the dissolved oxygen monitoring necessary to show the success of these improvements. This bond shall be provided within ninety days of receipt of the Certification, must be continuous in nature, must bind to APCI or Alcoa as well as their heirs and successors. The bond shall be conditioned upon the faithful performance of the requirements set forth in this Certification. Upon filing the bond with the Department, APCI or its parent company Alcoa, or its heirs and successors shall lose all right, title, and interest in the bond while the bond is held by the Department. The bond shall be maintained until the improvements and the monitoring confirms that the dissolved oxygen standard has been met for at least three (3) consecutive years and approved in writing by the Division unless released via written notification from the Division. In no event shall the liability to the surety exceed the amount of the surety bond required by this Condition. Notification shall be given upon completion of compliance or acceptance by the Division of a substitute bond. This bond shall remain in force until canceled by the surety. Cancellation by the surety shall be effectuated only upon 60 days written notice thereof to the Division and to the operator. If the surety bond is canceled, then APCI or its parent company Alcoa as well as their heirs and successors shall provide a

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ATTACHMENT XI

new surety bond within ninety days of the cancelation that also meets the same requirements as previously described in this Condition. If that new surety bond is not issued in this time frame, then this Certification is null and void. This surety bond may be terminated by the State of North Carolina upon an affirmative showing that the improvements and the monitoring have been successfully accomplished such that dissolved oxygen water quality standards have been met for at least three (3) consecutive years. This Certification is only effective once the required performance/surety bond is in place.

8. APCI must conduct a study similar to the 2004 study on the Narrows (Badin) Lake turbines during the summer of 2009 (with both turbines upgraded) in order to provide scientific and engineering assurance that the plan to meet dissolved oxygen standards will be successful below Narrows (Badin) Lake. DWQ must approve the final study plan and the results of the study. A similar study will need to be once both upgrades are done to the High Rock Lake turbines. A study plan shall be submitted to DWQ for approval prior to implementation. The final results of the study shall be submitted to DWQ upon completion.
9. Other Relicensing Settlement Agreement Conditions – The following conditions were taken from appropriate sections of the Relicensing Settlement Agreement February 2007 related to project operations affecting water quality standards and uses including dissolved oxygen enhancements, in-stream flows, reservoir shoreline protection and compliance monitoring. Any conflict with these conditions and the Relicensing Settlement Agreement will need additional written confirmation from DWQ in order to address these conflicts.

a. Project Operations

Unless in accordance with the Hydro Project Maintenance and Emergency Protocol (HPMEP) and Low Inflow Protocol (LIP), Project minimum flows take priority over reservoir water elevations, as specifically described in Articles PO-1 and PO-2, below.

Article PO-1 - Reservoir Operations

A. High Rock Reservoir Operations

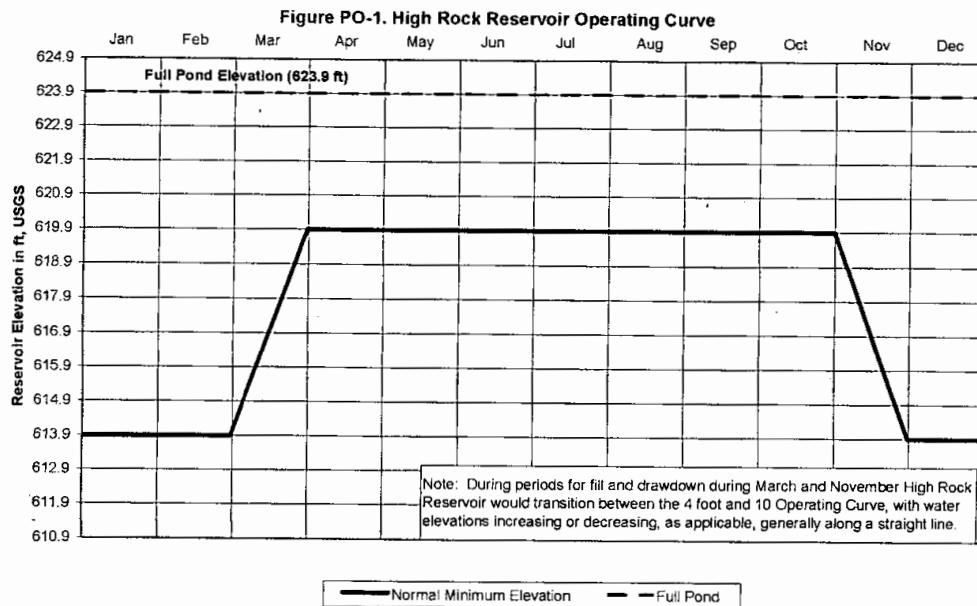
The Applicant (APCI) shall operate High Rock Reservoir at or above the normal minimum elevation (NME) as depicted on the High Rock Operating Curve (Figure PO-1), except as needed in order to maintain minimum flows or as provided under the Low Inflow Protocol (LIP) or the Hydro Project Maintenance and Emergency Protocol (HPMEP). High Rock Reservoir may be drawn down below its NME in order to meet the Required Minimum Instream Flow at Falls, as specified in Article PO-2, only after Narrows Reservoir has reached its NME. If High Rock Reservoir water elevation is below the NME at 12:01 AM on any operating day, where the operating day is defined as 12:01 AM through 12:00 midnight, the Applicant shall reduce releases from High Rock Reservoir for that operating day up to a maximum of the daily average flow equivalent of the minimum flow requirement at Falls, as specified in Article PO-2. Under this condition, releases from Falls will be limited to those defined in Article PO-2.

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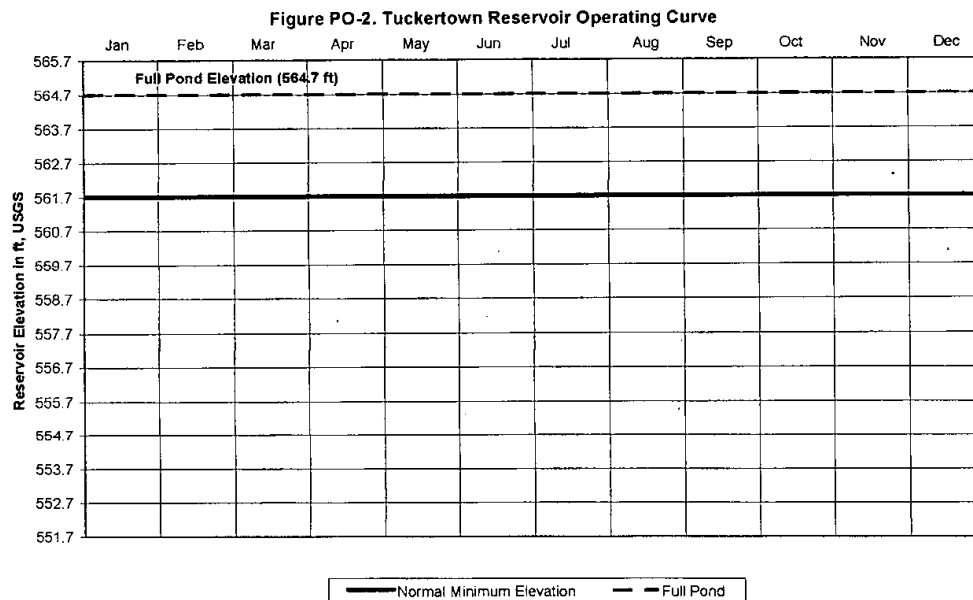
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B. Tuckertown Reservoir Operations

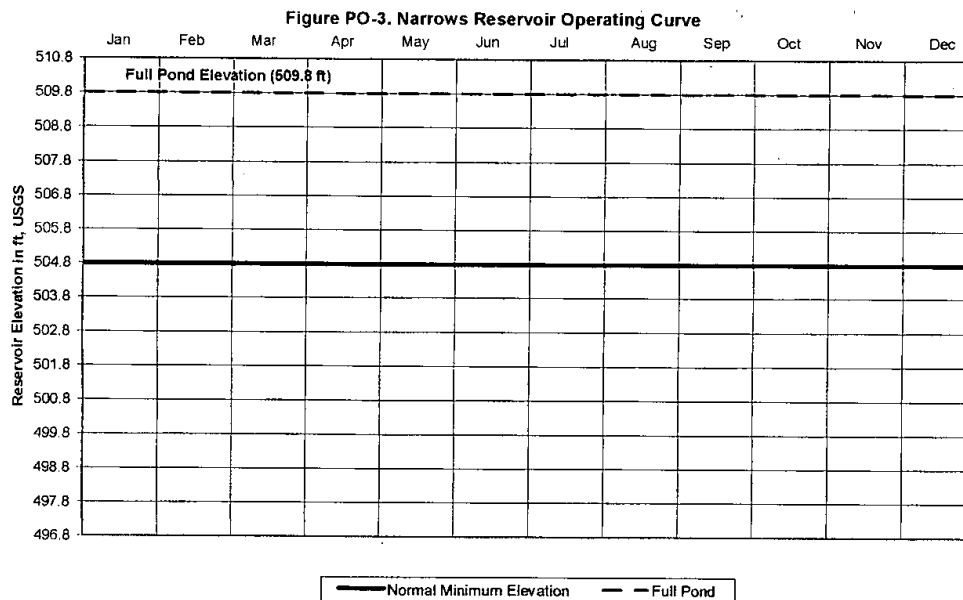
The Applicant shall operate Tuckertown Reservoir at or above the NME as depicted on the Tuckertown Operating Curve (Figure PO-2), except as provided in the HPMEP.



ATTACHMENT XI

C. Narrows Reservoir Operations

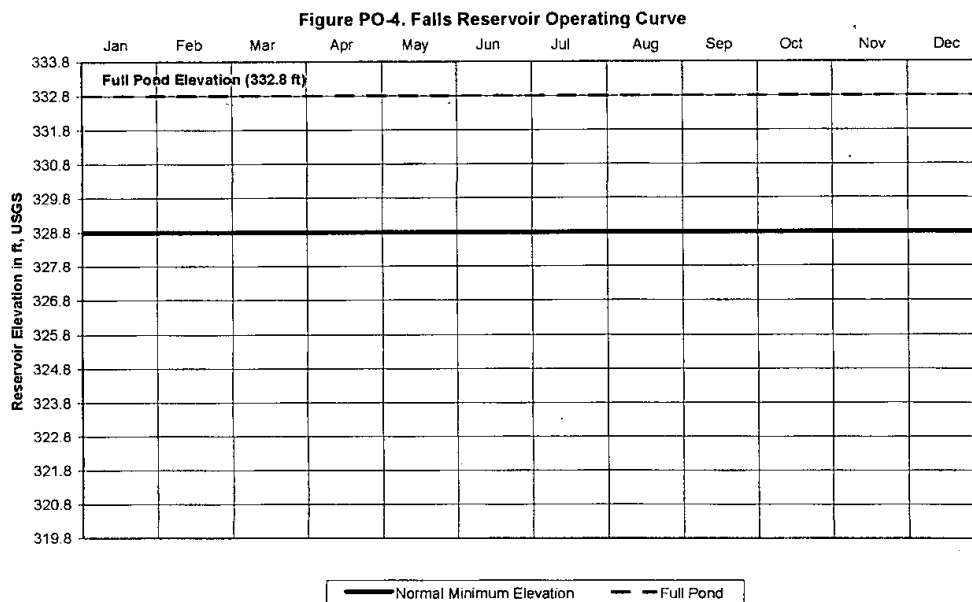
The Applicant shall operate Narrows Reservoir at or above the NME as depicted on the Narrows Operating Curve (Figure PO-3), except as needed in order to maintain minimum flows, or as provided under the LIP or HPMEP.



ATTACHMENT XI

D. Falls Reservoir Operations

The Applicant shall operate Falls Reservoir at or above the NME as depicted on the Falls Operating Curve (Figure PO-4), except as provided in the HPMEP.



E. Reservoir Stabilization to Enhance Fish Spawning

From April 15 through May 15 of each year, the Applicant will endeavor to maintain reservoir water elevations at all four Project reservoirs no lower than -1.0 feet below the elevation of each reservoir on April 15 to enhance conditions for fish spawning in the reservoirs. No later than August 31 of each year, the Applicant will report the resulting reservoir water elevations at each reservoir during the April 15 through May 15 period in a letter report to the North Carolina Wildlife Resources Commission (NCWRC). The letter report will provide an explanation of any circumstances that prevented the Applicant from maintaining the target water elevations. Within 60 days of filing the letter report with the NCWRC, a copy of the letter report will be filed with NCDWQ and FERC. Satisfaction of these reporting commitments shall constitute compliance with this Article.

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ATTACHMENT XI

Article PO-2 - Project Instream Flows

A. Required Minimum Instream Flows

Commencing no later than six months from the effective date of the License and except when operating under the Low Inflow Protocol (LIP) or Hydro Project Maintenance and Emergency Protocol (HPMEP), the Applicant shall operate the Project to provide a daily average minimum flow from the Falls Development according to the following schedule:

June 1 – January 31	1,000 cfs
February 1 – May 15	2,000 cfs
May 16 – May 31	1,500 cfs

B. Flow Adjustment for Enhancement of Downstream Spawning

The Applicant will work with the licensee of the Yadkin-Pee Dee River Project, FERC No. 2206, (Downstream Licensee), the North Carolina Division of Water Resources (NCDWR), the North Carolina Wildlife Resources Commission (NCWRC), the South Carolina Department of Natural Resources (SCDNR), the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), The Nature Conservancy (TNC) and American Rivers (collectively, Group) to develop a process to allow the Downstream Licensee to provide adjusted flow between February 1 and May 15 to enhance spawning conditions in the lower river downstream of the Blewett Falls development, part of the Yadkin-Pee Dee River Project.

The Applicant's role in enhancing downstream spawning below Blewett Falls will be limited to:

1. Attending an annual meeting with the Group, if held, to consider expected flow and hydrologic conditions and to schedule adjusted flow period(s) for the upcoming spawning season, and
2. Once the schedule for adjusted spawning flow period(s) has/have been established by the Group, the Applicant will communicate its daily generation/flow release schedule during the adjusted spawning flow period(s) to the Downstream Licensee at least one week in advance of the start of the adjusted spawning flow period(s). If unexpected hydrologic conditions, or other conditions, such as those covered in the Low Inflow Protocol (LIP, Appendix A) or the Hydro Project Maintenance and Emergency Protocol (HPMEP, Appendix B), occur during any adjusted spawning flow period, the Applicant shall communicate to the Downstream Licensee any resulting changes in its daily generation/flow release schedule for the remainder of that adjusted spawning flow period.

The Applicant will not be required to attempt to match Yadkin Project outflow to inflow during any adjusted spawning flow period(s), nor will the Applicant be required to provide an instantaneous minimum flow release from the Yadkin Project during any adjusted spawning flow period(s).

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ATTACHMENT XI

The Applicant's participation in enhancement of downstream spawning will take place within the confines of the other requirements of the New License and 401 Water Quality Certification relating to management of flows and reservoir water elevations, and would not result in any modification of those flow and reservoir management requirements. Specifically, nothing in this section will require or cause the Applicant to fall below the Project Minimum Flows as described in Article PO-2 or to have to modify its reservoir operations as prescribed in Article PO-1.

If state and federal agencies and the Downstream Licensee are unable to come to an agreement on what measures are to be undertaken by the Downstream Licensee to achieve Flow Adjustment for Enhancement of Downstream Spawning, the Applicant will be under no obligation to meet the commitments outlined in Article PO-2, section B.

Article PO-3 - Flow and Reservoir Elevation Monitoring

Within six months of the effective date of the License, the Applicant shall file with the North Carolina Division of Water Quality (NCDWQ) a final Flow and Reservoir Elevation Monitoring and Compliance Plan for the Yadkin Project. The Flow and Reservoir Elevation Monitoring and Compliance Plan shall be developed in consultation with the North Carolina Division of Water Resources (NCDWR), the South Carolina Department of Natural Resources (SCDNR), the U.S. Geological Survey (USGS) and the Downstream Licensee (the Licensee of the Yadkin-Pee Dee River Project, FERC No. 2206), and shall include detailed provisions for monitoring reservoir water elevations and for monitoring flows from both the Falls and High Rock developments.

The Applicant shall include with the final plan documentation of consultation, copies of comments and recommendations on the draft plan after it has been prepared and provided to the agencies and Downstream Licensee, and specific descriptions of how comments are accommodated by the final plan. The Applicant shall allow a minimum of 30 days for the agencies and Downstream Licensee to comment prior to filing the plan with the NCDWQ. If the Applicant does not adopt a recommendation, the filing shall include the Applicant's reasons, based on Project-specific information.

The NCDWQ reserves the right to require changes to the plan. Upon NCDWQ approval, the Applicant shall submit the plan to the FERC for approval. Upon receiving FERC approval, APGI shall implement the plan, including any changes required by the NCDWQ. The Applicant shall file the final plan with NCDWQ within 30 days of receiving FERC approval.

A. Releases from High Rock Development

Flow monitoring from the High Rock Development will serve as the measure for the flow releases from the High Rock Development required under Article PO-1 or under the Low Inflow Protocol (LIP). Daily average flows within +25% of the applicable maximum flow, measured from 12:01 AM to 12:00 midnight, shall be considered compliant for each operating day.

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B. Releases from Falls Development

Flow monitoring from the Falls Development will serve as the compliance measure for the flow release from the Falls Development required under Articles PO-1, PO-2 or under the LIP. Daily average flows within -5% of the applicable minimum flow, measured from 12:01 AM to 12:00 midnight, shall be considered compliant for any operating day so long as:

- a) Whenever High Rock Reservoir is at or above its normal minimum elevation (NME), the applicable daily average minimum flow is achieved on a weekly average basis, measured from 12:01 AM Saturday to 12:00 midnight Friday.
- b) Whenever High Rock Reservoir is drawn down below its NME (when a maximum release from Falls is also applicable), releases from Falls shall be limited to +/- 5% of the cfs equivalent of the Required Instream Minimum Flow at Falls, as measured on a weekly average basis from 12:01 AM Saturday to 12:00 midnight Friday.

The Applicant shall endeavor to meet the Required Minimum Instream Flows required in Article PO-2, and shall not routinely use the flow variances provided above. The Applicant shall prepare an annual flow monitoring report documenting its compliance with minimum flow releases, including a record of any days during the year when the daily average required minimum instream flow fell within the -5% and was made up as part of the weekly average, a record of flows during any period when High Rock was below its NME, and a record of any LIP events. By no later than March 31 of the following year, the Applicant shall file the report with NCDWQ of the North Carolina Department of Environment and Natural Resources (NCDENR) summarizing its evaluation. If, based on the results of the report, the State of North Carolina has a concern about the frequency or pattern of use of the variance by the Applicant, the State may request consultation with the Applicant to discuss the Applicant's reasons for that use and any practicable alternatives to that use.

Article PO-4 - Low Inflow Protocol (LIP)

This Article highlights the responsibilities of the Applicant from Appendix A, "Low Inflow Protocol for the Yadkin and Yadkin-Pee Dee River Hydroelectric Projects." The complete text of the LIP is also attached for inclusion by reference in the 401 Water Quality Certificate.

A. Definitions

The following definitions shall be applicable to this Article PO-4:

- Stream Gage Three-Month Rolling Average Flow – The three-month rolling average of streamflow at the following U.S. Geological Survey (USGS) stream gages:
 - Yadkin River at Yadkin College (02116500)
 - South Yadkin River near Mocksville (02118000)

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- Abbotts Creek at Lexington (02121500)
- Rocky River near Norwood (02126000)

On the last day of each month, the Applicant shall calculate the arithmetic mean of (a) the daily flows of the current month and (b) the arithmetic mean of the daily flows of each of the two preceding months. The sum of the three-month rolling average for these four gage stations shall be compared by the Applicant to the Historic Stream Gage Three-Month Rolling Average Flow for the corresponding period and a percentage of Historic Three-Month Rolling Average shall be calculated.

- **Historic Stream Gage Three-Month Rolling Average Flow** – The historical three-month rolling average flow for each of the four designated USGS stream gages for the period 1974 through 2003 (except for the Abbotts Creek gage, for which the period is 1988 through 2003) are set forth in Table LIP-1 below:

Table LIP-1. Historic Stream Gage Three-Month Rolling Average Flow

For Evaluation of Flow Trigger on:	Average of daily flows during:	Historic Three-Month Rolling Average Flow, cfs
January 1	Oct-Nov-Dec	4,000
February 1	Nov-Dec-Jan	5,200
March 1	Dec-Jan-Feb	6,250
April 1	Jan-Feb-Mar	7,700
May 1	Feb-Mar-Apr	7,550
June 1	Mar-Apr-May	6,850
July 1	Apr-May-Jun	5,350
August 1	May-Jun-Jul	4,200
September 1	Jun-Jul-Aug	3,600
October 1	Jul-Aug-Sep	3,200
November 1	Aug-Sep-Oct	3,300
December 1	Sep-Oct-Nov	3,550

- **Full Pond Elevation** – The Full Pond Elevation for each development's reservoir is listed in Table LIP-2:

Table LIP-2. Full Pond Elevations

Reservoir	Full Pond Elevation (feet, USGS datum - NGVD 1929)
High Rock	623.9
Tuckertown	564.7
Narrows	509.8
Falls	332.8

- **Normal Minimum Elevation (NME)** – NME for each Project reservoir is listed in Table LIP-3.

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Table LIP-3. Normal Minimum Elevations (feet, USGS datum - NGVD 1929)

Month	High Rock	Tucker-town	Narrows	Falls
Full Pond	623.9	564.7	509.8	332.8
January 1	613.9	561.7	504.8	328.8
February 1	613.9	561.7	504.8	328.8
March 1	transition	561.7	504.8	328.8
April 1	619.9	561.7	504.8	328.8
May 1	619.9	561.7	504.8	328.8
June 1	619.9	561.7	504.8	328.8
July 1	619.9	561.7	504.8	328.8
August 1	619.9	561.7	504.8	328.8
September 1	619.9	561.7	504.8	328.8
October 1	619.9	561.7	504.8	328.8
November 1	transition	561.7	504.8	328.8
December 1-15	613.9	561.7	504.8	328.8
December 16-31	613.9	561.7	504.8	328.8

- U.S. Drought Monitor Three-Month Numeric Average** – The Applicant shall calculate a three-month rolling average of U.S. Drought Monitor (<http://www.drought.unl.edu/dm/monitor.html>) values by (a) assigning a numeric value equal to the highest U.S. Drought Monitor designation (e.g. D0=0, D1=1, D2=2, D3=3 and D4=4) for any part of the Yadkin-Pee Dee River Basin draining to Blewett Falls development as of the last day of that month; and (b) calculating an arithmetic mean of that numeric value and numeric values correspondingly assigned for the previous two months. A normal condition in the basin, defined as the absence of a drought designation, shall be assigned a numeric value of negative one (-1).
- Yadkin-Pee Dee River Basin Drought Management Advisory Group (YPD-DMAG)** –The YPD-DMAG shall consist of one representative from each of the following organizations (to the extent that they are willing to participate): Alcoa Power Generating Inc. (APGI), Progress Energy (PE), North Carolina Department of Environment and Natural Resources (NCDENR), North Carolina Division of Water Resources (NCDWR), North Carolina Division of Water Quality (NCDWQ), North Carolina Wildlife Resources Commission (NCWRC), South Carolina Department of Natural Resources (SCDNR), South Carolina Department of Health and Environmental Control (SCDHEC), the United States Fish and Wildlife Service (USFWS), High Rock Lake Association (HRLA), Badin Lake Association (BLA), Duke Power Company, Lake Tillery Homeowners Association, South Carolina Pee Dee River Coalition (SCPDRC) and owners of intakes that withdraw more than one million gallons of water per day from the impoundments of either the Yadkin Project (FERC Project 2197) or the Yadkin-Pee Dee Project (FERC Project 2206).

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B. Implementation Procedure

1. Table LIP-4 sets forth the combinations of conditions under which the LIP shall be implemented. The determination of the applicable LIP Stage shall be made using the High Rock Reservoir water elevation as of midnight between the last day of the previous month and the first day of the current month in combination with the U.S. Drought Monitor Three-Month Numeric Average and the Stream Gage Three-Month Rolling Average Flow to determine the need to declare or change a Stage of the LIP. The LIP shall be implemented beginning at Stage 0 and, if the combination of conditions becomes more severe, the Stages shall increase in one Stage increments.

Table LIP-4: Summary of LIP Triggers					
Stage	High Rock Reservoir Elevation		US Drought Monitor Three-Month Numeric Average		Stream Gage Three-Month Rolling Average as a percent of the Historical Average
0	< NME minus 0.5 ft	and	any	or	any
	OR				
	< NME	and either	≥ 0	or	< 48 %
1	< NME minus 1 ft	and either	≥ 1	or	< 41 %
2	< NME minus 2 ft	and either	≥ 2	or	< 35 %
3	< NME minus 3 ft	and either	≥ 3	or	< 30 %
4	< $\frac{1}{2}$ of (NME minus Critical Reservoir Water Elevation)	and either	≥ 4	or	< 30 %

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2. The average daily flows set forth in Table LIP-5 shall be initiated no later than seven days after the determination of the applicable LIP Stage and shall be in effect for the balance of the month except as provided in the section titled "Recovery from LIP Stages."

Table LIP-5: LIP Flows⁽¹⁾, cfs						
Stage	High Rock (daily average maximum flow target)			Falls⁽²⁾ (daily average flow target)		
	Feb 1-May 15	May 16- 31	Jun 1-Jan 31	Feb 1- May 15	May 16-31	Jun 1-Jan 31
0	2000	1500	1000	2000	1500	1000
1	1450	1170	900	1450	1170	900
2	1080	950	830	1080	950	830
3	770	770	770	770	770	770
4	Additional measures may be determined by consensus of the Applicant and State Agencies, subject to NCDWQ approval					
	1 (1) Developments shall be operated to achieve the target flows to the extent practicable as a first priority and to supplement inflows equitably from the storage reservoirs as a second priority. For LIP Stages 1, 2, 3 and 4, APGI shall achieve the indicated average daily flows set forth in this table by supplementing Project inflows by drawing proportionally from High Rock and Narrows reservoirs such that the difference between the respective drawdowns below NME of High Rock and Narrows reservoirs shall be approximately one foot. 2 3 (2) For LIP Stages 0-3, the values shown in this table reflect flow targets. These values cannot be met exactly as shown and shall likely vary slightly on a real time basis from the values shown here, but it is expected that the variances from the target flows shall be minimal.					

3. The Applicant shall notify via email the NCDWR of LIP implementation or a change in Stage as soon as practicable but no later than (i) three business days after a Stage 0 determination; (ii) two business days after a Stage 1 or a Stage 2 determination; or (iii) 48 hours after a Stage 3 or Stage 4 determination.
4. The Applicant shall consult with the YPD-DMAG with respect to issues relating to or arising out of implementation of the LIP, including, but not limited to, (i) notification to the public of the possible effects of and/or continuance of drought; (ii) issues relating to the effects of drought conditions on life, health,

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property, wildlife, aquatic life; (iii) possible public health concerns; and (iv) short and long term prospects for recovery from drought.

5. The Applicant shall develop and provide information on its website to inform the public on reservoir water elevations, Project releases, usability of public access areas, reservoir inflows, meteorological forecasts, Historic and Actual Stream Gage Three-Month Rolling Average Flow calculations, U.S. Drought Monitor Three-Month Numeric Average calculations, LIP status, YPD-DMAG meeting summaries, and implementation of maintenance or emergency operation plans.

C. Recovery from LIP Stages

1. Recovery from the LIP shall be triggered by the occurrence of any of the three following conditions either separately or in combination:

- Condition 1: All three triggering conditions associated with a lower numbered LIP Stage, as described in Table LIP-4, are met.

OR

- Condition 2: High Rock Reservoir water elevations return to at or above the NME plus 2.5 ft.

OR

- Condition 3: High Rock Reservoir water elevations return to at or above the NME for 2 consecutive weeks.

2. When any of these three conditions occurs, the Applicant shall take the following actions as indicated by the particular condition:

- Condition 1: The LIP recovery shall be a stage-by-stage reversal of the staged approach described in Table LIP-4 above, beginning at the first day of each month.
- Condition 2: Implementation of the LIP shall be immediately discontinued.
- Condition 3: Implementation of the LIP shall be immediately discontinued.

3. The Applicant shall notify the NCDWR via email within 3 business days following attainment of any of the conditions necessary to return to a lower stage of the LIP.

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D. Updating the LIP

During the term of this license, the Applicant shall consult with the YPD-DMAG at least once every five (5) years to review and consider updating the LIP. The use of the period of record 1974 through 2003 to calculate the Historic Stream Gage Three-Month Rolling Average flows set forth in Table LIP-1 of this Article shall be evaluated every five years during such review. On the basis of such consultation, review and consideration, the Applicant may propose modifications to this Article for the NCDWQ's review and approval.

Funding of Gages

Assuming the U.S. Geological Survey (USGS) has necessary rights for the License term, the Applicant shall continue to provide 100% funding support during the License term for the maintenance of the following USGS standard flow gages that are used in the LIP to determine the Three-Month Rolling Average Flow:

- Yadkin River at Yadkin College (02116500)
- South Yadkin River near Mocksville (02118000)
- Abbotts Creek at Lexington (02121500)

Any substantial increase in funding support due to changes in these flow gages are subject to review by the Applicant with the North Carolina Department of Environment and Natural Resources (NCDENR). The Applicant may review and propose changes in the contractor, location, or equipment associated with these gages. Any changes proposed by the Applicant will require agreement of NCDENR's Division of Water Quality.

Article PO-5 - Hydro Project Maintenance and Emergency Protocol

If conditions so warrant, the Applicant shall operate the Project in accordance with the Hydro Project Maintenance and Emergency Protocol (HPMEP) included as Appendix B, "Yadkin Project Hydro Project Maintenance and Emergency Protocol." The complete text of the HPMEP is also attached for inclusion by reference in the 401 Water Quality Certificate.

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b. Water Quality

Article WQ-1 - Water Quality

A. Tailwater Dissolved Oxygen Enhancement Schedule

The Applicant shall install equipment and implement measures designed to enhance Yadkin Project (Project) tailwater dissolved oxygen (DO) conditions as specified in the schedule in Table WQ-1.

Table WQ-1. Dissolved Oxygen Enhancement and Monitoring Schedule

Year	DO Enhancement Action	Monitoring/Reporting
2007 ¹		- Continuous DO/temperature monitoring 5/1-11/30 at existing stations in all four tailwaters. - File Draft DO Monitoring Plan and Quality Assurance Project Plan (QAPP) with the North Carolina Division of Water Quality (NCDWQ) as part of 401 Application.
	Narrows Units 2 & 4 - Completed	- Continuous DO/temperature monitoring 5/1-11/30 at existing stations in all four tailwaters. - File Final DO Monitoring Plan and QAPP for approval by NCDWQ and the Commission.
2009	Narrows Unit 1 - Addition of two aeration valves by 12/31/09.	- Implement NCDWQ/FERC approved DO Monitoring Plan. - File annual DO monitoring data report with NCDWQ by March 31.
2010	Narrows Unit 3 - Addition of two aeration valves by 12/31/10. High Rock Unit 3 - Install "through the blade" aerating turbine by 12/31/10.	- Monitoring/reporting in accordance with DO Monitoring Plan.
2011	High Rock Unit 2 - Install a "through the blade" aerating turbine by 12/31/11.	- Monitoring/reporting in accordance with DO Monitoring Plan. - Initiate special study (up to 2 years) to evaluate the effectiveness of the aeration at Narrows on DO levels being discharged from Falls (2011-2012).

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Year	DO Enhancement Action	Monitoring/Reporting
2012	High Rock Unit 1 - Install a "through the blade" aerating turbine by 12/31/12.	- Monitoring/reporting in accordance with DO Monitoring Plan. - Complete second year of 2-year study of effectiveness of aeration at Narrows on DO at Falls by 12/31/12 and prepare Study Report.
2013		- Monitoring/reporting in accordance with DO Monitoring Plan. - File 2-year Narrows/Falls DO Study Report with NCDWQ by 3/1/13. - If 2-year study does not demonstrate compliance at Falls, file an Action Plan for DO (DOAP) enhancement at Falls with NCDWQ by 12/31/13. - Initiate special study (up to 2 years) to evaluate the effectiveness of aeration at High Rock on DO levels being discharged from Tuckertown (2013-2014).
2014	Falls Unit 1 - Install aeration valves or other appropriate aeration technology, if needed, in accordance with Falls Action Plan by 12/31/14.	- Monitoring/reporting in accordance with DO Monitoring Plan. - Complete second year of 2-year study of High Rock/Tuckertown DO by 12/31/14 and prepare Study Report.
2015	Falls Unit 2 - Install aeration valves or other appropriate aeration technology, if needed, in accordance with Falls Action Plan by 12/31/15.	- Monitoring/reporting in accordance with DO Monitoring Plan. - File 2-year High Rock/Tuckertown DO Study Report with NCDWQ by 3/1/15. - If 2-year study does not demonstrate compliance at Tuckertown, file an Action Plan for DO enhancement at Tuckertown by 12/31/15.

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Year	DO Enhancement Action	Monitoring/Reporting
2016	Falls Unit 3 - Install aeration valves or other appropriate aeration technology, if needed, in accordance with Falls Action Plan by 12/31/16. Tuckertown - Install aeration technology, if needed, at Tuckertown in accordance with Tuckertown Action Plan by 12/31/16.	- Monitoring/reporting in accordance with DO Monitoring Plan.

Notes: 1 Actions to be taken under the current, existing FERC License for the Yadkin Project, not the New License.

B. Tailwater Dissolved Oxygen Enhancement Operations

As DO enhancement equipment or measures are installed or implemented on the schedule in Table WQ-1, the Applicant shall operate the generating units with DO enhancement equipment added on a "first-on-last-off" basis, subject to unit availability, from no later than May 1 of each year through November 30 of each year. If DO enhancement equipment or measures are not associated with generating equipment, once completed, that equipment or those measures shall be operated or implemented as designed from no later than May 1 of each year through November 30 of each year.

If at any time during the term of the New License, the Applicant can demonstrate through studies and/or monitoring that DO conditions have improved, the Applicant may consult with the North Carolina Division of Water Quality (NCDWQ) regarding the possibility of reducing the period of DO enhancement operations (May 1 – November 30). Should any such consultation result in an agreement between the Applicant and the NCDWQ to modify the operation of the Project for purposes of DO enhancement, the Applicant shall consult with the NCDWQ to develop a plan to revise DO enhancement operations. The Applicant shall include with the plan, an implementation schedule, documentation of consultation, copies of comments and recommendations on the plan after it has been prepared and provided to NCDWQ, and specific descriptions of how NCDWQ's comments are accommodated by the plan. The Applicant shall file the plan with the FERC within 30 days of receiving NCDWQ's written approval of the plan.

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Article WQ-2 - Dissolved Oxygen Monitoring

Within six months of the effective date of the New License, the Applicant shall file with NCDWQ a Dissolved Oxygen Monitoring Plan (DO Monitoring Plan) and Quality Assurance Project Plan (QAPP) for the Project. The DO Monitoring Plan and QAPP will be developed in consultation with NCDWQ and other appropriate state and federal resource agencies.

The primary component of the DO Monitoring Plan will be the operation of four (4) continuous DO/temperature monitors (one in each tailwater), for the period May 1 through November 30 of each year. The Plan shall include a schedule for preparing an annual DO and temperature data report. The annual report shall be filed with NCDWQ and the Downstream Licensee no later than March 31 of the following year.

The Plan shall also include provisions for conducting two studies as part of the overall DO enhancement schedule (Table WQ-1) designed specifically to investigate the effectiveness of aeration technology installed and operating at Narrows on the DO conditions in the Narrows and Falls tailwaters, and the effectiveness of aeration technology installed and operating at High Rock on DO conditions in the High Rock and Tuckertown tailwaters. At the completion of each of the two studies, the Applicant shall prepare a study report which shall be filed with NCDWQ in accordance with the schedule in the DO Monitoring Plan. If the study results demonstrate that the Falls and/or Tuckertown tailwaters do not meet state dissolved oxygen standards as a result of Project operations, the Applicant shall prepare a DO Action Plan (DOAP) for the Falls and Tuckertown developments, respectively. The resulting DOAP(s), if needed, will be filed with NCDWQ in accordance with the schedule shown in Table WQ-1.

The Applicant shall file the DO Monitoring Plan with the FERC within 30 days of receiving NCDWQ's written approval of the plan. The Applicant shall include with the DO Monitoring Plan an implementation schedule, documentation of consultation, copies of comments and recommendations on the plan after it has been prepared and provided to NCDWQ, and specific descriptions of how NCDWQ's comments are accommodated by the plan.

Article WQ-3 - Additional Dissolved Oxygen Enhancement Actions

If at any time during the term of the New License, after all the DO enhancement equipment and measures outlined in Table WQ-1 have been installed and implemented, all of the planned unit upgrades have been completed and the upgraded units are operational, and at least two additional years of monitoring have been completed, the Applicant is notified by the NCDWQ that based on the results of monitoring under the DO Monitoring Plan, State water quality standards are not being met as a result of the Applicant's hydroelectric operations, the Applicant shall consult with the NCDWQ to develop a plan to implement corrective actions. The Applicant shall file a Dissolved Oxygen Corrective Action Plan (DOCAP) for NCDWQ approval within one year of initiating consultation with the NCDWQ. The Applicant shall include with the DOCAP an implementation schedule, documentation of consultation, copies of comments and recommendations on the plan after it has been prepared and provided to NCDWQ, and specific descriptions of how NCDWQ's comments are accommodated by the plan. The Applicant shall file the plan with the FERC within 30 days of receiving NCDWQ's written approval of the plan.

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Article WQ-4 - Total Maximum Daily Load Process

The Applicant agrees to participate in the High Rock Total Maximum Daily Load (TMDL) process for High Rock Reservoir initiated by the State of North Carolina in 2005. The Applicant will contribute up to \$50,000 in in-kind services for planned water quality sampling efforts, upon notification that the Yadkin-Pee Dee River Basin Association has received federal or state grants of at least \$50,000, for which the Applicant's contribution will be used as the required "matching funds".

If, during the term of the New License, other TMDL processes are required for the Yadkin River or its tributaries, within the Project Boundary of the Yadkin Project, the Applicant will participate in these processes.

c. *Shoreline Management*

Article SMP-1 - Shoreline Management Plan

The Applicant shall file a revised Shoreline Management Plan (SMP) for the Project with the Federal Energy Regulatory Commission within two years of the effective date of this License. The Applicant shall revise the SMP in consultation with state and federal resource agencies and other interested parties. The Applicant shall provide the consulted parties with a 30-day period to review and comment on a draft revised SMP. The Applicant shall include with its filing copies of all comments received on the draft revised SMP and a discussion of those comments, including whether the Applicant adopted the comments or the Applicant's rationale for not incorporating the comments in the final revised SMP. Additional written DWQ approval is needed for this shoreline management plan notably for those issues related to water quality such as buffer zones and management of shoreline erosion.

Upon Federal Energy Regulatory Commission approval, the Applicant shall implement the approved SMP, including any changes required by the Commission.

d. **Incorporation of Appendix A and B by reference.**

The following Appendices are hereby incorporated by reference as conditions to this Certification and are drawn verbatim from the Relicensing Settlement Agreement. In a few instances, "NCDWQ" should be substituted for "FERC" or "Commission" in these appendices – specifically in the sections that describe approval of LIP or HPMEP updates or revisions, and approval of additional stages (level 4 and beyond) to the LIP.

Appendix A: Low Inflow Protocol for the Yadkin & Yadkin-Pee Dee River Hydroelectric Projects

Appendix B: Yadkin Project, Hydro Project Maintenance and Emergency Protocol

Also, this approval to proceed with your proposed impacts or to conduct impacts to waters as depicted in your application shall expire upon expiration of the new FERC License and any Annual Licenses issued after the expiration of the new License.

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If this Certification is unacceptable to you, you have the right to an adjudicatory hearing upon written request within sixty (60) days following receipt of this Certification. This request must be in the form of a written petition conforming to Chapter 150B of the North Carolina General Statutes and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, N.C. 27699-6714. If modifications are made to an original Certification, you have the right to an adjudicatory hearing on the modifications upon written request within sixty (60) days following receipt of the Certification. Unless such demands are made, this Certification shall be final and binding.

This the 7th day of May 2009
DIVISION OF WATER QUALITY



Coleen H. Sullins, Director

CHS/jrd

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**STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES**

Water Quality Section

KNOW ALL MEN BY THESE PRESENTS, That _____

_____ a _____ and having its principal office at _____
in the State of _____, as principal, and _____
a corporation organized under the laws of the State of _____ and duly authorized by the
Insurance Commissioner of North Carolina to do business in North Carolina, with an office located at _____
_____, in the City of _____, North Carolina, as surety, are held and firmly bound
unto the State of North Carolina in the sum _____ of Bond No. _____
lawful money of the United States of America, to the payment of which will and truly be made, we bind
ourselves, our heirs, administrators and successors jointly and severally, firmly by these presents.

Signed, sealed and delivered this ____ day of _____, 20__.

THE CONDITIONS OF THIS BOND ARE SUCH, That Whereas, the said

_____ conducts or will conduct the required water quality-related modifications to the APGI project in North
Carolina as described in the original application for a 401 Certification dated May 9, 2008 (received May 8,
2009) and has obtained approval of this application on the _ day of _____, 20__, from the
Department of Environment and Natural Resources under Water Quality Certification Number 003173
issued on May 7, 2009.

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NOW THEREFORE, if the said _____
 shall comply with the requirements set forth in Water Quality Certification Number 003173 issued on May 7,
 2009 and with the rules and regulations adopted pursuant thereto and faithfully perform all obligations under
 the Certification then this obligation shall be null and void; otherwise to be and remain in full force and effect
 until released by the Department of Environment and Natural Resources or canceled by the surety.
 Cancellation by the surety shall be effectuated only upon 60 days written notice thereof to the Department of
 Environment and Natural Resources and the operator.

ATTEST:

 Secretary or
 Assistant Secretary

 Principal

(Attach)
 (Corporate Seal)
 (here of Corporation)

By

 President, Vice President,
 Partners, or Owner

 Surety

Countersigned at _____, North Carolina

By:

 Resident Agent of NC

 Agent and Attorney in Fact

***PLEASE MAIL THIS FORM AND THE ATTACHED INSTRUMENT
 TO THE FOLLOWING ADDRESS:**

WATER QUALITY SECTION
 WETLAND PROGRAM DEVELOPMENT UNIT
 1617 MAIL SERVICE CENTER
 RALEIGH, NC 27699-1617

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North Carolina Department of Environment and Natural Resources

Division of Water Quality

Beverly Eaves Perdue
Governor

Coleen H. Sullins
Director

Dee Freeman
Secretary

DWQ Project No.: 003173 County: Stanley County
 Applicant: Alcoa Power Generating Inc.
 Project Name: Yadkin Hydroelectric Project
 Date of Issuance of 401 Water Quality Certification: May 7, 2009

Certificate of Completion

Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401/Wetlands Unit, North Carolina Division of Water Quality, 1650 Mail Service Center, Raleigh, NC, 27699-1650. This form may be returned to DWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Agent's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

If this project was designed by a Certified Professional

I, _____, as a duly registered Professional _____ (i.e., Engineer, Landscape Architect, Surveyor, etc.) in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project, for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature _____ Registration No. _____

Date _____

1650 Mail Service Center, Raleigh, North Carolina 27699-1650
 Location: 2321 Crabtree Blvd., Suite 250, Raleigh, North Carolina 27604-2260
 Phone: 919-733-1786 \ FAX: 919-733-6893 \ Customer Service: 1-877-623-6748
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Attachment XII

Letter from David R. Poe,
Counsel to APGI,
to Magalie R. Salas, Sec'y, FERC, Project
No. 2197-037 (Mar. 10, 2006)

ATTACHMENT XII

LEBOEUF, LAMB, GREENE & MACRAE LLP

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March 10, 2006

Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Re: Alcoa Power Generating Inc., Yadkin Hydroelectric Project No. 2197-038

Dear Secretary Salas:

By this letter, the Yadkin Division of Alcoa Power Generating Inc ("Yadkin") hereby respectfully (i) requests authorization from the Federal Energy Regulatory Commission ("Commission") for modification of certain upgrade activities from what the Commission previously approved for the Yadkin project in 2000, and (ii) informs the Commission of changes in the authorized installed capacity and flow capacities for the Yadkin project reflecting these modified upgrades, as updated to be consistent with the Commission's current methodology for calculating authorized installed capacity.

As shown herein, the proposed modification of the upgrade activities from what the Commission previously approved results in shifting work on the Narrows, High Rock and Falls units that was originally intended to occur before the end of the existing license to now be within the term of the new license; the activities themselves are unchanged. Thus, all that is changing is the timing of the work. Under these circumstances, Yadkin respectfully submits that the Commission can approve the modification of the schedule as a technical revision to its prior order approving the upgrades. Nonetheless, if the Commission finds it necessary to further amend the existing license, Yadkin respectfully requests that Commission treat this filing as a request for such amendment and waive any further requirements of its regulations.¹

¹ Yadkin submits that the changes identified in this letter are minor technical updates to matters determined as part of its December 3, 1999 license amendment application, and thus Part 4.200 of the Commission's regulations, 18 C.F.R. §§ 4.200-4.201 (200602401-00011), is not applicable. Therefore, Yadkin has not styled this document as an

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March 10, 2006
Page 2

A. Background

On December 3, 1999, Yadkin, Inc. submitted an application seeking Federal Energy Regulatory Commission ("FERC" or "Commission") authorization to amend the license for Yadkin Project No. 2197 to allow Yadkin to undertake unit upgrades at certain of the developments of the project.² The Director of the Commission's Office of Energy Projects ("OEP"), on delegated authority, approved Yadkin's application to amend the license on August 2, 2000. *Alcoa Power Generating Inc.*, 92 FERC ¶ 62,084 (2000) (the "August 2 Order").

In its December 1999 application, Yadkin sought Commission approval to replace existing turbine runners and re-wind generators at the Narrows, High Rock and Falls developments, three of the four developments that comprise the project. The plan was to perform the upgrade activities on a unit-by-unit basis in the following order: (1) Narrows Unit 4; (2) Narrows Units 1 and 2; (3) Narrows Unit 3 and High Rock Unit 1; (4) High Rock Units 2 and 3; and (5) Falls Unit 2. Yadkin indicated that it planned to undertake the proposed upgrades in the next several years before the end of the term of the current license in 2008.

Now, the original schedule of the upgrades needs to be modified to reflect Yadkin's more than 4 years' experience in implementation. The upgrades performed to date have taken longer to complete than Yadkin anticipated and, as a result, Yadkin cannot undertake all of the upgrades the Commission authorized in the August 2 Order before the current license expires in 2008. As a result, Yadkin proposes to modify the upgrade plan as described below.

B. Change In Upgrade Activities

Yadkin has completed the upgrade of Narrows Unit 4. Yadkin plans to complete the upgrade of Narrows Unit 2 in early 2008. However, given the complications and attendant delays, it is no longer feasible to complete the upgrades to Narrows Units 1 and 3, High Rock Units 1, 2 and 3, and Falls Unit 2 prior to the expiration of the existing project license. Instead, Yadkin will include the planned upgrades to these units as part of Yadkin's application for a new license for the project.

As will be more fully described in its application to relicense the project, which will be filed in the coming weeks, Yadkin anticipates that it will complete these upgrades early in the new license term.

application to amend the license to reflect the changes described herein but would seek formal amendment if the Commission determines that the situation so requires. A similar letter request for technical updates to the February 24, 2000 Tapoco Project 2169 license amendment application submitted to the Commission on February 12, 2003 was approved on September 12, 2003. *Alcoa Power Generating Inc.*, 104 FERC 62,181 (2003). Under these circumstances, Yadkin further respectfully submits that Order No. 663, 112 FERC ¶ 61,297, is likewise inapplicable because this letter does not constitute a "pleading" within the meaning of Rule 203, 18 CFR § 385.203.

² On July 17, 2000, the Commission approved the transfer of the Yadkin license to Yadkin Inc.'s affiliate company, Alcoa Power Generating, Inc. *Yadkin, Inc.*, 92 FERC 62,029 (2000).

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C. Changes to Authorized Installed Capacity and Flow Capacities

As indicated December 1999 application, the performance of upgrades at the specific project units would result in a slight increase in the installed capacity of the project as a result of replacing existing older equipment with modern equivalents. In addition to the foregoing, Yadkin is providing as an appendix hereto updated authorized installed capacities and flow information for each of the project developments. These updated numbers reflect the completed upgrade to Narrows Unit 4, the planned upgrade of Narrows Unit 2, as well as revised installed capacities that are now calculated pursuant to the revised methodology set forth in the Commission's Order No. 576.³

Accordingly, Yadkin respectfully requests that the Commission approve the proposed changes in its specific upgrade activities and informs the Commission of the consequent changes to the authorized installed capacity for the project (consistent with the Commission's revised calculation methodology) and flow capacities.

If you have any questions, please contact the undersigned at (202) 986-8000.

Respectfully submitted,

/s/ David R. Poe
David R. Poe

Counsel for Alcoa Power Generating Inc.

cc: All parties

³ *Charges and Fees for Hydroelectric Projects*, 1991-1996 FERC Stats. & Regs. ¶ 31,016 (1995).

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APPENDIX

REVISED AUTHORIZED INSTALLED AND HYDRAULIC FLOW CAPACITIES

	2000 AMEND	2006 FILING	2000 AMEND	2006 FILING
YADKIN PROJECT UNITS	<u>AUTHORIZED INSTALLED CAPACITY</u>		<u>MAXIMUM HYDRAULIC CAPACITY</u>	
	MW	MW	FLOW - CFS	FLOW - CFS
HR1	13.20	10.97	3680	3350
HR2	13.20	10.97	3680	3350
HR3	13.20	10.97	3680	3350
HR Total	39.6	32.91	11040	10050
TT1	12.68	12.68	3825	3825
TT2	12.68	12.68	3825	3825
TT3	12.68	12.68	3825	3825
TT Total	38.04	38.04	11475	11475
NR1	27.20	26.86	2500	2500
NR2	27.20	28.21	2500	2390
NR3	27.20	26.86	2500	2500
NR4	27.20	26.86	2500	2290
NR Total	108.8	108.79	10000	9680
FL1	8.75	8.75	2685	2685
FL2	10.00	11.19	2800	3085
FL3	11.19	11.19	3085	3085
FL Total	29.94	31.13	8570	8855
Project Total	216.38	210.87	41085	40060

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list in this proceeding in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure.

Dated at Washington, D.C. this 10th day of March, 2006.

/s/ David R. Poe

David R. Poe

LeBoeuf, Lamb, Greene & MacRae LLP

1875 Connecticut Avenue, N.W.

Washington, D.C. 20009-5728

202-986-8000

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Fish and Aquatics IAG and Water Quality IAG
Joint Meeting, Final Meeting Summary
(Feb. 3, 2004), *reprinted in* Alcoa Power
Generating, Inc., Application for License,
Project No. 2197, vol. V(C) (2006),
available at eLibrary Accession No.
20060425-4005 (attachments omitted)

ATTACHMENT XIII

Fish and Aquatics IAG and Water Quality IAG Joint Meeting

February 3, 2004

Alcoa Conference Center

Badin, North Carolina

Final Meeting Summary

Meeting Agenda

Attachment 1.

Meeting Attendees

Attachment 2.

Introductions, Review Agenda

Jane Peeples, Meeting Director, opened the meeting with introductions and a review of the agenda. Jane mentioned that she had been asked about the procedure for postponing the Issue Advisory Group (IAG) meetings in the event of inclement weather. Jane explained that if Yadkin has to postpone a meeting, Yadkin would send a notice via email to the IAG. Wendy Bley, Long View Associates, said that the purpose of the meeting was to update the IAG on the ongoing fish and aquatics and water quality studies.

Update on Water Quality Studies

Wendy Bley explained that Yadkin recently completed four consecutive years of monthly reservoir water quality monitoring. She added that Yadkin also operated continuous temperature and dissolved oxygen (DO) monitors in all four tailwaters during 2003. Also, as part of the upgrade program, Yadkin operated continuous monitors in the Narrows and Falls tailwaters in 2001 and 2002 (for a total of three years of consecutive data from these areas). Wendy explained that Yadkin is required by the FERC order to continue operating the continuous monitors in the Narrows and Falls tailwaters. She said that one year of continuous temperature and DO data from below the High Rock and Tuckertown dams should be sufficient to characterize the conditions below the dams and suggested that these monitors be removed and no additional data be collected in 2004. Continuing, Wendy introduced Don Kretchmer, Normandeau Associates, who reviewed water quality data collected in 2003.

First, Don reviewed the objectives of the water quality studies: 1) characterize baseline water quality in the reservoirs and tailwaters, 2) evaluate effects of Project operations on reservoir water quality, and 3) evaluate effects of Project operations on tailwater water quality (see Attachment 3). Don also briefly reviewed the study components: continuous monitoring of temperature and DO below Narrows and Falls from 2001 through 2004; continuous monitoring of temperature and DO below High Rock and Tuckertown in 2003; and a series of lateral transects in the tailraces to confirm monitor placement. Don said that he was convinced that the monitors were located in a representative location downstream of the dams. Darlene Kucken, NC

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Division of Water Quality, asked if Normandeau had also completed the longitudinal investigation of DO. Don said no, Normandeau could not complete the work during summer 2003 because of the high flows in the river.

Next, Don reviewed the continuous monitoring results. He showed river flow at the Yadkin College gage from 1999 through 2003 (the sampling period) and the daily water elevations at each of the four reservoirs (see Attachment 3). Andy Abramson, Central NC Land Trust, asked if there were any times that the High Rock Reservoir elevation was greater than 655-ft. Don said that 655-ft is full pond. Gene Ellis, Yadkin, said that APGI would spill at the dam before allowing the reservoir to top 655-ft. Continuing, Don reviewed the minimum daily DO for each of the tailwaters. He explained that 4.0 mg/l is the instantaneous standard. He noted the instances when minimum daily DO was below the 4.0 mg/l standard in the four tailwaters.

Gerrit Jobsis, SC Coastal Conservation League and American Rivers, noted that there is not a lot of difference in the number of violations in the high and low flow years in the Narrows tailwater. Larry Jones, High Rock Lake Association, said that flow, or water condition, through the turbines at Narrows is representative of the conditions of flow entering Narrows Reservoir.

Gerrit Jobsis asked Don if the DO violations at Narrows were occurring earlier than June and later than October. Don answered that the violations were occurring as early as May. Don said that the data would be presented year-by-year in the study report and would therefore be easier to interpret. Don said that he saw no clear pattern among the dry (2002), wet (2003), and average (2001) years. Gerrit said the pattern across the years was that there are water quality violations from about late spring through early fall.

Mark Oden, High Rock Lake Business Owners Group, asked what was causing the low DO concentrations. Don replied that low DO conditions are a result of several factors: river flow, temperature, and particularly, nutrients entering the system from upstream sources.

Next, Don reviewed the daily average DO data for each of the tailwaters. The daily average standard for DO is 5.0 mg/l. Don highlighted the instances when the DO in the tailwaters did not meet this standard. Larry Jones commented that 2001 should not be considered an “average year”. Don explained that while overall it was a dry year, hydrologically, 2001 was closer to an average year than 2002, since it did not have the same mid-summer issues that 2002 had. Continuing, Don discussed the relationships among turbine discharge, spill, and DO at each of the developments. He highlighted spills at the dam and the related spike in DO. He also noted spikes in DO, unrelated to spills at the dam (e.g. Tuckertown tailwater in August 2003). Mark Oden asked if the continuous temperature and DO data was collected from one location. Don replied yes – there was one continuous monitor in each tailwater collecting data every 15 minutes from May through November 2003. Larry asked if the spike with no turbine discharge at Tuckertown is reflective of what happens when the mix does not occur. Mark asked Normandeau to plot the temperature and DO data together. Gerrit Jobsis commented that it would be beneficial to understand what happened to water temperatures during spill events. Don agreed to look at the effect of spills on water temperature, but noted that water temperatures in 2003 were generally lower because of the higher river flows and reduced reservoir stratification. Jim Mead, NC Division of Water Resources, asked about the location of the continuous monitors and

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questioned if they were placed far enough downstream to pick up water spilling over the dam. Don said that the monitors were located in the tailwaters based on consultation with the resource agencies and then the location of the monitors was confirmed with lateral transects.

In conclusion, Don said that the monthly reservoir monitoring was completed in 2004; the longitudinal DO survey will be completed in summer 2004; and the continuous temperature and DO monitoring will continue at Narrows and Falls. Ben West, US Environmental Protection Agency, questioned the purpose of the lateral transects in the reservoir. Don explained that the IAG asked Normandeau to study the effects of changes in operation at the dam on DO profiles up and downstream of the dam (e.g. DO profiles above and below before and after generation). Gerrit Jobsis asked if Normandeau was collecting any DO data on inflows to High Rock. Don answered that Normandeau collected grab samples from the monthly monitoring station above the reservoir.

Chris Goudreau, NC Wildlife Resources Commission, asked about the status of the turbine upgrades at Narrows. Gene Ellis explained that Yadkin had successfully completed one of the unit upgrades (unit four) at Narrows but Yadkin notified FERC in early 2003 when it filed its Notice of Intent that the original upgrade program would be modified and some of the upgrades would not be completed under the present license. Gene said that the economics of the planned upgrades were stalled when capital dried up but that APCI is continuing to evaluate the issue. Wendy Bley added that the one upgrade completed at Narrows also added air injection capabilities at the unit. The air injection at unit four is currently operated continually May through November, whenever unit four is operating. Having seen the continuous DO data at Narrows, Gerrit asked when the air injection was operational. Wendy replied that the air injection was operational in 2002 and 2003 and possibly part of 2001. Wendy said that Yadkin had measured the contribution of unit four during its operation and had found a substantial improvement in DO (about a 1.0-2.0 mg/l enhancement). A report including this information was filed with FERC.

Darlene Kucken observed that even with the air injection in place at Narrows, there are still violations of the DO standard. Wendy explained that the current license amendment approves upgrades at High Rock and Narrows. As these units are upgraded, APCI can consider the design and installation of aeration technology. Wendy said that an outstanding question is whether aeration technology is needed at all or a portion of the units at the dams.

Mark Oden asked if air injection is required by FERC or is it done voluntarily by the licensee. Darlene explained that to get a new license from FERC, APCI must first be issued a Clean Water Act Section 401 Water Quality Certificate from North Carolina. In order to receive a 401 Certificate, APCI must meet water quality standards at the Project. Larry Jones asked about the consequences of not meeting the standards. Darlene explained that the state would either 1) require APCI to conduct further studies and implement measures to achieve the standards, or 2) not issue a 401 Certificate.

Based on the data, Gerrit Jobsis commented that even a 1.0-2.0 mg/l enhancement might not help Yadkin meet the standard. He asked if APCI had considered oxygen injection. Wendy Bley said that the aeration technology used would be specific to each unit and site. She said that APCI had

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considered oxygen injection and for a variety of reasons (cost, safety etc.), APCI would prefer not to do oxygen injection.

Jim Melton, SaveHighRockLake.org, asked if the benefit of the air injection is system-wide or more localized. Wendy answered system-wide. Wendy said if the water quality is improved at High Rock Dam, some improvement in DO might be evident all of the way downstream. Larry commented that if the water quality is improved in High Rock Reservoir, water quality would be improved system-wide.

Gerrit Jobsis asked whether air injection is different than venting. Wendy said that like venting, air injection is forcing air into the water, as opposed to pure oxygen. Gerrit said that several hydro projects were considering how different gate openings at the dam could help improve DO levels (e.g. set the wicket gates a certain way to create more turbulence in the water). Wendy explained that when Voith designed the air injection valve at Narrows unit four, changes in operation at the dam were also considered. Gerrit added that other projects have been able to run more efficiently with changes in operations without extensive and costly upgrades. He said that baffles to increase turbulence in the water only result in a 1-2 percent loss in efficiency. He said that APCI was at the end of the line and asked what it planned to do.

Gene Ellis stated that APCI does want a 401 Certificate and that it will continue working to correct the DO violations, but that it might take a while. John Ellis, US Fish and Wildlife Service, asked if APCI contemplated correcting the violations before submitting its application for a new license to FERC. Gene said that actions to correct the DO violations would be staged during the new license term. Gene said that APCI still desires to complete the unit upgrades because the upgrades can increase generating efficiency and address the DO problem, but currently there is no capital to complete the upgrades. Gene said that APCI had notified FERC of the change in schedule.

Mark Oden asked about preventative measures to reduce pollutants in the river basin (e.g. the “Don’t Mess with Texas” campaign). John Ellis said that the USFWS works with landowners and farms to implement water quality improvement strategies, with the focus of restoring fish and wildlife habitat. Mark Cantrell, USFWS, said that his agency also provides comments to the NC Division of Water Quality on NPDES (National Pollutant Discharge Elimination System) permits. Andy Abramson added that the NCDWQ also has developed basinwide water quality plans for each of the state’s river basins. He said that the agencies have many “carrots” to encourage the landowners to do the right thing, but no “sticks”.

Larry Jones commented that there is still time before APCI submits its license application to explore operating High Rock differently to demonstrate that dam operation does or does not have an effect on downstream water quality problems. He suggested that if the Project was operated as run-of-river and High Rock was kept full year round, water quality might improve.

Darlene Kucken said that improving water quality in High Rock Reservoir will first require improving water quality flowing into the reservoir. She said that the watershed is disproportionately big when compared to the much smaller reservoir. She encouraged the locals to work with their local governments to encourage responsible land use and management. She

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said that the NCDWQ developed a TMDL (Total Maximum Daily Load) for the South Yadkin River, but there are no regulations to allow implementation of the TMDL. Mark Oden observed that there were no local government officials present at the meeting. Mark asked if it was typical in a hydropower relicensing to see no involvement from local leaders. Gene Ellis noted that APGI had in December 2003, reached out again with letters and phone calls to local government officials, inviting them to participate in the relicensing process. Andy Abramson said that the Land Trust invited all the riparian landowners to a public meeting and only 30 showed up. He said the interest in these types of issues is not there.

Wendy Bley commented that though the root cause of the DO problem is upstream sources of nutrients and BOD (biological oxygen demand), Yadkin recognizes that the reservoirs may also be contributing to the problem. She said that for APGI to get a 401 Certificate it expects to take care of its share of the responsibility. She concluded that the IAG would have to come up with some concepts to address the DO problem.

John Ellis asked if APGI envisioned everything happening after the issuance of a new license, or if would try to do something in the interim to show a good faith effort. Gene Ellis said that he would be willing to consider looking into possible modifications in operations at the dams to improve tailwater DO. John Ellis suggested that changes in operation at the dam could be a “band-aid” until the capital becomes available to complete the unit upgrades. Jim Mead asked if the lack of capital was local problem. Gene said no, the lack of capital is a company-wide problem due to the general downturn in the economy. Wendy suggested that Normandeau complete their data analysis to determine if there are any operational changes that could be tested in lieu of more permanent measures to improve DO at the Project.

For clarification, Darlene Kucken said that while she is representing the NCDWQ, she does not work for the 401 water quality certification division. She said that she could not say if the certification division would provide a water quality certificate based on a promise to meet the standards in the future. Darlene thought it worthwhile to meet with John Dorney. John Ellis suggested that John Dorney be invited to come and speak to the IAG. Darlene agreed to invite John Dorney to a future IAG meeting.

Mark Cantrell asked that Normandeau show percent saturation on the graphs included in the study report. Don Kretchmer agreed.

Before moving to the next topic on the agenda, Wendy asked that the IAG resolve the outstanding question about monitoring in 2004. She said that Normandeau plans to do the longitudinal transects and continuous monitoring below Narrows and Falls. Ben West asked if Wendy was recommending no further continuous monitoring below High Rock and Tuckertown. Wendy said that originally, she was concerned about having only one year of continuous data below High Rock and Tuckertown because of the abnormally high flows. However, the 2003 data did document a problem in those tailwaters as well. Wendy recommended no further continuous monitoring below High Rock and Tuckertown. Ben agreed that it makes sense to focus on evaluating potential ways to mitigate the problem rather than just continuing to document it.

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Darlene Kucken thought it worthwhile to continue monitoring temperature and DO below High Rock on a continuous basis because of the high flows, reduced reservoir stratification, and other unknowns. Chris Goudreau suggested that APGI ask FERC permission to remove the continuous monitors from below Narrows and Falls and instead operate one of the monitors below High Rock. Jim Mead agreed that the monitor below Falls is probably no longer necessary. Gerrit suggested that APGI start looking at changes in operations at Narrows (rather than continue to monitor) to address the DO problem.

Wendy Bley thought the only issue about asking FERC about revising the monitoring plan would be that FERC would have questions about the upgrades and associated schedule that APGI might not be able to answer. Wendy suggested the following actions: complete data analysis; review analysis of the operation of unit four at Narrows with air injection; consider asking FERC permission to revise the monitoring plan (specifically, to remove the monitor from below Falls and monitor at High Rock and Narrows); and start investigating gate settings at Narrows. Gene Ellis indicated that he wanted the opportunity to discuss these actions with his internal team first before making a commitment to go to FERC. Jim Mead said that APGI would only need FERC's approval to remove the Falls monitor.

Jim Mead commented that the longitudinal monitoring might suggest some other options for improving water quality. For clarification, Wendy explained that the lateral surveys would not extend all the way up into the headwaters; rather, the monitoring would be conducted immediately above and below the four dams.

Gerrit Jobsis asked what Normandeau would be looking at specifically during its analysis of the data. Don said that he would look at, among other things, water quality coming in and going out of the reservoirs; generation and no generation; unit four at Narrows operating and not operating etc. Gerrit said the focus should be the effect of the Project on water quality (i.e. how temperature is being altered; seasonal loading of nutrients etc.).

Mark Cantrell asked if there were operational scenarios being developed that may influence water quality. Wendy Bley explained that the Operations Model IAG is not that far along yet, that the OASIS model is still being developed, and that it would be some time before specific operational scenarios were being discussed. She acknowledged, however, that there will be alternative operating scenarios to be considered in the future.

Ben asked when the study report would be available. Don said the report should be available sometime during the third quarter of 2004.

After some discussion, it was agreed that the Water Quality IAG would meet independent of the Fish and Aquatics IAG on March 31 and May 4. Wendy said that Normandeau would try to complete its data analysis prior to the March meeting. She said that the IAG could possibly hear from APGI sooner than March 31 if APGI decides to seek FERC permission to revise the current DO monitoring plan and remove the Falls continuous monitor. Darlene Kucken committed to asking John Dorney to participate in the May meeting. Agenda topics for the March 31 meeting include a review of the data analysis (focus on parameters that directly impact DO such as chlorophyll a) and recommendations for investigations of gate settings and/or additional data

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analysis. Larry Jones suggested that APCI give its operational staff a “heads up” about potential investigations of gate settings and other operational changes for summer 2004. Donley Hill, US Forest Service, suggested that APCI also consider long sustained periods of one unit generation (i.e. pick out instances when there was generation with one turbine and look at the effect on DO in the tailwater).

Update on Tailwater Fish and Aquatic Studies

Wendy Bley introduced Rick Simmons, Normandeau, who provided an update on the status of the fish and aquatic studies. Rick mentioned that the Fish Entrainment Evaluation was nearly complete and that a draft study report would be available soon for review by the IAG. Specific to the Tailwater Fish and Aquatic Study, Rick said that Normandeau had completed both summer (August/September 2003) and fall (November 2003) fish and mussel sampling (see Attachment 4). Rick shared fish species lists for each of the Project tailwaters. The Falls tailwater was sampled August 26-28 and November 4-6 and bluegill, redbreast sunfish, and white perch were the top three species captured (by percent composition). The Narrows tailwater was sampled August 28-September 1 and November 6-8 and white perch, largemouth bass, and gizzard shad were the top three species captured. The Tuckertown tailwater was sampled September 1-4 and November 9-11 and bluegill, gizzard shad, and white perch were the top three species captured. The High Rock tailwater was sampled September 15-18 and November 11-13 and bluegill, white perch, and channel catfish were the top three species captured.

Mark Oden asked if Rick considered the reservoirs to have a healthy fish population. Rick said that based on the number of species present in the reservoirs, he considers the reservoir fish populations to be healthy. He said that if conditions were poor, he would expect to find less species. He said that some species captured are very sensitive to water quality. He said that how the reservoirs are operated impact species assemblages (e.g. largemouth bass, adults and juveniles, benefit from a drawdown). In response to a question from Mark Cantrell, Rick said that he would be providing the age and lengths of the captured fishes.

Continuing, Rick explained that Wendell Pennington, Pennington and Associates, surveyed the tailwaters in September and November 2003 for macroinvertebrates and mussels. Rick commented that the Falls tailwater provides the best habitat for mussels. The USFWS and NCWRC noted that the *Lampsilis radiata* and *Villosa delumbis* are both rare species. Mark Cantrell noted that additional mussel species that were not found in September were found in November. Rick said that visibility may have been a factor in September. Mark also asked if Pennington had looked at the fish in the tailwaters for glochidia (larvae). Rick said he would ask his crew to look for this. Rick showed species lists for the other three tailwaters (see Attachment 4).

Larry Jones asked about the relationship between the mussel populations in the reservoir and the tailwater. Specifically, he said, that High Rock Reservoir used to have a large number of mussels present. He wondered if the decline of mussels in the reservoir had affected the tailwater mussel population.

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Mark Oden asked how long it would take macroinvertebrates and mussels to recolonize after a drought. Ryan Heise, NCWRC, said that most freshwater mussel species typically live in flowing water environments (rivers and streams) and that while some mussel species may persist in reservoirs, they may never be able to reproduce. However, mussel species that prefer a still water environment and many macroinvertebrate species can recover within one year. Rick said it would take about 45 days for the macroinvertebrates to recolonize.

Update on Reservoir Aquatic Habitat Assessments

Rick said that Normandeau completed the Narrows Reservoir Aquatic Habitat Assessment in December 2003. He discussed the habitat composition of the drawdown area (see Attachment 4) – cobble and boulder are the dominant habitat types. Rick noted that boat docks and the default substrate had not been included in this calculation of habitat composition. Rick commented that Narrows had more gravel habitat than expected. Chris Goudreau asked if Sarah Allen's (Normandeau) aquatic vegetation work would be included in the habitat assessment. Rick replied yes. Rick explained that Normandeau filmed the entire Narrows shoreline and had collected gps data for eroding areas (with a minimum 30-ft linear extent).

Rick explained that Normandeau is currently working on the High Rock Reservoir Aquatic Habitat Assessment. At the time of the meeting, Normandeau had surveyed 160 shoreline miles. Rick showed a graphic, which depicted the areas surveyed to date. Larry Jones said that he knew that some areas shown as having been surveyed were not in fact surveyed. Rick said that his crew had filmed all of the areas surveyed. When asked, Rick said that he expected the assessment to be completed within about a week and a half (by February 13, 2004).

Habitat Fragmentation Study Request

Rick distributed several Yadkin River RTE species maps and asked that the IAG not distribute this sensitive information. Wendy Bley felt that the mussel species maps are a good starting point to determine what, if any, additional data collection and analysis should be done to complete the Habitat Fragmentation Study. Wendy commented that Progress Energy was asked to collect mussel data, but not to conduct a habitat fragmentation study, as Yadkin had been. Chris Goudreau said that he had asked Progress to do such a study, but that they are more focused on looking for opportunities for mitigation.

Mark Cantrell suggested that Normandeau also look at the fish hosts for the mussels and overlay the dams, land use, and NPDES discharges to the maps.

Wendy asked that the agencies look at the maps and then get back to Normandeau with ideas to build the database and refine the study. The agencies agreed that they would review the mussel data and get together to discuss possible next steps.

Progress Energy Instream Flow Study

Wendy Bley said that she had attended a December meeting of the Progress Energy Instream Flow Study subcommittee to discuss the details of an instream flow study plan. She said that

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Progress recently distributed a draft study plan, which she had not had the opportunity to review. She added that the subcommittee would be meeting on February 12 to discuss the draft study plan. Field work is planned for summer 2004. Chris Goudreau said that he had reviewed the study plan and that it was well put together.

Jim Mead acknowledged that both Wendy and Paul Leonard, Entrix, were participating on the subcommittee on behalf of Yadkin. He asked that Yadkin formally bless the study plan for the record to avoid any disagreements later on about methodology etc.

Schedule and Agenda for Next Meeting

Chris Goudreau suggested that an hour be set aside on March 31 for a discussion of the Habitat Fragmentation Study.

Gene Ellis acknowledged that Yadkin had received numerous emails and phone calls about the High Rock drawdown and that Yadkin had surprised many with how deep the draw was. He acknowledged that Yadkin could have communicated better. Gene explained that one of Alcoa's communications representatives is contacting several key stakeholders to solicit ideas about how to improve communications in the future. Larry Jones commented that Yadkin had done a great job communicating with shoreline residents on Narrows during the planned drawdown, but not with those living on High Rock. Mark Oden asked if the newspapers respond to Yadkin when it distributes a press release. Gene said that both drawdowns were well covered by the press. Max Walser, Davidson County Commissioner, reiterated Gene's commitment to improve communications to the county and shoreline residents.

The Water Quality IAG will meet on March 31, 2004 and May 4, 2004. A discussion of the Habitat Fragmentation Study will be included on the March 31 agenda.

Attachment XIV

Yadkin Hydroelectric Project, FERC No. 2197,
Relicensing Settlement Agreement, (Feb. 2007),
filed in *Alcoa Power Generating Inc.*, Project
No. 2197-073 (May 7, 2007), *available at* eLibrary
Accession No. 20070507-5011 (selected sections)

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**Yadkin Hydroelectric Project
FERC No. 2197**

Relicensing Settlement Agreement

February 2007

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Appendix A - Low Inflow Protocol for the Yadkin & Yadkin-Pee Dee River Hydroelectric Projects

Appendix B - Yadkin Project Hydro Project Maintenance and Emergency Protocol

Appendix C - Yadkin Project Recreation Facility Enhancements

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Appendix D - Modifications to the Yadkin Project Specifications for Private Recreation Facilities, Shoreline Stewardship Policy, and Subdivision Access Approval, Multi-use Facility Permitting, and Industrial Approval Procedures for Inclusion in the Revised Shoreline Management Plan

Appendix E - Maps of Land Conveyances and Land Grants

Appendix F - List of Parties and Primary Contacts

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of the Settlement Agreement. The proposed amendment shall not go into effect until all authorizations, including the New License, are conformed to the proposed amendment. However, if the proposed amendment lacks the unanimous consent of the Parties or FERC denies modification of the New License, that lack of unanimous consent or denial of the proposed amendment shall not constitute grounds for withdrawal under Section 1.3.9.

1.3.11.4.8 Amendment of the New License

To the extent permitted by law, a Party may petition FERC to amend the New License, pursuant to any reopener condition contained in the New License, or to take any other action with regard to the Licensee or the Project or may petition the Section 401 Agency to amend its Section 401 Certification, pursuant to any reopener condition included in any Certification, or to take any other action with regard to the Licensee or the Project, so long as the amendment or other action would not substantially conflict with this Agreement. Before filing any such petition or initiating any such action, the Party shall notify all other Parties and consult with any Party that wishes to consult, but under no circumstance shall such consultation requirement be construed to prevent a Party from pursuing any action within the time required by law or regulation.

1.3.12 Rights, Duties, and Obligations Regarding Section 401 Certification

Except as permitted under the terms of the third paragraph, below, the Parties shall not: (1) request or support any Section 401 Certification conditions for the Project that conflict with the proposed license conditions or any other terms of this Agreement or that add substantial additional burdens, costs or risks to the Licensee beyond those to which all Parties have herein agreed or (2) oppose any Section 401 Certification conditions that are not inconsistent with the proposed license articles or any other terms of this Agreement; or oppose any Section 401 Certification conditions that are standard State of North Carolina Section 401 Certification conditions. These standard North Carolina Section 401 Certification conditions are, as included in the Section 401 Certification for the Tapoco Hydroelectric FERC Relicensing Project, dated December 17, 2003, with reference number 03-0191: conditions no. 9 (regarding reporting of consumptive uses), 10 (regarding continuing compliance), and 11 (regarding property rights). The inclusion in the Section 401 Certification, and therefore in the New License, of any conditions that are not inconsistent with the proposed license articles or any other terms of this Agreement shall not be deemed a FERC-Imposed Modification.

The Parties reserve the right to be actively involved in any Section 401 Certification process, and nothing in this Agreement shall prevent the Licensee from opposing any Section 401 Certification condition that it, in its sole judgment, determines is or could be inconsistent with any provision of this Settlement Agreement.

Nothing in this Settlement Agreement is intended to or shall be construed to affect in any way the authority of the State of North Carolina pursuant to 33 U.S.C. § 1341, and related state statutes and rules, such as by limiting the authority of the State of North Carolina to issue, condition, or in any way alter a water quality certification or by limiting the exercise of the State of North Carolina's discretion. Execution of this Settlement Agreement by the State of North Carolina or any agency thereof expresses or implies no representation that the requirements of this Settlement Agreement ensure compliance with State water quality standards and other appropriate requirements of State law. Nothing in this Agreement shall limit the right of the State of North Carolina from enforcing its Section 401 Certification and from taking any steps, within the sole discretion of the State, to protect and defend its authority, such as by seeking rehearing

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of any FERC action regarding issues related to the exercise of the State's authority with regard to 33 U.S.C. § 1341. Similarly, nothing in this Agreement shall be construed to limit SC's or the EPA's right to initiate the procedures under 33 U.S.C. § 1341 should it be deemed necessary by SC or EPA.

1.3.13 Potential for Negotiation of Recreation Easements

Notwithstanding section 1.3.14, in the event that the Project ceases to be a federally licensed hydropower project, the Licensee shall convey recreational easements to the United States of America and/or the State of North Carolina. No later than one year prior to the date that the Project ceases to become a federally licensed hydroelectric project, the Licensee shall negotiate recreational easements with the United States and/or the State of North Carolina to ensure continued public access to the public recreational facilities on the Project reservoirs as they exist at the time the Project ceases to be federally licensed hydroelectric project. Such easements will only become effective in the event that the Project ceases to be a federally licensed hydroelectric project. However, nothing in this Agreement shall prevent the Licensee (under which circumstances would be a former Licensee and owner of private land encumbered by any recreational easements) from proposing to the United States or the State of North Carolina the closure of a recreational facility that becomes a "stranded asset" or has otherwise fallen into disuse for any reason, and agreement to such closure shall not be unreasonably withheld by the United States or the State of North Carolina.

1.3.14 Termination of Settlement Agreement

This Settlement Agreement shall terminate as to all Parties and have no further force or effect upon withdrawal of the Licensee, or upon expiration of the New License and any Annual License issued thereafter

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2.0 Settlement Provisions Not Covered by Proposed License Articles

2.1 Project Operations

2.1.1 Flow Adjustment for Enhancement of Downstream Spawning

The Licensee (Alcoa Power Generating Inc. or APGI) will work with the licensee of the Yadkin-Pee Dee River Project, FERC No. 2206, (Downstream Licensee), the North Carolina Division of Water Resources (NCDWR), the North Carolina Wildlife Resources Commission (NCWRC), the South Carolina Department of Natural Resources (SCDNR), the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), The Nature Conservancy (TNC) and American Rivers (collectively, Group) to develop a process to allow the Downstream Licensee to provide adjusted flow between February 1 and May 15 to enhance spawning conditions in the lower river downstream of the Blewett Falls development, part of the Yadkin-Pee Dee River Project.

The Parties agree that the Licensee's role in enhancing downstream spawning below Blewett Falls will be limited to:

- a) Attending an annual meeting with the Group, if held, to consider expected flow and hydrologic conditions and to schedule adjusted flow period(s) for the upcoming spawning season, and
- b) Once the schedule for adjusted spawning flow period(s) has/have been established by the Group, the Licensee will communicate its daily generation/flow release schedule during the adjusted spawning flow period(s) to the Downstream Licensee at least one week in advance of the start of the adjusted spawning flow period(s). If unexpected hydrologic conditions, or other conditions, such as those covered in the Low Inflow Protocol (LIP, Appendix A) or the Hydro Project Maintenance and Emergency Protocol (HPMEP, Appendix B), occur during any adjusted spawning flow period, the Licensee shall communicate to the Downstream Licensee any resulting changes in its daily generation/flow release schedule for the remainder of that adjusted spawning flow period.

The Parties agree that the Licensee will not be required to attempt to match Yadkin Project outflow to inflow during any adjusted spawning flow period(s), nor will the Licensee be required to provide an instantaneous minimum flow release from the Yadkin Project during any adjusted spawning flow period(s).

The Parties understand and agree that the Licensee's participation in enhancement of downstream spawning will take place within the confines of the other requirements of the New License relating to management of flows and reservoir water elevations, and would not result in any modification of those flow and reservoir management requirements. Specifically, nothing in this section will require or cause the Licensee to fall below its FERC-prescribed Project Minimum Flows as described in Article PO-2 or to have to modify its reservoir operations as prescribed in Article PO-1.

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If state and federal agencies and the Downstream Licensee are unable to come to an agreement on what measures are to be undertaken by the Downstream Licensee to achieve Flow Adjustment for Enhancement of Downstream Spawning, the Licensee will be under no obligation to meet the commitments outlined in this section.

2.1.2 Low Inflow Protocol

The Parties to the Relicensing Settlement Agreement that also have designated roles and responsibilities under the LIP (Appendix A) hereby agree to uphold their respective LIP commitments. In the event that a Party or Parties do not uphold their respective LIP commitments, then any Party, including the Licensee may (but is not required to) invoke the dispute resolution process described in Section 1.3.8 of this Agreement to attempt to resolve issues regarding LIP commitments

Assuming the U.S. Geological Survey (USGS) has necessary rights for the License term, the Licensee shall continue to provide 100% funding support during the License term for the maintenance of the following USGS standard flow gages that are used in the LIP to determine the Three-Month Rolling Average Flow:

- Yadkin River at Yadkin College (02116500)
- South Yadkin River near Mocksville (02118000)
- Abbotts Creek at Lexington (02121500)

Any substantial increase in funding support due to changes in these flow gages are subject to review by the Licensee with the North Carolina Department of Environment and Natural Resources (NCDENR). The Licensee may review and propose changes in the contractor, location, or equipment associated with these gages. Any changes proposed by the Licensee will require agreement of NCDENR.

2.2 Water Quality

2.2.1 Tailwater Dissolved Oxygen Enhancement Schedule

The Licensee shall install equipment and implement measures designed to enhance Yadkin Project (Project) tailwater dissolved oxygen (DO) conditions as specified in the schedule in Table WQ-1.

Table WQ-1. Dissolved Oxygen Enhancement and Monitoring Schedule

Year	DO Enhancement Action	Monitoring/Reporting
2007 ¹		- Continuous DO/temperature monitoring 5/1-11/30 at existing stations in all four tailwaters. - File Draft DO Monitoring Plan and Quality Assurance Project Plan (QAPP) with the North Carolina Division of Water Quality (NCDWQ) as part of 401 Application.
2008 ²	Narrows Unit 2 - Addition of two aeration valves by 03/31/08.	- Continuous DO/temperature monitoring 5/1-11/30 at existing stations in all four tailwaters. - File Final DO Monitoring Plan and QAPP for approval by NCDWQ and the Commission.

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Year	DO Enhancement Action	Monitoring/Reporting
2009	Narrows Unit 1 - Addition of two aeration valves by 12/31/09.	- Implement NCDWQ/FERC approved DO Monitoring Plan. - File annual DO monitoring data report with NCDWQ by March 31.
2010	Narrows Unit 3 - Addition of two aeration valves by 12/31/10. High Rock Unit 3 - Install "through the blade" aerating turbine by 12/31/10.	- Monitoring/reporting in accordance with DO Monitoring Plan.
2011	High Rock Unit 2 - Install a "through the blade" aerating turbine by 12/31/11.	- Monitoring/reporting in accordance with DO Monitoring Plan. - Initiate special study (up to 2 years) to evaluate the effectiveness of the aeration at Narrows on DO levels being discharged from Falls (2011-2012).
2012	High Rock Unit 1 - Install a "through the blade" aerating turbine by 12/31/12.	- Monitoring/reporting in accordance with DO Monitoring Plan. - Complete second year of 2-year study of effectiveness of aeration at Narrows on DO at Falls by 12/31/12 and prepare Study Report.
2013		- Monitoring/reporting in accordance with DO Monitoring Plan. - File 2-year Narrows/Falls DO Study Report with NCDWQ by 3/1/13. - If 2-year study does not demonstrate compliance at Falls, file an Action Plan for DO (DOAP) enhancement at Falls with NCDWQ by 12/31/13. - Initiate special study (up to 2 years) to evaluate the effectiveness of aeration at High Rock on DO levels being discharged from Tuckertown (2013-2014).
2014	Falls Unit 1 - Install aeration valves or other appropriate aeration technology, if needed, in accordance with Falls Action Plan by 12/31/14.	- Monitoring/reporting in accordance with DO Monitoring Plan. - Complete second year of 2-year study of High Rock/Tuckertown DO by 12/31/14 and prepare Study Report.
2015	Falls Unit 2 - Install aeration valves or other appropriate aeration technology, if needed, in accordance with Falls Action Plan by 12/31/15.	- Monitoring/reporting in accordance with DO Monitoring Plan. - File 2-year High Rock/Tuckertown DO Study Report with NCDWQ by 3/1/15. - If 2-year study does not demonstrate compliance at Tuckertown, file an Action Plan for DO enhancement at Tuckertown by 12/31/15.
2016	Falls Unit 3 - Install aeration valves or other appropriate aeration technology, if needed, in accordance with Falls Action Plan by 12/31/16. Tuckertown - Install aeration technology, if needed, at Tuckertown in accordance with Tuckertown Action Plan by 12/31/16.	- Monitoring/reporting in accordance with DO Monitoring Plan.

- Notes:
- 1 Actions to be taken under the current License for the Yadkin Project.
 - 2 The schedule shown starting in 2008 assumes an effective date of the New License for the Yadkin Project of or before May 1, 2008. If the effective date of the New License is after May 1, 2008, the schedule will be adjusted such that the 2008 schedule would begin within the year following the effective date of the New License, as provided in a revised schedule that has written approval from NCDWQ.

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2.2.2 Tailwater Dissolved Oxygen Enhancement Operations

As DO enhancement equipment or measures are installed or implemented on the schedule in Table WQ-1, the Licensee shall operate the generating units with DO enhancement equipment added on a “first-on-last-off” basis, subject to unit availability, from no later than May 1 of each year through November 30 of each year. If DO enhancement equipment or measures are not associated with generating equipment, once completed, that equipment or those measures shall be operated or implemented as designed from no later than May 1 of each year through November 30 of each year.

If at any time during the term of the New License, the Licensee can demonstrate through studies and/or monitoring that DO conditions have improved, the Licensee may consult with the North Carolina Division of Water Quality (NCDWQ) regarding the possibility of reducing the period of DO enhancement operations (May 1 – November 30). Should any such consultation result in an agreement between the Licensee and the NCDWQ to modify the operation of the Project for purposes of DO enhancement, the Licensee shall consult with the NCDWQ to develop a plan to revise DO enhancement operations. The Licensee shall include with the plan, an implementation schedule, documentation of consultation, copies of comments and recommendations on the plan after it has been prepared and provided to NCDWQ, and specific descriptions of how NCDWQ’s comments are accommodated by the plan. The Licensee shall file the plan with the Commission within 30 days of receiving NCDWQ’s written approval of the plan.

2.2.3 Dissolved Oxygen Monitoring

Within six months of the effective date of the New License, the Licensee shall file with NCDWQ a Dissolved Oxygen Monitoring Plan (DO Monitoring Plan) and Quality Assurance Project Plan (QAPP) for the Project. The DO Monitoring Plan and QAPP will be developed in consultation with NCDWQ and other appropriate state and federal resource agencies.

The primary component of the DO Monitoring Plan will be the operation of four (4) continuous DO/temperature monitors (one in each tailwater), for the period May 1 through November 30 of each year. The Plan shall include a schedule for preparing an annual DO and temperature data report. The annual report shall be filed with NCDWQ and the Downstream Licensee no later than March 31 of the following year.

The Plan shall also include provisions for conducting two studies as part of the overall DO enhancement schedule (Table WQ-1) designed specifically to investigate the effectiveness of aeration technology installed and operating at Narrows on the DO conditions in the Narrows and Falls tailwaters, and the effectiveness of aeration technology installed and operating at High Rock on DO conditions in the High Rock and Tuckertown tailwaters. At the completion of each of the two studies, the Licensee shall prepare a study report which shall be filed with NCDWQ in accordance with the schedule in the DO Monitoring Plan. If the study results demonstrate that the Falls and/or Tuckertown tailwaters do not meet state dissolved oxygen standards as a result of Project operations, the Licensee shall prepare a DO Action Plan (DOAP) for the Falls and Tuckertown developments, respectively. The resulting DOAP(s), if needed, will be filed with NCDWQ in accordance with the schedule shown in Table WQ-1.

The Licensee shall file the DO Monitoring Plan with the Commission within 30 days of receiving NCDWQ’s written approval of the plan. The Licensee shall include with the DO Monitoring Plan

ATTACHMENT XIV

an implementation schedule, documentation of consultation, copies of comments and recommendations on the plan after it has been prepared and provided to NCDWQ, and specific descriptions of how NCDWQ's comments are accommodated by the plan.

2.2.4 Additional Dissolved Oxygen Enhancement Actions

If at any time during the term of the New License, after all the DO enhancement equipment and measures outlined in Table WQ-1 have been installed and implemented, all of the planned unit upgrades have been completed and the upgraded units are operational, and at least two additional years of monitoring have been completed, the Licensee is notified by the NCDWQ that based on the results of monitoring under the DO Monitoring Plan, state water quality standards are not being met as a result of the Licensee's hydroelectric operations, the Licensee shall consult with the NCDWQ to develop a plan to implement corrective actions. The Licensee shall file a Dissolved Oxygen Corrective Action Plan (DOCAP) for NCDWQ approval within one year of initiating consultation with the NCDWQ. The Licensee shall include with the DOCAP an implementation schedule, documentation of consultation, copies of comments and recommendations on the plan after it has been prepared and provided to NCDWQ, and specific descriptions of how NCDWQ's comments are accommodated by the plan. The Licensee shall file the plan with the Commission within 30 days of receiving NCDWQ's written approval of the plan.

2.2.5 Total Maximum Daily Load Process

The Licensee agrees to participate in the High Rock Total Maximum Daily Load (TMDL) process for High Rock Reservoir initiated by the State of North Carolina in 2005. The Parties agree that the Licensee will contribute up to \$50,000 in in-kind services for planned water quality sampling efforts, upon notification that the Yadkin-Pee Dee River Basin Association has received federal or state grants of at least \$50,000, for which the Licensee's contribution will be used as the required "matching funds".

If, during the term of the New License, other TMDL processes are required for the Yadkin River or its tributaries, within the Project Boundary of the Yadkin Project, the Licensee will participate in these processes.

2.3 Recreation

2.3.1 Recreation Facility Improvements

The Parties agree that the Licensee will develop a Recreation Plan that at a minimum will include the recreation facility enhancements described in Appendix C.

2.3.2 Operations and Maintenance Funding Commitments

The Parties agree that the Licensee will contribute \$30,000 annually to the U.S. Forest Service (USFS) for the purposes of assisting with the operation and maintenance of six public recreation sites in Uwharrie National Forest that provide direct access to the Yadkin Project reservoirs (Badin Lake Campground, Cove Boat Ramp, Kings Mountain Point, Deep Water Trail Access, Holt's Cabin, Badin Lake Hiking Trail). The use of these funds by the USFS for any purpose other than the operation, maintenance, or construction of new facilities at the recreation sites

Attachment XV

N.C. OAH Order Granting
Petitioner's Motion for
Preliminary Injunction
Stay of Certification
09 EHR 3078 in the Office of
(May 27, 2009)

ATTACHMENT XV

STATE OF NORTH CAROLINA

COUNTY OF STANLY

STANLY COUNTY, NORTH CAROLINA,

Petitioner,

V.

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL
RESOURCES, DIVISION OF WATER
QUALITY,

Respondent,

ALCOA POWER GENERATING, INC.,

Respondent-Intervenor.

Filed

2009 MAY 27 AM 11 51 IN THE OFFICE OF
ADMINISTRATIVE HEARINGS
09 EHR 3078

Office of
Administrative Hearings

ORDER GRANTING
PETITIONER'S MOTION FOR
PRELIMINARY INJUNCTION/
STAY OF CERTIFICATION

THIS MATTER came on for hearing on May 20, 2009 before the undersigned Administrative Law Judge Joe L. Webster upon Petitioner Stanly County's Motion for Temporary Restraining Order and Preliminary Injunction, seeking to stay the effectiveness of the North Carolina Section 401 Water Quality Certification (No. 003173) issued by Respondent North Carolina Department of Environment and Natural Resources, Division of Water Quality ("Respondent") to Respondent-Intervenor Alcoa Power Generating, Inc. ("APGI") on May 7, 2009 (the "Section 401 Certification") pending the outcome of this contested case. Petitioner's Motion was made pursuant to N.C. Gen. Stat. § 150B-33(b)(6), 26 NCAC 03 .0115 and Rule 65 of the North Carolina Rules of Civil Procedure. Notice of the Motion was provided to Respondent and to APGI. Petitioner, Respondent and APGI were represented by counsel at the hearing, and all parties had the opportunity to present arguments, authorities and exhibits supporting their positions. The undersigned Administrative Law Judge also permitted the submission of a written *amicus curiae* statement by the Governor of the State of North Carolina. Based on the Motion, the attachments thereto, the representations of counsel at the hearing, the

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exhibits presented at the hearing and the submissions of the parties, the undersigned finds that Petitioner has met its burden of establishing the facts necessary for the issuance of a preliminary injunction/stay, in that:

A. Petitioner has demonstrated a likelihood of success on the merits of its claim that Respondent erred in one or more of the ways contemplated by N.C. Gen. Stat. § 150B-23(a) when it did not exercise the full scope of its jurisdiction in deciding that certain water quality impacts in Badin Lake were beyond the scope of its Section 401 water quality certification review. This is demonstrated by, among other things, the deposition testimony of John Dorney and the May 6, 2009 Hearing Officer Report on the Public Hearing for Alcoa 401 Water Quality Certification for FERC Re-license.

B. Petitioner has demonstrated a likelihood of success on the merits of its claim that Respondent erred, in one or more of the ways contemplated by N.C. Gen. Stat. § 150B-23(a), in the manner in which it determined the scope of its jurisdiction under the Section 401 water quality certification program. This is demonstrated by, among other things, the deposition testimony of John Dorney.

C. Petitioner has demonstrated a likelihood of success on the merits of its claim that the nature of the prolonged compliance schedule included in the Section 401 Certification for coming into compliance with North Carolina's dissolved oxygen standards does not comply with Respondent's obligations under the Federal Clean Water Act, and that Respondent therefore erred in one or more of the ways contemplated by N.C. Gen. Stat. § 150B-23(a). This is demonstrated by, among other things, the language of the Section 401 Certification.

D. Petitioner has demonstrated that it will suffer irreparable harm if an injunction/stay is not issued, given the effect of the issuance of a final Federal Energy Regulatory

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Commission (“FERC”) license to APGI even if there is future modification of the Section 401 Certification, and the impact of that issuance on the effectiveness of these proceedings.

E. Petitioner has demonstrated that the environment will suffer irreparable harm in the absence of an injunction/stay.

F. The undersigned has taken into account that Respondent stated on the record, both in its Responsive Pleading and oral argument that the Respondent Division of Water Quality (DWQ) believes the 401 Certification was issued in accordance with all substantive requirements and the DWQ does not concede any error. Respondent DWQ also believes its decision was made for the right reasons and addresses the necessary elements. (Transcript, p. 76)

G. Petitioner has demonstrated that it has no adequate remedy at law and that money damages are not adequate to compensate for the irreparable injury that will be suffered in the absence of an injunction/stay.

H. Petitioner has demonstrated that the balance of hardships and equities weighs heavily in favor of the issuance of the injunction/stay.

I. The undersigned acknowledges the statements concerning the public interest made at the hearing and in submissions, including the Respondent’s statement that the public interest may be best served by a stay and the statement by the Governor of the State of North Carolina, as *amicus curiae*, that the public interest should serve as an important factor in the undersigned’s consideration of Petitioner’s Motion. The undersigned finds it unnecessary to address these statements in that he has determined that Petitioner has met the standards and requirements of N.C. Gen. Stat. § 150B-33(b)(6) and Rule 65 of the North Carolina Rules of Civil Procedure. The issuance of the injunction/stay is based solely on N.C. Gen. Stat. § 150B-33(b)(6) and Rule 65 of the North Carolina Rules of Civil Procedure.

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NOW THEREFORE, pursuant to N.C. Gen. Stat. § 150B-33(b)(6) and Rule 65 of the North Carolina Rules of Civil Procedure, it is hereby ORDERED that:

1. Petitioner's Motion is granted and the undersigned hereby issues a preliminary injunction staying the effectiveness of the Section 401 Certification for all purposes.
2. The preliminary injunction/stay shall remain in place until the undersigned holds a full hearing on Petitioner's claims in this contested case proceeding and makes a final determination on the merits of those claims.
3. Accordingly, the Section 401 Certification issued on May 7, 2009 is not yet effective to demonstrate APGI's compliance with Section 401 of the Federal Clean Water Act until such time as the undersigned determines whether the Section 401 Certification should be affirmed, modified or voided as a result of Petitioner's claims.
4. No bond is required pursuant to Rule 65(c) of the North Carolina Rules of Civil Procedure because Petitioner is a County of the State of North Carolina.
5. This preliminary injunction/stay is effective immediately.
6. Respondent shall immediately notify FERC of this injunction/stay.

ENTERED this 27th day of May, 2009, nunc pro tunc for April 26, 2009 at 9:00 a.m.



Joe L. Webster
Administrative Law Judge

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A copy of the foregoing was mailed to:

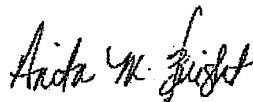
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This the 27th day of May, 2009.



Office of Administrative Hearings
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Raleigh, NC 27699-6714
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Jack Betts, *The Water is Shifting Under Alcoa*,
The News and Observer, June 2, 2009,
[http://www.newsobserver.com/opinion/
columns/story/1551070.html](http://www.newsobserver.com/opinion/columns/story/1551070.html)

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Raleigh News & Observer

The water is shifting under Alcoa

BY JACK BETTS - The Charlotte Observer

Published: Tue, Jun. 02, 2009 09:49AM

Modified Tue, Jun. 02, 2009 06:56AM

RALEIGH -- A lawyer from the state Attorney General's Office surprised a lot of folks the other day in an administrative law hearing. He asked Judge Joe Webster if he could summarize the views of Gov. Bev Perdue on a request by Stanly County to stop a state permit the Alcoa Power Generating Inc. wants. The company needs the permit to renew its Federal Energy Regulatory Commission license to operate hydroelectric dams on the Yadkin River.

What surprised folks was not that the governor opposes Alcoa's getting the new license. Perdue made her views known last year.

What surprised folks at the May 20 hearing was that Perdue took a position that, in effect, is at odds with a permit issued by her administration. The Department of Environment and Natural Resources on May 7 issued a clean water certification, a key document Alcoa needs in order to renew its license.

Getting that permit in early May was a major victory for Alcoa, which once employed about 1,000 workers at its Badin aluminum plant. But when the company shut down the smelter, support for the company -- and its federal license to run the dams -- began to dwindle.

The state's official support began to unravel last year when then-Gov. Mike Easley and Lt. Gov. Perdue began opposing renewal. Perdue doesn't think Alcoa should get a license to use public waters to generate unregulated power and sell it on the open market -- unless it comes with a lot of jobs.

So it was that Special Deputy Attorney General Faison Hicks asked Judge Webster if Perdue could express her view "of the significant public interests that are at stake here," Hicks wrote the next day. Perdue, he said, relied on experts in her administration to decide permits, but since the permit was issued, "the governor believes that an important development has occurred."

That development, he said, was that Stanly County "has raised questions going directly to the welfare of our environment, the life of the Yadkin River and, ultimately, the health and safety of the people of this state." She was concerned about "cancer-causing toxins that even Alcoa agrees reside in sediments at the bottom of Badin Lake as a result of Alcoa's past activities." Alcoa says they're not a threat. Stanly County disputes that, and Perdue was aware of the state's recent fish study showing toxins in the tissue of a significant percentage of Badin Lake fish, Hicks said.

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Perdue, he went on, wasn't thinking only of procedural rules and technicalities. She's also thinking about "common sense decision-making and ordinary prudence" -- and, he added, she believes the public interest "should reign supreme" in this case.

That's high-toned language for a governor to use, through a spokesman, in a legal proceeding, to take issue with a state permit issued by her administration, without challenging the decision to issue the permit.

The larger issue, Perdue told me Thursday, is how the state takes care of its waterways, and whether the state should endorse a company's use of the water for its own commercial purposes without a significant benefit such as a substantial number of jobs.

One reason Alcoa got its 50-year permit in 1958, she said, was its workforce at the Badin plant. That benefit no longer exists. And questions about environmental issues further undermine the company's request, she said.

"I believe private use of the state's waters has to be tied to providing jobs," she said, "and it's not right" to grant a license to Alcoa without such a tie.

"Alcoa in my mind has not shown much of a good-faith effort in terms of either hiring people or making sure the water quality is well-taken care of," she went on.

Perdue is likely to sign legislation, if the General Assembly approves it, creating a Yadkin River Trust that might eventually purchase and operate the Yadkin River hydroelectric dams. While Alcoa has protested the creation of such an entity as a "taking" of a legitimate business, under federal law such dam projects on public waters can be "recaptured" at a fair price -- though it has never happened. If it did, Alcoa argues, it would send the wrong message about doing business here.

Perdue sees a different message: "We want jobs, but the state has to derive for the people some sort of benefit -- and (for Alcoa) to sell it (power) off in the market without a benefit to the people of this state sends the wrong message."

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N.C. Economic Development Board
Strategic Plan 2008 Update (Sept. 25, 2008)

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N.C. Economic Development Board Strategic Plan 2008 Update

September 25, 2008

Prepared by the Interagency Economic Development Group



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FORWARD

The Interagency Economic Development Group (IEDG) is a team composed of staff from state agencies and organizations charged with the duty of assisting the Economic Development Board (EDB) in implementing and annually updating the economic development strategic plan and providing policy recommendations for Board consideration. In accordance with General Statute 143B-434, as staff lead, the Department of Commerce convenes the IEDG as needed to collect updates from the organizations that are responsible for implementing the goals of the strategic plan and/or to provide information as needed by the Board for future planning considerations.

Since its first policy roundtable discussion, the IEDG has worked to assess the status of the plan's goals and to begin developing recommendations for future policy actions. In 2008, Policy Team staff in Commerce's Division of Policy, Research and Strategic Planning Division worked closely with the IEDG members in preparing the annual Strategic Plan Update Executive Summary for presentation at the September EDB meeting.

The following IEDG representatives offered their expertise and support in the preparation of this executive summary:

- **Department of Commerce** (*Gene Byrd, Meihui Bodane, Michael Haley, Chris Harder, Teresa Johnson, Beth Lucas, Vickie Miller, Lynn Minges, Gloria Nance-Sims, Jack Newman, Sara Nienow, Liz Parham, David Rhoades, Mark Roberts, Libby Smith, Rodney Swink, Aaron Syrett*)
- **Department of Transportation** (*Missy Dickens, Alpesh Patel, Donald Voelker*)
- **Department of Environment and Natural Resources** (*Gary Hunt, Bruce Nicholson*)
- **Department of Cultural Resources** (*Maryanne Friend, Wayne Martin*)
- **E-NC Authority** (*Angie Bailey, Ashley Crane, Cary Edgar, Jane Smith Patterson*)
- **North Carolina Association of County Commissioners** (*Rebecca Troutman*)
- **North Carolina Board of Science and Technology** (*John Hardin*)
- **North Carolina Community College System** (*Willa Dickens, Glynda Lawrence, Maureen Little*)
- **North Carolina Rural Center** (*Brett Altman, Julie Haigler Cubeta, Leslie Scott*)
- **North Carolina Utilities Commission** (*Bill Gilmore*)
- **School of Government at University of North Carolina, Chapel Hill** (*Will Lambe, Tyler Mulligan*)
- **Small Business & Technology Development Center** (*Scott Daugherty*)
- **University of North Carolina System** (*Leslie Boney*)

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INTRODUCTION

In 2007, the North Carolina Economic Development Board and its partners continued to make substantial progress and realize successes through the implementation of action steps from the Economic Development Strategic Plan. This update highlights this progress and identifies the seventeen priority action steps the Board will focus on during 2008 – 2009.

The report consists of five sections. First, it provides a general overview of the state's economy and demographic and macroeconomic trends impacting North Carolina. The state's performance against a set of key economic indicators also is summarized. The Board's overall progress on the strategic plan over the last six years is outlined. Next, strategic plan priority action steps for 2008 – 2009 are identified. Each action step is described and accompanied by the Board's planned activity for accomplishing it. The majority of this update is dedicated to providing a summary of activities undertaken in 2007 related to the seven goals of the strategic plan. A conclusion regarding the Board's progress in 2007 and its direction in 2008 – 2009 is provided. Finally, two appendices, with further detailed information, are provided. The first appendix describes the priority action steps and the second provides detailed information on the progress of all the action steps.

In 2009, the State will see a change in Governor, Administration, and North Carolina Economic Development Board membership. To this end, efforts were made to identify ways to resolve outstanding action items within the current plan and to begin preparing for new leadership and a new Economic Development Strategic Plan, one that reflects the current needs of our 21st century economy and better positions the state to realize promising opportunities on the horizon.

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2007 ECONOMIC OVERVIEW

Despite lackluster performance at the national level in 2007, North Carolina's economy is strong according to many measures. The state continues to attract people and businesses and the productivity of its labor force continues to grow. The state's economic strength is evident in the increase of Gross Domestic Product, its growing labor force and its expanding export market. The following is a summary of demographic and macroeconomic trends and North Carolina's performance on key economic indicators.

Demographic and Macroeconomic Trends Affecting North Carolina

Globalization: Every region of the world has experienced the impacts of globalization. North Carolina experienced a steep decline of jobs in traditional manufacturing industries due in part to cheaper labor costs abroad. Economists anticipate that this trend will continue. However, globalization has had some positive impact on North Carolina's economy. In recent years, North Carolina has shown significant job growth in a number of knowledge-based industries such as biotechnology, information technology, pharmaceuticals, and advanced manufacturing.

Demographic Changes: North Carolina's population is growing rapidly. Currently, the state ranks 10th in the country, with a population of about 9.1 million. Between 2000 and 2007, the state experienced a 12.6 percent growth rate. Migrants from other states and countries contribute significantly to North Carolina's population growth. Migration from rural to urban areas (or at least to rural areas in close proximity to urban areas) is also a demographic trend. Urban and suburban areas are growth centers for jobs, especially those associated with high-growth knowledge-based industries. Finally, the nation as a whole is aging. As "baby-boomers" get older they will require more services, such as health care and social assistance.

National Economy: The United States as a whole is experiencing economic uncertainty. The pace of economic growth slowed in 2007 and there are strong indications that it will slacken further during 2008. The ongoing problems in the housing and financial markets and the high price of oil will trim the growth of GDP¹. North Carolina shows signs of remaining competitive relative to comparison states and the United States as a whole.

Summary of Key Economic Indicators

Gross Domestic Product: North Carolina's Gross Domestic Product (GDP) growth exceeds that of the United States and most comparison states. Despite the continued restructuring of the state's economic base away from labor-intensive industries toward knowledge-based industries, manufacturing in North Carolina is still the largest contributor to State GDP. In 2007, North Carolina's GDP was just under \$400 billion, an increase in real GDP of 2.2 percent from 2006. The growth in real GDP for the United States as a whole over the same period was 2 percent.

Earnings: Adjusted for inflation, earnings in North Carolina are below the national average. The median household income in North Carolina (using a three-year average: 2004-2006) was \$42,061, compared to \$47,790 nationally. The state's highest average weekly wages are in North Carolina's three urban economic development regions: Charlotte, Piedmont Triad and Research Triangle.

Labor Force: The state's expanding workforce and the availability of jobs are indicators of a healthy economy. In 2007, North Carolina's labor force exceeded 4.5 million, with employment slightly more than 4.3 million. North Carolina's labor force grew 9.5 percent from 2000 to 2007, faster than the national average (7.5 percent).

¹ Congressional Budget Office. The Budget and Economic Outlook: Fiscal Years 2008 to 2018. Washington, DC: Congress of the United States, January 2008.

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2007 ECONOMIC OVERVIEW

Exports: An important indicator of a state's successful involvement in the global economy is the amount of goods and services it exports to foreign markets. A key driver of a state's GDP is the value of its exports. In 2007, the total value of exports leaving North Carolina ports was \$23.4 billion, an increase of 9.7 percent from 2006. North Carolina's 2007 exports represent 2 percent of all exports out of the United States. The five largest destination countries of North Carolina exports are: 1) Canada, 2) Japan, 3) China, 4) Mexico, and 5) France.

Labor Productivity: Productivity represents the amount of output (GDP) per unit of input (employment). Not only is labor productivity growth closely tied to earnings growth, educational attainment and standard of living, it also provides a measurement of a state's competitive position over time. In 2007, North Carolina's labor productivity (\$77,922) was below the national average of \$78,519. Both the United States and North Carolina experienced an increase in labor productivity of less than 1 percent between 2006 and 2007.

Occupational Mix: Popular occupations in North Carolina have relatively low wages. In 2007, the five occupations in North Carolina with the highest employment were: office and administrative support (699,087), sales (668,768), production (422,676), management (384,983), and food preparation (368,251). Of these five occupations, only management occupations earned more than \$30,000 annually.

Capital Investment: Capital investment is key indicator of the state's economy. In 2007, North Carolina attracted \$547 million in venture capital funding, up from \$510 million in 2006. However, the state's share of venture capital investments to Gross Domestic Product was 0.14 percent, below the U.S. average of 0.22 percent. Investment by new and expanding business in North Carolina averaged \$5.8 billion annually between 2000 and 2007. However, the vast majority of this investment is concentrated in the Charlotte, Piedmont Triad and Research Triangle regions.

Industry Mix: In general, the manufacturing sector continues to lose jobs, but remains significant in terms of overall state employment. Knowledge-intensive industries such as financial services, professional and technical services and health care/social assistance are experiencing significant growth. North Carolina's largest industries were manufacturing, retail trade, and health care/social assistance. In 2007, these industries accounted for more than 42 percent of private sector employment in the state.

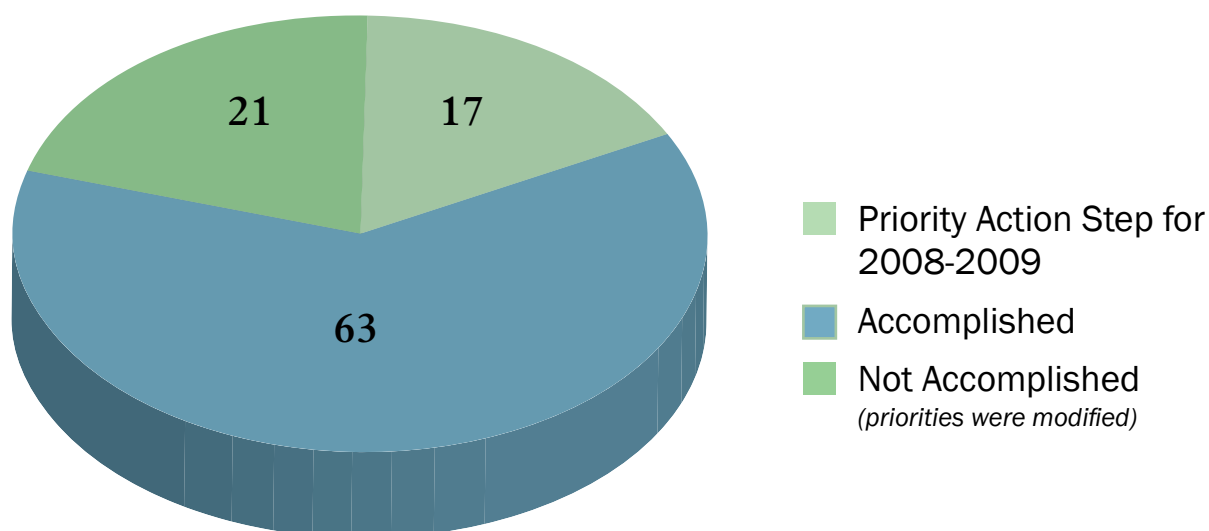
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STRATEGIC PLAN
PROGRESS SUMMARY

During the past year, the state has made good progress in accomplishing a number of the action steps in the strategic plan. Since 2002, North Carolina agencies and organizations have worked hard to accomplish sixty-three of the one hundred and one original action steps and only seventeen are currently under way. Approximately twenty-one of the actions steps were not accomplished, in part, due to modifications in policy priorities.

The table below illustrates the success of the Economic Development Board's strategic plan.

Implementation of Action Steps, 2002-2008
Total = 101 action steps



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PRIORITY ACTION STEPS
FOR 2008 – 2009

Of the one hundred and one (101) action steps in the North Carolina Economic Development Strategic Plan, there are seventeen (17) action steps that have not yet been accomplished. The following is a brief description of each remaining action step, and the corresponding recommended actions that the Board can take to help achieve each goal. (Note: Two of the actions steps, found in Goal 2 of the Strategic Plan, have been consolidated below due to their relationship to one another.) These remaining action steps will be the priorities for the Board during the next year.

For more detailed information please see the North Carolina Economic Development Board Strategic Plan Priority Action Steps 2008-2009 located in the Appendix.

- **Maintain support for enrollment growth for the University of North Carolina System, the North Carolina Community College System and the North Carolina Public School system.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter supporting continued full funding for enrollment growth to the Chairs and Members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators.

- **Advocate and support the North Carolina Community College System's recommendations to provide additional funding for equipment needs by crafting a letter to the Governor and the General Assembly, as well as, assembling the support of all stakeholders through the N.C. Economic Development Board.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter supporting additional funding for equipment needs for the North Carolina Community Colleges to the Chairs and Members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators.

- **Develop a mechanism within state government to provide coordination and assistance to existing public and private sector science and technology resources to make the best use of those resources for advancing economic development and job growth throughout the state by increased funding for the North Carolina Office of Science and Technology. Science, technology, and economic development, which are interrelated and vital to North Carolina's future economic success, and require coordinated attention at the state level.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter supporting increased recurring state appropriations for the basic operations of the N.C. Office of Science and Technology and the Board of Science and Technology to the Chairs and Members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators.

- **Catalyze and support expanded innovation activities from all of North Carolina's universities through appropriate follow-up to the University's economic development plan. This has been integrated into the strategic priorities of the UNC System, providing staffing to the function at a system level and on each campus.**

Recommended Action: The N.C. Economic Development Board will encourage the UNC System to re-examine technology transfer structures and staffing at all public universities, to determine how they will maximize technology transfer for creation of jobs in North Carolina, and to complete a comprehensive plan to increase university innovation and maximize job creation by technology transfer.

- **Taking into account mission studies mandated by the legislature in this area, complete regional resource analyses across the state to understand regional strengths and opportunities; align university initiatives and expertise with the needs of regional economic development clusters; and develop strategies and tactics to address knowledge-based job creation in each region.**

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PRIORITY ACTION STEPS
FOR 2008 – 2009

Recommended Action: The N.C. Economic Development Board will encourage the North Carolina Department of Commerce (DOC) and The University System (UNC) to fully implement the 2007 UNC/DOC Memorandum of Agreement. The UNC/DOC MOA outlines the collaborative relationship between DOC and the universities at the state and regional levels. The MOA includes other key partners in economic development to be included in regular meetings and discussions in the regions and at the state level. The MOA implementation is currently underway in several of the regions.

- **Strengthen the overall R&D capacity of all North Carolina Universities and research institutions by enhancing key administrative support functions and processes that currently constrain their competitive R&D position.**

Recommended Action: The N.C. Economic Development Board should encourage broader flexibility under the State Personnel Act.

- **Fund an initiative to promote economic growth in North Carolina through the identification and development of emerging technologies. For example, nanotechnology—the science of the very small— will fundamentally transform science, technology, and society, from microscopic computer chips to cancer-fighting vaccines.**
- **As such, it holds tremendous potential for North Carolina and the nation. Nanotechnology will be the basis of manufacturing technology in the future. Developing a coordinated response to the challenges and opportunities presented by this and other emerging technologies will greatly expand the opportunity for all North Carolinians to obtain and retain challenging and economically rewarding employment.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter supporting recurring funding to support implementation of components of the nanotechnology research efforts, to the Chairs and Members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators.

- **Strengthen the overall R&D capacity of the 16-institution University of North Carolina by providing resources and incentives for faculty development.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter supporting recurring sources of competitive research funding to support UNC faculty research in sectors deemed critical to North Carolina's long term economic future.

- **As part of a regional strategy, systematically promote the state's University Millennium Campuses and support the development of new ones as sites for growing and attracting new technology-based businesses.**

Recommended Action: The N.C. Economic Development Board will encourage the UNC System to undertake a significant, high profile ad campaign to promote industry/university research parks.

- **Increase knowledge of federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) awards throughout the state and strengthen application assistance for entrepreneurs to increase their success rate in receiving such awards.**

Recommended Action: Recurring state incentive funding for SBIR/STTR applicants and matching funding for SBIR/STTR recipients via the One North Carolina Small Business Program is needed. In preparation for the 2009 legislative session, the Economic Development Board will send a letter supporting recurring sources of funding for the One NC Small Business Program to the Chairs and Members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators. The letter will also advocate increased funding for the Small Business and Technology Development Center (SBTDC) to expand its efforts to improve statewide knowledge of SBIR/STTR opportunities and strengthen application assistance.

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PRIORITY ACTION STEPS
FOR 2008 – 2009

- **Identify a dedicated source of funding for the One North Carolina Fund.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter to the Chairs and Members of the House and Senate appropriations committees supporting recurring funding for the One North Carolina Fund.

- **Identify development hubs with regional significance (beyond the three largest metropolitan areas) and develop strategies to strengthen them and make them more competitive.**

Recommended Action: Currently a development hubs study is underway through a joint effort between North Carolina State University and University of North Carolina-Chapel Hill to define development hubs, examine North Carolina's resources, and identify best practices around the nation. Upon the completion of the study, in January 2009, members from various divisions of Commerce will work with the N.C. Economic Development Board to formulate and implement policies to support this economic development concept.

- **Request new funding to recapitalize the Main Street Financial Incentive Fund with its 10:1 leverage to increase the number of buildings rehabilitated in downtowns.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter to the Chairs and Members of the House and Senate appropriations committees supporting new funding to recapitalize the Main Street Financial Incentive Fund, which will increase the number of buildings rehabilitated in downtown and spur investment and create jobs.

- **Expand the Department of Commerce's successful Small Town Main Street Program statewide.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter to the Chairs and Members of the House and Senate appropriations committees supporting expansion of the Small Town Mainstreet Program. Because there is growing interest in small towns and micropolitan areas, dedicated funding from the General Assembly is needed to successfully expand the program.

- **Continue promoting participative and comprehensive approaches to economic development by making a refined 21st Century Communities Initiative available to thirty-seven counties by 2010.**

Recommended Action: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter to the Chairs and Members of the House and Senate appropriations committees supporting the 21st Century Communities program and encourage dedicated funding for the successful expansion of the program.

- **Continue to develop and implement an e-agriculture strategy to increase the rate at which farm operators and employees utilize Internet resources.**

Recommended Action: The N.C. Economic Development Board will continue its support for e-NC Authority and encourage the 2009 General Assembly to provide additional funding for development of an agricultural portal that would focus on the needs and use of the Internet as it applies to the economics of agriculture.

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STATUS REPORT

This section of the report provides an update of actions undertaken and accomplishments realized during the past year.

GOAL 1:**DEVELOP AN OUTSTANDING EDUCATION SYSTEM AND A HIGHLY QUALIFIED WORKFORCE.**

Providing support to industry and statewide economic development is a core mission of North Carolina's education and workforce development entities. North Carolina's workforce development organizations are recognized as national leaders in economic and workforce development. Continued support for North Carolina's education and workforce development system is necessary in order to build a workforce with the skills necessary for highly skilled occupations, to obtain livable wages, and to attract and retrain workers for high-growth industries in the new economy. To that end, much progress was made in 2007 in several workforce development- and education-related actions steps of the strategic plan.

The North Carolina Community College System (NCCCS) enrollment growth was fully funded (\$8.8 million) by the General Assembly in 2007, facilitating the accommodation of 2,296 additional full-time students. An additional \$2 million was appropriated to an enrollment growth reserve for colleges that experienced growth greater than 5 percent. The reserve was distributed, however, it was approximately \$10 million short of what was needed to accommodate new growth in 2007-2008.

In 2007-2008, the New and Expanding Industry Training (NEIT) program trained 17,087 workers and served 187 companies—92 existing North Carolina companies expanding and 95 new companies. The total expenditures for the program were over \$7.36 million or \$407.01 per trainee. The Focused Industry Training (FIT) program trained 6,729 workers and served 466 companies. The program convened 675 skill classes and workshops providing 20,002 hours of instructional training. The Customized Industry Training (CIT) program trained 1,498 workers and served 54 companies. The total expenditures for the program were \$723,000 or \$483 per trainee.

As part of the NCCCS Strategic Plan for 2007-2009, a process was undertaken to examine changing population trends and gaps that may exist in the ability to fill needs as a result of these changes in state demographics.

The NCCCS BioNetwork continues to connect community colleges across North Carolina, providing specialized training, curricula and equipment, to develop a world-class workforce for the biotechnology, pharmaceutical and life sciences industries. In June 2007, the BioNetwork released an economic impact study, "The Economic Contributions of the NCCCS BioNetwork Initiative". The purpose of the report was to determine the socioeconomic impact of the BioNetwork. The report concluded that "money invested in the community college system reaps a great return—in greater industry wages, tax benefit and return, and educational capital." In 2007, the BioNetwork funded 28 grants to twenty community colleges across the state worth \$2 million for a number of programs, curriculum development, and resources.

In 2007, the N.C. Department of Commerce's Division of Workforce Development and the Governor's Office announced a planning grant opportunity to support the development of Regional Skills Partnerships in the allied health sector. The planning grants were designed to address workforce issues of the allied health sector for the purpose of increasing the sector's competitiveness and creating employment and career advancement opportunities for workers. The partnerships promote system change through realignment of public and private resources, expanded integration of services, leadership through workforce intermediaries, and development of career pathways for low income / entry-level workers.

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The allied health sector was selected because it is one of the fastest growing sectors in the state's economy. The category of allied health included healthcare professionals with a wide range of credentials—from high school graduates working as pharmacy technicians to physical therapists with doctoral training. The healthcare sector has been one of the key drivers in North Carolina's economic growth. As manufacturing employment in the state has declined, healthcare and social assistance occupations, as a percentage of the state's workforce, increased from 10% to 13% of the total workforce. Between 1999 and 2005, allied health employment in North Carolina grew by 46%. By contrast, total healthcare employment grew by 20% and total employment in the state grew by 0.2%. More than 69% of the total job growth in the healthcare sector during this time was due to allied health jobs.

The Economic Development Partnership Committee—a subcommittee of the North Carolina Commission on Workforce Development—provides oversight of the Allied Health Regional Skills Partnership grant program. A core team oversees direct guidance for the project. This team includes representatives from the Governor's Office, the N.C. Department of Commerce, the North Carolina Community College System, the Employment Security Commission, the UNC Cecil G. Sheps Center, and the North Carolina Hospital Association. Planning grants have been awarded to 7 partnerships across the state to address allied health employment and skills development related issues.

GOAL 2:**INVEST IN SCIENCE, TECHNOLOGY, AND UNIVERSITY OUTREACH.**

In December 2007, a memorandum of agreement was signed between the University of North Carolina and the Department of Commerce, which aims to increase the connectivity of campuses to regional development infrastructures. Additional emphasis on these issues will come as campuses develop their responses to UNC Tomorrow, with the report's emphasis on assisting regional economic development and community engagement.

Technology transfer services have been strengthened over the past five years on less research-intensive campuses through contracts with university-based spin-off companies, and the University is currently developing a plan to strengthen technology transfer efforts on all campuses. These initiatives were implemented based on discussions with the Council of Research Administrators, a group comprised of representatives from the various university campuses, and convened by the Vice President of Research. These measures aim to increase the amount of university innovation through technology transfer and commercialization and to promote economic development activities.

The Small Business and Technology Development Center (SBTDC) has been designated by the Governor as the North Carolina Federal and State Technology Partnership (FAST) representative and plays a lead statewide role in promoting participation in the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) R&D Award Program.

The SBTDC has taken the lead in supporting the creation of six structured early-stage angel capital funds located across the state. The funds will make investments of from \$50,000 to \$125,000 in early-stage technology and other high-growth potential businesses. Four of the six funds are now operational.

The SBTDC's success in this area has been noticeable, as it hosted the highly successful national 2007 SBIR/STTR conference held for the first time in North Carolina.

The University system has benefited from an expansion of funding for the Area Health Education Centers (AHEC) to help address critical needs for health care workers and other needs.

With support from the General Assembly and Golden LEAF Foundation, North Carolina State University and North Carolina Central University have continued to develop their programs to do research and train graduates in critical areas of biotechnology.

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The University System's President's Advisory Committee on Efficiency and Effectiveness (PACE) Commission recommendations have aimed to reduce inefficiencies and redundancies.

The N.C. Biotechnology Center launched a Centers of Innovation initiative in 2007. Planning grant applications have been solicited and four awards have been made. Applicants will develop business plans and create and sustain Centers of Innovation in targeted areas of bio-science (Marine –Bio science, Medical Devices, Natural Products and Bio-nano). Approved plans will receive multi-year funding support.

Since the inception of the One North Carolina Small Business Incentive and Matching Fund Programs in early 2006, the Board of Science and Technology has issued more than 160 grants to North Carolina small businesses, totaling more than \$10 million. The North Carolina small businesses receiving the grants project to create more than 100 jobs in the state and to patent, license, and sell technologies and products worth more than \$1 billion.

GOAL 3:

ENSURE A COMPETITIVE ENVIRONMENT FOR THE RECRUITMENT AND RETENTION OF BUSINESS, CAPITAL INVESTMENT, AND JOBS CREATION.

In 2007 – and for the sixth time in seven years – North Carolina ranked first in Site Selection magazine's annual state business climate analysis. State and private agencies took significant steps in 2007 to maintain and enhance the competitive business environment for industries locating in North Carolina.

The General Assembly approved an extension of the Job Development Investment Grant (JDIG) program until 2010. In 2007, this discretionary grant program awarded 14 grants to new and existing companies. If performing as expected, these companies will create 5,574 new jobs, retain 3,653 existing jobs, and invest \$525 million in North Carolina. The General Assembly also approved the creation of the Job Maintenance and Capital Development (JMAC) grant program. This program assists expanding businesses with substantial capital improvements and maintenance of high-quality jobs.

There continues to be a groundswell of state support for developing the military and defense industries. Most recently, the N.C. Department of Commerce (DOC) estimated that the military and Coast Guard presence in the state have a \$23.4 billion impact on the state's economy each year. As a result of the 2005 Base Realignment and Closing (BRAC) decisions, this impact is anticipated to increase to over \$26 billion by 2013. Non-profit planning organizations are doing community needs assessments to prepare for the sudden influx of population in the Fayetteville and Jacksonville areas. Members of the armed services, state agencies, community leaders, and other organizations with military-related missions such as the North Carolina Military Foundation, the North Carolina Military Business Center, and the Defense and Security Technology Accelerator (DSTA) are assisting these planners.

The DOC launched its newly designed website in 2007. This comprehensive redesign provides a new platform to build the state's brand among business audiences, communicate news to relevant stakeholders, and explain in-depth the wide spectrum of economic development programs underway in the state. The website features the Economic Development Intelligence System (EDIS) as a method of collecting a wide variety of information about counties, Economic Development Partnerships, and the state as a whole.

Another significant undertaking by the DOC is the implementation of a Customer Relationship Management (CRM) system. This software will allow the department to keep track of and share information about new and expanding businesses internally, provide better customer service to existing business, and to customize and direct marketing activities.

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GOAL 4:

CREATE STRONG METROPOLITAN GROWTH CENTERS THAT GENERATE REGIONAL BUSINESS DEVELOPMENT, SHARED PROSPERITY, AND A HIGH QUALITY OF LIFE, IN PARTNERSHIP WITH SURROUNDING AREAS.

North Carolina continues to help its communities develop the infrastructure, cultural amenities, and social capacity that attract business and investment and ensure a high quality of life.

The Division of Community Assistance (DCA), within the N.C. Department of Commerce (DOC), continues to serve 57 communities designated as North Carolina Main Street communities and 22 NC Small Town Main Street communities. The North Carolina Main Street Program Annual Conference saw record attendance at the January 2008 conference that has held in Rocky Mount, N.C. Approximately 350 attendees represented Main Street, Small Town Main Street, and communities of all sizes that are interested in downtown revitalization attended the education sessions and annual awards ceremony. Sessions on municipal wiring, wayfinding, diversifying the main street budget, and real cost design solutions were among just a few of the lessons learned.

The Office of Urban Development in the DCA has successfully expanded the small town downtown revitalization initiative statewide. In 2007, the General Assembly funded a Small Town Main Street staff position for western North Carolina, enabling the program to provide downtown development assistance to smaller communities across the state. The Small Town Main Street program now has four staff positions – two in the west and two in the east – and continues to add new towns annually. In August 2007, six towns were selected to participate in the program, and an additional six communities were designated in September 2008.

In November 2007, the North Carolina Economic Development Board approved a development hubs study, proposed by the Division of Policy, Research, and Strategic Planning at in the DOC, be undertaken. Currently this study is underway through a joint effort between North Carolina State University and University of North Carolina-Chapel Hill to define development hubs, examine North Carolina's resources, and identify best practices around the nation. Upon the completion of the study, in January 2009, members from various divisions of DOC will work with the N.C. Economic Development Board to formulate and implement policies to support this economic development concept.

GOAL 5:

DEVELOP THRIVING RURAL AREAS THAT MAINTAIN A HIGH QUALITY OF LIFE; ACHIEVE ONE NORTH CAROLINA BY MOBILIZING THE STATE'S RESOURCES TO CREATE STRONG REGIONAL PARTNERSHIPS AND PROGRAMS THAT FOSTER BROADER ECONOMIC DEVELOPMENT OPPORTUNITIES IN RURAL NORTH CAROLINA.

The state's economic development agenda places a large emphasis on improving the quality of life in rural areas of North Carolina. This goal encompasses improvements in physical infrastructure, technical assistance, and better access to state programs.

The North Carolina General Assembly took significant steps to support economic growth and quality of life in rural communities during its 2007 session. It authorized \$138.5 million to support rural development through infrastructure and job creation. The North Carolina Rural Economic Development Center, charged with administering the funds, has allocated \$100 million appropriation for Clean Water Partners Grants to meet the water and wastewater needs of rural communities. As of August 2008, more than \$62 million in grants has been awarded to the localities across the state to provide access to clean water or repair aging wastewater systems. Over the next several months, the Rural Center will continue to invest and address critical water and sewer problems in the rural areas. The expected result of the Clean Water Partners Grants will be to serve over 200 communities and leverage over \$200 million dollar.

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In 2006, the General Assembly appropriated \$244,699 for the 21st Century Communities program to employ three full-time staff for the central, eastern, and western regions to provide planning and technical assistance to current and future program participants. In 2007, six counties were selected to participate in the program, and in 2008 another five new counties were chosen, raising the total to thirty-one. The program anticipates that with the refining of selection elements of the competitive process and an increase in capacity (staffing), that designation and participation of thirty-seven counties by 2010 is an attainable benchmark. Because of the growing interest in the 21st Century Communities program, continued legislative support and funding are encouraged to successfully expand the program.

The N.C. Department of Commerce's Small Cities Community Development Block Grant (CDGB) program set aside \$1,000,000 in funds for fiscal year 2007 and 2008 to help implement the Small Business Entrepreneurial Assistance Program to help create and retain jobs within the state's most distressed communities. It is anticipated that thirty new jobs will be created as a result. While the 2007 program was available to the state's most distressed communities (Tier 1 and 21st Century Communities), the 2008 program will be open to all local governments eligible under North Carolina CDBG program. Tier 1 counties and 21st Century Communities participants will receive extra points during application scoring for their designation as a distressed community.

The Infrastructure category under CDBG provides funds for public water and/or public sewer. In 2007, CDBG funds provided 54,504 linear feet of water and sewer improvements to eligible local governments and assisted 286 households in those communities.

Placed Based Economic Development (PBED) is a recognized economic development strategy that capitalizes on local assets – natural, cultural, historic, human community and built – to create jobs, economic development and entrepreneurial opportunities in communities. In early 2007 a group of interagency representatives began meeting in an effort to better define the state's role in supporting PBED and working on strategies for interagency collaboration. Currently this group is partnering with the N.C. Department of Commerce's 21st Century Communities Program in an effort to better identify viable PBED projects and align their agencies' collective resources more effectively.

GOAL 6:**DEVELOP A COMPETITIVE, REGIONALLY BASED INFRASTRUCTURE AND PROMOTE SUSTAINABLE ECONOMIC DEVELOPMENT.**

As North Carolina competes in a competitive global market, the need for solid infrastructure and sustainable economic growth has increased. The N.C. General Assembly approved several pieces of legislation in 2007 to promote sustainable development and infrastructure maintenance and improvement.

The General Assembly established the Green Business Fund to attract and maintain sustainable businesses in the state. In 2008, the Green Business Fund allocated \$1 million for the first round of grants. A total of 85 small businesses filed applications seeking nearly \$7 million in funds. Thirteen businesses from across North Carolina received awards, totaling \$950,000. The N.C. Department of Commerce's Board of Science and Technology administers the program.

The e-NC Authority works to expand access to technology across the state. As of late 2006, 82 percent of North Carolina households have access to high-speed Internet service if they choose to subscribe. However, five counties still have less than 50 percent access and another 21 counties have less than 70 percent access. During the 2007 legislative session, the e-NC Authority received an appropriation of \$1.21 million for the expansion of high-speed Internet service in the four least-connected counties in the state - Gates, Greene, Jones and Warren counties, where less than 50 percent of households had access to high-speed Internet service. After this deployment, only 17 counties

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in North Carolina will have connectivity levels below 70 percent. The expected target is to eliminate the digital divide and increase the number of rural citizens who have access to high-speed Internet technology from 77 percent to 95 percent by Fall 2009.

The e-NC Authority also promotes technology access in the state through the development of community websites, technology training, and the operation of seven business Telecenters across the state. Since 2001, the Business & Technology Telecenter program has created 1,490 jobs, at a cost of \$4,049 per job. Collectively, the seven program sites have leveraged \$11.9 million in private financing.

GOAL 7:

MAINTAIN AND STRENGTHEN TOURISM, FILM, AND SPORTS INDUSTRIES; PRESERVE, PROTECT, AND PROMOTE OUR STATE'S CULTURAL, NATURAL, AND HERITAGE ASSETS.

The North Carolina Division of Tourism, Film and Sports Development continued its mission to unify and lead the state in developing the State as a major destination for leisure travel, group tours, meetings and conventions, sports events and film production.

In 2007, the Tourism Division delivered several publications highlighting travel and sporting opportunities. The publications included: The Official 2007 North Carolina Travel Guide; The Official 2007 North Carolina Golf Guide; and the North Carolina Calendar of Events.

Through its Community Development and Heritage Tourism programs, the Tourism Division continued efforts to develop tourism across the state, particularly in rural, less advantaged areas.

The state's Film Office reported that spending by film, television and commercial production companies increased to \$160.2 million in North Carolina in 2007, a 61 percent increase from 2006. This figure includes wages, goods and services used by commercial production companies. North Carolina introduced a film incentive program in 2007 that provides a tax credit for productions filmed in the state. A minimum of \$250,000 in-state spending qualifies productions for a 15 percent tax credit.

The North Carolina Department of Cultural Resources (DCR), "Homegrown Handmade: Art Roads and Farm Trails" book, companion to the website of the same name, became available May 2008. The self-driving trails cover 76 counties. This publication is a partnership of the DCR, North Carolina Cooperative Extension, and Golden LEAF Foundation.

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CONCLUSION

Although the nation's economy faced many challenges during the past year, North Carolina continued its tenure as one of the best places to do business and demonstrated its resilience by continuing to grow its workforce and expand export markets in the global economy.

In 2007, many of the North Carolina Economic Development Strategic Plan objectives and action steps were achieved or continued to progress. This update provides a measurement of progress on existing objectives, summarizes new economic trends, and details recent events that have influenced the state's agencies ability to fulfill the action steps corresponding to the board's stated objectives.

During the past year, the North Carolina Economic Development Board made a committed effort to focus on the challenges of achieving greater shared prosperity across our state. To this end, the Board and Department of Commerce partnered to support a development hubs study, being conducted through a joint collaboration between North Carolina State University and the University of North Carolina – Chapel Hill.

During 2008 and 2009, The N.C. Economic Development Board, Department of Commerce and economic development partners will continue to work on those strategic objectives which have not yet been fully achieved.

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APPENDIX A:
PRIORITY ACTION STEPS FOR 2008-2009**NORTH CAROLINA ECONOMIC DEVELOPMENT STRATEGIC PLAN PRIORITY ACTION STEPS FOR 2008-2009****GOAL 1: DEVELOP AN OUTSTANDING EDUCATION SYSTEM AND A HIGHLY QUALIFIED WORKFORCE****OBJECTIVE 1.1: SUPPORT CONTINUED FULL FUNDING FOR ENROLLMENT GROWTH IN THE UNIVERSITY OF NORTH CAROLINA, THE NORTH CAROLINA COMMUNITY COLLEGE SYSTEM AND K-12 PUBLIC EDUCATION.**

Action Step 1.1.1: Maintain support of the University of North Carolina, the North Carolina Community College System (NCCCS), and the North Carolina Public School system in regards to continued full funding for enrollment growth.

- a. **Responsibility:** N.C. Economic Development Board, the North Carolina Community College System, and the University of North Carolina
- b. **Deadline:** 2009 Legislative Session
- c. **Funding:** NA
- d. **Expected Outcome/Return on Investment:** Recommendations made by the Economic Development Board will result in the continued full funding of enrollment growth in all public education systems.

What Has Been Accomplished: A State Education Lottery was established in 2005 to provide funds for school construction, smaller class sizes, college scholarships, and pre-kindergarten programs.

Also in 2005, the legislature appropriated \$2 million for the Community College Enrollment Reserve fund, which will aid the community colleges in providing technical training for regional job development. During the 2006 legislative session, the General Assembly outlined the goals of the community college system in HB 583 - which identified the community college system as the lead state agency for workforce development training, literacy, and adult education.

One of the major efforts the N.C. Commission on Workforce Development is developing for 2008 is a valuing education campaign. The intent of this campaign is to underscore the importance of education in the 21st century economy. More jobs are requiring degrees and technical knowledge than in previous generations. This campaign in part recognizes that continued funding for higher education in North Carolina is critical for the success of the state's economy.

NCCCS enrollment growth was fully funded (\$8.8 million) by the North Carolina General Assembly in 2007 facilitating the accommodation of 2,296 additional full-time students. An additional \$2 million was also appropriated to an enrollment growth reserve for colleges that experienced growth greater than 5 percent. The reserve was distributed but was approximately \$10 million short of what was needed to accommodate new growth in 2007-2008.

What Remains to be Done: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter advocating its support for continued full funding for enrollment growth to the chairs and members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators.

Milestone Targets: Letter will be sent prior to the convening of the 2009 session.

OBJECTIVE 1.4: FUND AN INCREASE IN STATE-OF-THE-ART TRAINING EQUIPMENT TO MEET THE NEEDS OF EMPLOYEES AND EMPLOYERS SEEKING TO THRIVE IN THE NEW ECONOMY.

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Action Step 1.4.1: Advocate and support the NCCCS's recommendations to provide additional funding for equipment needs by crafting a letter to the Governor and the General Assembly, as well as, assembling the support of all stakeholders through the N.C. Economic Development Board.

- a. **Responsibility:** N.C. Economic Development Board Chair
- b. **Deadline:** 2009 Legislative Session
- c. **Funding:** General Fund
- d. **Expected Outcome/Return on Investment:** Clearly expressed support leading to passage of legislation that creates equity in funding for high-demand courses.

What Remains to be Done: In preparation for the 2009 legislative session, the N.C. Economic Development Board will send a letter advocating its support for additional funding for equipment needs for the state's community colleges to the chairs and members of the House and Senate appropriations committees, other relevant committee chairs and members, and key legislators.

Milestone Targets: Letter will be sent prior to the convening of the 2009 session.

GOAL 2: INVEST IN SCIENCE, TECHNOLOGY, AND UNIVERSITY OUTREACH

OBJECTIVE 2.1 ALLOCATE RESOURCES AND MAKE INVESTMENTS TO CREATE AN ENVIRONMENT THAT PROMOTES THE EFFECTIVE TRANSFER OF SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE AND RESOURCES TO PROMOTE THE ECONOMIC GROWTH AND DEVELOPMENT OF NORTH CAROLINA.

Action Steps 2.1.1 and 2.1.2: Develop a mechanism within state government to provide coordination and assistance to existing public and private sector science and technology resources to make the best use of those resources for advancing economic development and job growth throughout the state by increased funding for the N.C. Board of Science and Technology. Science, technology, and economic development, which are interrelated and vital to North Carolina's future economic success, and require coordinated attention at the state level.

- a. **Responsibility:** N.C. Board of Science and Technology
- b. **Deadline:** June 30, 2009
- c. **Funding Source:** State appropriations (cf. 2.1.2)
- d. **Expected Outcome/Return on Investment:** The creation of opportunities for more efficient and effective leveraging of existing and new resources to support technology-based economic development to create jobs and turn innovative ideas into marketable products.

For example, it will work with partners across the state to facilitate and support:

- External research funding to North Carolina's colleges, community colleges, universities, and industry;
- The amount of federal SBIR/STTR research commercialization funding awarded to North Carolina organizations;
- Commercialization of intellectual property from universities and laboratories and growth of entrepreneurial companies;
- Growth and diversification of private and venture investment across North Carolina;
- Activities to attract and leverage private investment in North Carolina companies; and
- Economic development through the promotion of technology-based solutions to current and future business issues, serving both technology and non-technology firms in the state.

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What Has Been Accomplished: The N.C. Board of Science and Technology continues to fulfill this function, as it has since its creation in 1963. However, the Board's funding level has remained constant for several years, thus severely limiting its ability to serve in an agenda-setting, coordinating, facilitating role.

What Remains to Be Done: The N.C. Board of Science and Technology should receive increased recurring state appropriations for basic operational purposes.

Milestone Targets: Letter will be sent prior to the convening of the 2009 session.

Action Step 2.1.3: Catalyze and support expanded innovation activities from all of North Carolina's universities through appropriate follow-up to the University System's economic development plan. This has been integrated into the strategic priorities of the UNC System, providing staffing to the function at a system level and on each campus. Incenting Universities to embrace a culture of innovation and entrepreneurship that transfers seamlessly to the State's economy by:

- i. Strengthening technology transfer services at all campuses;
 - ii. Establishing a statewide, distributed support network of key technology transfer partners;
 - iii. Providing additional resources to University technology-transfer organizations;
 - iv. Developing new metrics for university innovation and economic development;
 - v. Developing a consolidated database of UNC university research; and
 - vi. Supporting the creation of multiple early-stage seed capital funds across the state.
- a. **Responsibility:** University of North Carolina (Vice President for Research and Sponsored Programs; Small Business and Technology Development Center (SBTDC))
 - b. **Deadline:** June 2009
 - c. **Funding Source:** Accelerate NC SBTDC expansion budget requests and private investment funding
 - d. **Expected Outcome/Return on Investment:** Increase in level of technology transfer activities and value; statewide business creation and enhanced competitiveness

What Has Been Accomplished: North Carolina universities are emerging as centers of regional entrepreneurship. The University of North Carolina's Board of Governors added a seventh strategic directive to its long-range plan in 2006 to emphasize the university's role in transforming the state economy through "basic and applied research, innovation and creativity, transfer of knowledge, application of best practices, and high quality degree programs." In May 2006, the Board of Governors adopted a report by the Special Committee on 'Economic Development and the Role of The University'. This report provides a framework for economic and community development activities on university campuses.

Technology transfer services have been strengthened over the past five years on less research-intensive campuses through contracts with university-based spin-off companies, and the University is currently developing a plan to strengthen technology transfer efforts on all campuses. These initiatives were implemented based on discussions with the Council of Research Administrators, a group comprised of representatives from the various university campuses, and convened by the Vice President of Research. These measures aim to increase the amount of university innovation through technology transfer and commercialization and to promote economic development activities.

The Small Business Technology Development Center (SBTDC) has taken the lead in supporting the creation of six structured early-stage angel capital funds located across the state. The funds will make investments of from \$50,000 to \$125,000 in early-stage technology and other high-growth potential businesses.

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What Remains to Be Done: The UNC System should systematically re-examine technology transfer structures and staffing at all public universities to determine how they will maximize technology transfer for creation of jobs in North Carolina.

Milestone Targets: UNC System should complete a comprehensive plan to increase university innovation and maximize job creation by technology transfer by June 2010.

Action Step 2.1.4: Taking into account mission studies mandated by the legislature in this area, complete regional resource analyses across the state to understand regional strengths and opportunities; align university initiatives and expertise with the needs of regional economic development clusters; and develop strategies and tactics to address knowledge-based job creation in each region by:

- i. Creating the best possible / most robust set of tax and incentive policies available to start, grow, and attract technology-based businesses;
- ii. Undertaking a comprehensive review of the Umstead Act, with the goals of proposing amendments to it to improve the ability of the University of North Carolina to commercialize its technologies while protecting the state's private enterprises from unfair competition; and
- iii. Building strong regionally focused partnerships between universities, economic development organizations and businesses.
 - a. **Responsibility:** N.C. Board of Science and Technology; North Carolina Chamber; University of North Carolina; N.C. Department of Commerce; N.C. Department of Revenue
 - b. **Deadline:** June 2009
 - c. **Funding Source:** Current resources
 - d. **Expected Outcomes/Return on Investment:** Increased commercialization of University technologies. Increase in the number of high-technology companies.

What Has Been Accomplished: Several proposals passed during the 2006 legislative session aimed to boost North Carolina's position in science and technology. Specifically, the 2006 General Assembly included a provision in its budget to reduce the sales tax on R&D equipment to promote technology-based growth in North Carolina.

During the 2005 legislative session the General Assembly voted to amend the Umstead Act with HB 1539. This bill authorized the Board of Governors of the University of North Carolina to establish a panel to determine whether the university system has the authority to undertake an activity in competition with a nongovernmental entity. This measure aims to improve the ability of the University of North Carolina to commercialize its technologies while protecting private enterprises from unfair competition.

The University System has benefited from an expansion of funding for the Area Health Education Centers (AHEC) to help address critical needs for health care workers and other needs.

With support from the General Assembly and Golden LEAF Foundation, North Carolina State University and North Carolina Central University have continued to develop their programs to do research and train graduates in critical areas of biotechnology.

What Remains to Be Done: The N.C. Department of Commerce (DOC) and the University System (UNC) need to fully implement the 2007 Memorandum of Agreement pursuant to which there will be more effective collaboration between these agencies and others at both the state and regional levels.

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Milestone Targets: Each region convenes quarterly meetings of DOC and UNC regional representatives.

OBJECTIVE 2.2 ALLOCATE RESOURCES AND MAKE INVESTMENTS TO SUPPORT THE CREATION OF NEW KNOWLEDGE AND TECHNOLOGY THAT WILL SUSTAIN AND ENHANCE NORTH CAROLINA'S COMPETITIVENESS AS A LEADING TECHNOLOGY STATE.

Action Step 2.2.1: Strengthen the overall R&D capacity of all North Carolina Universities and research institutions by enhancing key administrative support functions and processes that currently constrain their competitive R&D position.

- i. Seeking opportunities to streamline internal operations and find ways to most effectively administer operations;
- ii. Continuing to allow the University to retain 100% of its indirect cost recovery;
- iii. Widening the flexibility of the University under the State Personnel System for UNC;
- iv. Modifying State purchasing regulations such that UNC can be empowered to use State purchasing contracts when advantageous from a cost, quality, and/or service perspective;
- v. Granting the University authority to choose alternative vendors when lower costs, higher quality, or superior service are available; and
- vi. Easing existing restrictions on construction and leasing arrangements for University buildings that are constructed or acquired through self-liquidating sources.
 - a. **Responsibility:** General Assembly; University President and Board of Governors; Institution Chancellors and Boards of Trustees
 - b. **Deadline:** June 2010
 - c. **Funding Source:** Current resources; required financial investment for this step would be minimal.
 - d. **Expected Outcome/Return on Investment:** Enhanced ability of UNC to construct research facilities to do research in areas of economic competitiveness, thus increasing the impact of University-based research on state economic recovery, growth, and development

What Has Been Accomplished: The University's President's Advisory Committee on Efficiency and Effectiveness (PACE) Commission recommendations have aimed to reduce inefficiencies and redundancies. The UNC system still retains 100% of its indirect cost recovery.

What Remains to Be Done: Broader flexibility under the State Personnel Act is still needed.

Action Step 2.2.2: Fund an initiative to promote economic growth in North Carolina through the identification and development of emerging technologies. For example, nanotechnology—the science of the very small— will fundamentally transform science, technology, and society, from microscopic computer chips to cancer-fighting vaccines. As such, it holds tremendous potential for North Carolina and the nation. Nanotechnology will be the basis of manufacturing technology in the future. Developing a coordinated response to the challenges and opportunities presented by this and other emerging technologies will greatly expand the opportunity for all North Carolinians to obtain and retain challenging and economically rewarding employment.

- a. **Responsibility:** N.C. Board of Science and Technology (coordinating); University of North Carolina (UNC); the North Carolina Chamber; N.C. Biotechnology Center; and Department of Commerce (DOC)
- b. **Deadline:** June 2010
- c. **Funding Source:** State appropriations Note: The UNC System is using current year non-recurring funding to pay for research in areas related to economic development priorities. In addition, NC State is using current year non-recurring funding to support 10 industry clusters ranging from value-added agriculture to medical technologies and devices. Recurring funding for both of these programs is a University priority budget request for FY2008/09

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- d. **Expected Outcome/Return on Investment:** The creation of a strategic plan which assesses the states assets and ROI comparable to state investment in Biotechnology. Development of capabilities core to the retooling of existing manufacturing industries as well as the development of new generations of science and technology businesses and clusters statewide. Position North Carolina aggressively to secure federal research funding and technology leadership in these technologies

What Has Been Accomplished: In the spring of 2005, the N.C. Board of Science and Technology formed the Governor's Task Force on Nanotechnology and North Carolina's 21st Century Economy. The task force issued its first report in April 2006 and is working to implement a series action steps that will improve the environment for technological innovation and the application of nanotechnology in North Carolina. Also in 2005, the General Assembly authorized the Defense Technology Innovation Center in Fayetteville to create collaborations with the military, entrepreneurs, and innovators to produce technology solutions and business development. The NC Biotechnology Center launched a Centers of Innovation initiative in 2007. Planning grant applications have been solicited and four awards have been made. Applicants will develop business plans and create and sustain Centers of Innovation in targeted areas of bio-science (Marine-Bio science, Medical Devices, Natural Products and Bio-nano). Approved plan will receive multi-year funding support.

What Remains to Be Done: Find recurring funding to support implementation of components of the nanotechnology research efforts.

Milestone Targets: Increase university research funding levels in targeted economic development areas by \$30 million in recurring funds by June 2010.

Action Step 2.2.3: Strengthen the overall R&D capacity of the 16-institution University of North Carolina by providing resources and incentives for faculty development.

Priorities include:

- i. Investing in competitive faculty salaries, increasing them to the 80th percentile of peer institutions;
 - ii. Investing in state-of-the art research and development facilities and equipment across all regions of the state;
 - iii. Increasing opportunities and incentives for faculty collaboration with universities, industry, government, and non-profits; and
 - iv. Reviewing and revising promotion and tenure guidelines to reflect the increasing importance of collaboration, entrepreneurship, and scholarly community assistance.
- a. **Responsibility:** General Assembly; University President and UNC Board of Governors; Institution Chancellors and Boards of Trustees
 - b. **Deadline:** June 2010
 - c. **Funding Source:** State appropriations would fund salaries, incentives, facilities, and equipment
 - d. **Expected Outcome/Return on Investment:** Enhanced competitive advantage for the University System, thus increasing the impact of University-based research on State economic recovery, growth, and development

What Has Been Accomplished: In 2006, community college and university faculty received a 6 percent, with a one-time 2 percent bonus for community college faculty and staff. The higher pay raises, along with \$79 million for new professors and staff, are intended to attract high-quality faculty and meet projected enrollment increases at North Carolina universities. The new budget also invested in research initiatives at state universities. The University of North

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Carolina at Chapel Hill medical school used/is using \$2.5 million to expand its translational medicine program, which connects basic research with applied pharmaceutical development. Biotechnology programs at North Carolina Central University and North Carolina State University will receive \$4.5 million, and the N.C. Biotechnology Center and its regional offices are getting a \$2.5 million budget increase. The new North Carolina Research Campus in Kannapolis will have \$6.7 million through UNC and Rowan-Cabarrus Community College Training Center and Greenhouse to fund its first year of operations, and Fayetteville State University will be able to begin capital planning on a new science and technology complex with a new allocation. The budget also provided \$20 million for a new competitive grant program for state universities to attract faculty, purchase equipment, and undertake allied health projects. In 2007 a memorandum of agreement was signed between the University of North Carolina and the Department of Commerce, which aims to increase the connectivity of campuses to regional development infrastructures.

What Remains to Be Done: The North Carolina Community College System and the University of North Carolina (UNC) System both face significant retention issues with their faculty over the next decade as more schools compete to hire their brightest faculty and retirements outstrip new faculty availability. Increased capital expenditures for research facilities will be pitted against increased space for teaching facilities, as overall student enrollment increases by an estimated 40% over the next decade. The Economic Development Board should send a letter advocating its support for recurring sources of competitive research funding to support UNC faculty research in sectors deemed critical to North Carolina's long term economic future.

Milestone Targets: Each region convenes quarterly meetings of the N.C. Department of Commerce (DOC), UNC regional representatives.

Action Step 2.2.4: As part of a regional strategy, systematically promote the state's University Millennium Campuses and support the development of new ones as sites for growing and attracting new technology-based businesses by allocating a portion of the state's marketing resources to heighten awareness of the state's science and technology initiatives, including its University research parks; also consider ways the State capital budget can serve as a strategic investment tool for creating new and enhancing existing industry-university research parks.

- a. **Responsibility:** DOC, University of North Carolina System
- b. **Deadline:** June 2010
- c. **Funding Source:** 20% of the state's marketing resources should be used to promote these critical research centers
- d. **Expected Outcome/Return on Investment:** Significant increase in inquiries by prospective tenant companies and measurable increase in company commitments to research park locations; increased collaboration among universities, industry, and non-profits; increase in number of research parks; strengthening of university-industry collaborations, enhanced opportunities for technology transfer and business creation

What Has Been Accomplished: This action step is in progress and the University of North Carolina continues to receive support for the millennium campus initiative.

What Remains to Be Done: A significant, high profile ad campaign should be launched to promote industry-university research parks.

Milestone Targets: By June 2010, 8 UNC campuses will have functional millennial campuses.

Action Step 2.2.5: Increase knowledge of SBIR and STTR awards throughout the state and strengthen application assistance for entrepreneurs to increase their success rate in receiving such awards.

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- a. **Responsibility:** University of North Carolina (Small Business and Technology Development Center)
- b. **Deadline:** June 2009
- c. **Funding Source:** State appropriations and possible federal funding under the Federal and State Technology Partnership (FAST) Program
- d. **Expected Outcome/Return on Investment:** Enhanced awareness of funding opportunities; improved quality of funding proposals; increased success rate of proposals and businesses relying on these programs for early-stage funding; increase in the number of strategic linkages between businesses and research institutions

What Has Been Accomplished: The Small Business and Technology Development Center (SBTDC) has been designated by the Governor as the North Carolina Federal and State Technology Partnership (FAST) representative. The SBTDC is the state's lead organization for the promotion and support of small business access to SBIR and STTR programs. It provides a robust range of services to entrepreneurs and university researchers aimed at increasing awareness of these programs and boosting the number of successful applications for awards. Examples of the SBTDC's services include major statewide conferences, numerous workshops, and individualized proposal assistance. Combined, these steps have raised awareness of SBIR and STTR awards throughout the state and increased the application success of regional entrepreneurs. The SBTDC's success in this area has been noticeable, as it was selected to host the national 2007 SBIR/STTR conference held for the first time in North Carolina. To increase the number of these awards as well as the competitiveness of North Carolina businesses in receiving them, the One North Carolina Small Business Fund, initiated in 2006 by the Board of Science and Technology, has issued more than 160 grants to North Carolina small businesses, totaling more than \$10 million. The North Carolina small businesses receiving the grants project to create more than 100 jobs in the state and to patent, license, and sell technologies and products worth more than \$1 billion.

What Remains to Be Done: Recurring state matching funding for recipients of SBIR and STTR awards is needed. The SBTDC should seek federal funding under the FAST program as it becomes available.

Milestone Targets: Continue to monitor and report on SBIR and STTR activity in North Carolina.

GOAL 3: ENSURE A COMPETITIVE ENVIRONMENT FOR THE RECRUITMENT AND RETENTION OF BUSINESSES, CAPITAL INVESTMENT, AND JOB CREATION

OBJECTIVE 3.1: DEVELOP AND MAINTAIN NORTH CAROLINA'S NATIONALLY SUPERIOR BUSINESS CLIMATE THAT CONSISTS OF AFFORDABLE BUSINESS COSTS, FAIR REGULATION, AND AN EQUITABLE TAX SYSTEM.

Action Step 3.1.3: Identify a dedicated source of funding for the One North Carolina Fund.

- a. **Responsibility:** Governor, Department of Commerce, Economic Development Board and General Assembly
- b. **Deadline:** December 31, 2009
- c. **Funding Source:** General Fund or other dedicated funding source
- d. **Expected Outcome/Return on Investment:** Recurring funds for the One North Carolina Fund

What Has Been Accomplished: While the North Carolina General Assembly often has given the N.C. Department of Commerce the authority to offer a higher level of support to companies, it has been unable to persuade the General Assembly of the need for a dedicated funding source.

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What Remains To Be Done: Continue to inform members of the General Assembly of the programs successes and to encourage recurring funding.

Milestone Targets: The 2009 General Assembly will approve dedicated funding for the One North Carolina Fund. The N.C. Economic Development Board will work with the N.C. Department of Commerce and others to promote this legislation.

GOAL 4: CREATE STRONG METROPOLITAN GROWTH CENTERS THAT GENERATE REGIONAL BUSINESS DEVELOPMENT

OBJECTIVE 4.1 - PROMOTE A STATE GROWTH FRAMEWORK THAT STIMULATES URBAN DEVELOPMENT WITH BENEFICIAL REGIONAL ECONOMIC INFLUENCES.

Action Step 4.1.2: Identify development hubs with regional significance (beyond the three largest metropolitan areas) and develop strategies to strengthen them and make them more competitive.

- a. **Responsibility:** Department of Commerce Division of Policy, Research, and Strategic Planning, and the Office of Urban Development, and other government and non-profit development agencies. State agencies and legislature identify and allocate or reallocate resources to strengthen hubs
- b. **Deadline:** 2009
- c. **Funding Source:** State agencies reallocate existing resources and legislature appropriate new funds
- d. **Expected Outcome/Return on Investment:** Strengthened “economic engines” in mid-sized development areas that will generate more jobs for multi-county regions that they serve

What Has Been Accomplished: A presentation on development hubs was presented at the August 2004 board meeting and the idea of development hubs has been discussed at several occasions since then but has not been able to reach a consensus on what the key ingredients of a successful hub would be.

What Remains To Be Done: During the November 2007 Board meeting, Division of Policy, Research, and Strategic Planning staff proposed a development hubs study which the Board approved. The study is now underway by a joint effort of North Carolina State University and UNC-Chapel Hill to define development hubs, examine North Carolina’s resources, and identifies best practices around the nation.

Milestone Targets: Upon the completion of the study in January 2009, members from various divisions of Commerce will work with the N.C. Economic Development Board to formulate and implement policies to support this economic development concept.

OBJECTIVE 4.3 - STRENGTHEN CENTRAL CITIES TO REESTABLISH THEIR ROLE AS THE ECONOMIC CORE AND ENGINE OF METROPOLITAN AREAS.

Action Step 4.3.2: Request new funding to recapitalize the Main Street Financial Incentive Fund with its 10:1 leverage to increase the number of buildings rehabilitated in downtowns.

- a. **Responsibility:** Department of Commerce’s Division of Community Assistance (DCA)
- b. **Deadline:** May, 2009 (contingent upon General Assembly budget)
- c. **Funding:** 1.0 million from General Fund to leverage millions from private sources

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- d. **Expected Outcome/Return on Investment:** Increased number of buildings being rehabilitated in Main Street community downtowns, increased job creation, business development. The Main Street Financial Incentive Fund used a \$1 million appropriation in 1989 to leverage \$22 million in private investment

What Has Been Accomplished: There is a proven track record of dramatically increasing number of buildings rehabilitated in downtowns to spur investment and create jobs. The economic impact of Main Street is evidenced by the reinvestment in its 57 designated communities. Since 1980, North Carolina Main Street downtowns have seen more than \$1.1 billion of new investment and experienced a net gain of more than 12,500 jobs. These central business districts have also benefitted from the renovation of 2,900 buildings and have seen a net gain of 3,000 businesses.

What Remains To Be Done: DCA has an interest in pushing for this program and has periodically put this item in their expansion budget request but it has not made it to the high priority list nor has it made it into the Governor's budget.

Milestone Targets: A self-help initiative, North Carolina Main Street provides services but no funding to local programs. As the North Carolina Main Street program continues to accept new communities, continued legislative support and funding are essential to maintaining and enhancing the current level of assistance, helping these communities return their downtowns to economic viability, while making them vibrant places to live, work and play and creating a better quality of life for all.

Action Step 4.3.3: Expand the N.C. Department of Commerce's successful Small Town Main Street Program statewide.

- a. **Responsibility:** Department of Commerce's Division of Community Assistance (DCA) and Office of Urban Development
- b. **Deadline:** Ongoing
- c. **Funding:** Legislative appropriation to maintain this program is needed. The initial pilot version of this program was funded with a grant from the Z. Smith Reynolds Foundation. That grant supported the implementation of the program in Eastern North Carolina, but is not intended to maintain or expand the program
- d. **Expected Outcome/Return on Investment:** The program will increase the number of small towns involved with downtown development and increased reinvestment within small town downtowns

What Has Been Accomplished: The 2006 session of the N.C. General Assembly granted the funding for creation of a position for Western North Carolina to reach western small towns in downtown development. The 2007 Governor's budget request for a second staff position in the Western Regional office was approved. The Small Town Main Street program now has four staff positions – two in the west and two in the east – and continues to add new towns annually. In September 2008, an additional six towns were designated N.C. Small Town Main Street communities.

What Remains To Be Done: DCA needs two positions in Central North Carolina to provide the same services as in the East and West, but in a more cost-effective manner. A Central office would cut travel time and expense. DCA received much interest in their assistance and has a growing number of Piedmont towns seeking help. A central office location would be critical to more efficiently serving these towns.

Milestone Targets: With the growing interest in Small Town Main Street Program from the many communities needing assistance, continued legislative support and funding are critical to providing services to all the communities seeking help.

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PRIORITY ACTION STEPS FOR 2008-2009**GOAL 5: RURAL DEVELOPMENT - DEVELOP THRIVING RURAL AREAS THAT MAINTAIN A HIGH QUALITY OF LIFE****OBJECTIVE 5.3 - BUILD SOCIAL CAPACITY TO ENHANCE COMMUNITY LIVABILITY.**

Action Step 5.3.2: Continue promoting participative and comprehensive approaches to economic development by making a refined 21st Century Communities Initiative available to 50 percent of rural communities.

- a. **Responsibility:** N.C. Department of Commerce
- b. **Deadline:** 2010
- c. **Funding Source:** General Assembly and the Department of Commerce
- d. **Expected Outcome/Return on Investment:** Begun in 2001, the 21st Century Communities initiative creates collaboration between DOC and selected counties affected by national economic slowdowns and by near- and long-term changes in the state's economic base. The initiative furthers the coordination among the public, private, and non-profit sectors engaging in economic, cultural, environmental, and community development planning and projects

What Has Been Accomplished: Through 2006, the N.C. Department of Commerce's successful 21st Century Communities Program has selected twenty counties. The N.C. General Assembly appropriated funds for the amount of \$244,699 to employ three full-time staff dedicated to the program providing collaborative planning and technical assistance to current and future communities of the program. During 2007, staff has been selected and is housed in three regional offices (Raleigh, Washington, and Asheville) of the Division of Community Assistance. In 2007, six counties were chosen to participate in the program, and in 2008 another five new counties were added, raising the total to thirty-one.

What Remains To Be Done: As there is a growing interest in the 21st Century Communities program, continued legislative support and funding are encouraged to successfully expand the program.

Milestone Targets: With continued legislative support and funding, the program anticipates that with the refining of selection elements of the competitive process and an increase in capacity (staffing), designation and participation of thirty-seven counties by 2010 is an attainable benchmark.

OBJECTIVE 5.5 - UTILIZE AGRICULTURE AND NATURAL RESOURCES FOR ECONOMIC DEVELOPMENT.

Action Step 5.5.5: Continue to develop and implement an e-agriculture strategy to increase the rate at which farm operators and employees utilize Internet resources.

- I. Develop a web-based portal for channeling timely information to farm operators.
 - II. Provide access to resources & information needed for value-added business development.
 - III. Target innovative methods for increasing farm operator and employee Internet usage
- a. **Responsibility:** e-NC, N.C. Department of Agriculture, N.C. Community College System, N.C. Cooperative Extension Service
 - b. **Deadline:** 2009
 - c. **Funding Source:** existing sources: e-NC, Ag Advancement Consortium, Rural Center, NCDA&CS

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- d. **Expected Outcome/Return on Investment:** Increased rate of farm Internet usage, increased capacity to provide information to farm operators and producers via the Internet, increased capacity for producers to access federal programs on the web

What Has Been Accomplished: The e-NC Authority has made significant strides to ensure that people in rural areas have access to high-speed Internet services. Currently 80.02 percent of rural households in North Carolina have the ability to access high-speed Internet services. This is a considerable improvement over data from 2004. The e-NC Authority is in active communication with partner organizations on this project, and is considering the development of an agricultural portal that would focus on the needs and use of the Internet as it applies to the economics of farming.

What Remains To Be Done: The e-NC Authority is seeking funding support for the Business & Technology Telecenter program comprised of seven technology resource centers located in Tier 1 communities across the state – Alleghany, Anson, Cherokee, Martin, Northampton, Rockingham and Rutherford counties. These centers serve to build digital literacy, develop jobs through entrepreneurship training, and allow access to major technical resources. They build local wealth while providing resources to help rural communities in the transition to a 21st century, knowledge-based economy.

Milestone Targets: To continue to support these centers, the e-NC Authority would like to have legislative support for a sustaining fund of \$50,000 annually, for a total of \$350,000 across the seven sites.

GOAL 6: DEVELOP COMPETITIVE, REGIONALLY-BASED INFRASTRUCTURE AND PROMOTE SUSTAINABLE ECONOMIC DEVELOPMENT

All the action steps were either successfully accomplished or could not be due to changes in policy priorities. For more information, refer to the Strategic Plan Action Step Progress Sheet in the Appendices.

GOAL 7: MAINTAIN AND STRENGTHEN TOURISM, FILM, AND SPORTS INDUSTRIES; PRESERVE, PROTECT, AND PROMOTE OUR STATE'S CULTURAL, NATURAL, AND HERITAGE ASSETS

All the action steps were either successfully accomplished or could not be due to changes in policy priorities. For more information, refer to the Strategic Plan Action Step Progress Sheet in the Appendices.

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Action Step	Action Status	Progress Update
GOAL 1: DEVELOP AN OUTSTANDING EDUCATION SYSTEM AND A HIGHLY QUALIFIED WORKFORCE		
Objective 1.1 Support continued full funding for enrollment growth in the University of North Carolina, the North Carolina Community College System, and K-12 public education.		
Action Step 1.1.1 Maintain support of the University of North Carolina, the North Carolina Community College System, and the North Carolina public school system in regards to continued full funding for enrollment growth.	Ongoing	Priority Action Steps for 2008-2009
Objective 1.2 Coordinate and improve the quality of K-16 public education to prepare students for the further education and enhanced work opportunities.		
Action Step 1.2.1 Support existing programs and create expanded choices for work-based learning opportunities for all students such as community service, job shadowing, internships, and apprenticeships that are tied to curriculum objectives.	Accomplished	This action step was previously accomplished, in part, by the continued implementation of the Learn and Earn program, the new position of the DPI Director of Joint High School / Community College Programs, and updates to DPI curriculum.
Action Step 1.2.2 Continue to implement the recommendations developed by the 2002 Commission On Closing the Minority Student Achievement Gap.	Accomplished	DPI created an implementation plan in 2006 for the recommendations of the Advisory Commission on Raising Achievement and Closing Gaps. To promote its objectives DPI hosts an annual conference for approximately 3,500 public school personnel. The conference continues to reflect the goals of the department in improving the quality of public education for all children in North Carolina.
Action Step 1.2.3 Implement the Subcommittee on the Workforce Delivery System's recommendations.	Accomplished	Several of the recommendations from the Subcommittee on Workforce Delivery System have been implemented: the Governor created an alliance; regional skills partnerships were undertaken by the Commission on Workforce Development; and the community college system is actively engaged with local workforce development boards.
Objective 1.3 Support and advocate for an adjusted funding formula for occupational extension continuing education in the North Carolina Community College System.		
Action Step 1.3.1 Provide \$4.2 million to a Customized Training program, based on combining the existing NEIT and FIT programs at the community college level that would implement strategic applied training programs and services that result in the recovery and retention of jobs and new investments in response to local market needs.	Accomplished	This was accomplished via continued recurring funding for these programs. The community college training programs were consolidated into the Customized Training Program to provide flexibility for the NCCCS to enhance training for the purpose of stimulating additional capital investment, creation of new jobs, and retention of existing jobs in North Carolina.

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Action Step 1.3.2 Contract with independent consultant to analyze and prioritize course offerings based on local industry needs and the level on demand for certain programs/degrees.	Accomplished	As part of an ongoing effort, the NCCCS continues to work with development consultants to analyze and prioritize course offerings and training programs based on local, regional, and statewide industry needs. As part of the NCCCS Strategic Plan for 2007-2009, a process was undertaken to examine changing population trends and gaps that may exist in the ability to fill needs as a result of these changes in state demographics.
Objective 1.4 Fund an increase in state-of-the-art training equipment to meet the needs of employees and employers seeking to thrive in the new economy.		
Action Step 1.4.1 Advocate and support the North Carolina Community College System's recommendations to provide additional funding for equipment needs by crafting a letter to the Governor and the General Assembly, as well as, assembling the support of all stakeholders through the Economic Development Board.	Ongoing	Priority Action Steps 2008-2009
Action Step 1.4.2 Provide adequate funding for the NCCCS equipment requests.	Accomplished	Additional funding for equipment was provided by the General Assembly for several community college programs, including: nursing; allied health; and biotechnology.
Objective 1.5 Position North Carolina as an international leader in science, math, and technology-based education and increase the number of scientists, engineers, and technicians produced through increased investment in North Carolina's public schools, the North Carolina Community College System, the University of North Carolina, and private universities.		
Action Step 1.5.1 Create a statewide Task Force organized by Education Cabinet, comprised of individuals from the Department of Commerce, the Department of Public Instruction, the North Carolina Community College System, the University System, private universities, the Commission on Workforce Development, and the business community to return recommendations to the Education Cabinet and the Economic Development Board.	Not Accomplished	Priorities were modified
Action Step 1.5.2 Make changes in the existing workforce training process to correct barriers to technology-oriented training (NC Community College System FTE limits and competitiveness) and fast track the development of critically needed technology-trained workers.	Accomplished	To accommodate technology-oriented training the NCCCS has taken significant measures to fast track the development of critically needed skilled workers. Funds were allocated for an online teaching and learning platform for distance education, an online helpdesk, an expansion of the NC Information highway and two new centers for the development of distance education centers.

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Action Step 1.5.3 Support continued funding (\$7.1 million) for the NCCCS BioNetwork Program. The BioNetwork Program produces a continuous stream of trained high-tech workers and provides dislocated workers with skills needed in the new economy.	Accomplished	The General Assembly appropriated recurring funds to provide the program with dedicated resources. The NCCCS BioNetwork continues to connect community colleges across North Carolina, providing specialized training, curricula and equipment, to develop a world-class workforce for the biotechnology, pharmaceutical and life sciences industries.
Objective 1.6 Advocate and support the development of regional skills alliances that are public/private ventures to ensure workers have the training they need to meet the demands of the current and future workplace.		
Action Step 1.6.1 Under the direction of the Commission on Workforce Development, in cooperation with the state community college system, local community colleges, workforce development boards, and regional economic development partnerships will be the development of a regional skills alliance implementation plan. This plan will include an identification of best practices, an identification of system capacity building needs and strategies related to the development and management of skills alliances, an identification of the sector-based skills alliances to be developed in each region, and an implementation timeline.	Accomplished	In 2007, the Department of Commerce's Workforce Division and the Governor's Office announced a planning grant opportunity to support the development of Regional Skills Partnerships in the allied health sector. The planning grants were designed to address workforce issues of the allied health sector for the purpose of increasing the sector's competitiveness and creating employment and career advancement opportunities for workers. Planning grants have been awarded to 7 partnerships across the state to address allied health employment and skills development related issues.
Action Step 1.6.2 The Commission on Workforce Development and the Workforce Development and Education Committee, along with the entire Economic Development Board, will reach agreement on a regional skills alliance implementation plan.	Accomplished	The Economic Development Partnership Committee—a subcommittee of the North Carolina Commission on Workforce Development—provides oversight of the Allied Health Regional Skills Partnership grant program. A core team has oversight for the project that includes representatives from the Governor's Office, Commerce, North Carolina Community College System, Employment Security Commission, UNC Cecil G. Sheps Center, and the North Carolina Hospital Association.
Action Step 1.6.3 Implement the plan to develop industry-led regional skills alliances.	Accomplished	Planning grants have been awarded to 7 partnerships across the state to address allied health employment and skills development related issues.
GOAL 2: INVEST IN SCIENCE, TECHNOLOGY, AND UNIVERSITY OUTREACH		
Objective 2.1 Allocate resources and make investments to create an environment that promotes the effective transfer of scientific and technological knowledge and resources to promote the economic growth and development of North Carolina.		
Action Step 2.1.1 Develop a mechanism within state government to provide coordination and assistance to existing public and private sector science and technology resources to make the best use of those resources for advancing economic development and job growth throughout the state.	Ongoing	Priority Action Steps for 2008-2009

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Action Step 2.1.2 Increase funding for the Board of Science and Technology. Science, technology, and economic development are interrelated and vital to North Carolina's future economic success, and they require coordinated attention at the state level. Increasing the resources of the Board will enable it to develop programs, identify opportunities, and strengthen science and technology as a foundation for North Carolina's economic development.	Ongoing	This action step has been combined with action step 2.1.1. (see 2008 ED Strategic Plan Update for specifics)
Action Step 2.1.3 Catalyze and support expanded innovation activities from all of North Carolina's universities through appropriate follow-up to the university system's recently completed Technology Development Initiative.	Ongoing	Priority Action Steps for 2008-2009
Action Step 2.1.4 Taking into account mission studies mandated by the legislature in this area, complete regional resource analyses across the state to understand regional strengths and opportunities; align university initiatives and expertise with the needs of regional economic development clusters; and develop strategies and tactics to address knowledge-based job creation in each region.	Ongoing	Priority Action Steps for 2008-2009
Action Step 2.1.5 Establish new, and refine existing, information technology platform, policy, and capacity priorities to enable the state and its businesses to remain competitive in a rapidly changing IT/ communications environment. Ensure that strategic IT infrastructures across the state have consistent ongoing funding appropriate to their mission and sufficient to leverage the strategic advantage of these assets.	Not Accomplished	Priorities were modified.
Action Step 2.1.6 Adopt and fund in sequence the strategies detailed in New Jobs Across North Carolina: A Strategic Plan for Growing the Economy Statewide through Biotechnology January 2004	Not Accomplished	Priorities were modified.
Action Step 2.1.7 Support legislation that would enable, on an ongoing basis, the allocation of funds (e.g. from the escheats fund) for the purpose of creating science and technology related jobs in NC.	Not Accomplished	Priorities were modified.
Objective 2.2 Allocate resources and make investments to support the creation of new knowledge and technology that will sustain and enhance North Carolina's competitiveness as a leading technology state.		
Action Step 2.2.1 Strengthen the overall R&D capacity of all North Carolina universities and research institutions by enhancing key administrative support functions and processes that currently constrain their competitive R&D position.	Ongoing	Priority Action Steps for 2008-2009

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Action Step 2.2.2 Fund an initiative to promote economic growth in North Carolina through the identification and development of emerging technologies. For example, nanotechnology—the science of the very small— will fundamentally transform science, technology, and society, from microscopic computer chips to cancer-fighting vaccines. As such, it holds tremendous potential for North Carolina and the nation. Nanotechnology will be the basis of manufacturing technology in the future. Developing a coordinated response to the challenges and opportunities presented by emerging technologies will greatly expand the opportunity for all North Carolinians to obtain and retain challenging and economically rewarding employment.	Ongoing	Priority Action Steps for 2008-2009
Action Step 2.2.3 Strengthen the overall R&D capacity of the 16-institution University of North Carolina by providing resources and incentives for faculty development.	Ongoing	Priority Action Steps for 2008-2009
Action Step 2.2.4 As part of a regional strategy, systematically promote the state's University Millennium Campuses and support the development of new ones as sites for growing and attracting new technology-based businesses.	Ongoing	Priority Action Steps for 2008-2009
Action Step 2.2.5 Increase knowledge of SBIR and STTR awards throughout the state and strengthen application assistance for entrepreneurs to increase their success rate in receiving such awards.	Ongoing	Priority Action Steps for 2008-2009
Objective 2.3 Allocate resources and make investments to increase public understanding of science and technology and their relationship to economic prosperity. Mobilize broad-based public leadership support for science, technology, and university outreach objectives and their role in economic prosperity.		
Action Step 2.3.1 Conduct and publish statewide assessments on public understanding of science and technology and their importance to the North Carolina economy.	Not Accomplished	Priorities were modified.
Action Step 2.3.2 Based upon the assessments of Action Step 2.3.1, develop recommendations for appropriate outreach programs targeted at educating the public and policy leaders (at the state level as well as in the seven Economic Development Regions) on technology-based economies, emphasizing best practices and key elements that produce the widest prosperity and economic benefit.	Not Accomplished	Priorities were modified.

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ACTION STEPS PROGRESS**GOAL 3: ENSURE A COMPETITIVE ENVIRONMENT FOR THE RECRUITMENT
AND RETENTION OF BUSINESS, CAPITAL INVESTMENT, AND JOBS CREATION****Objective 3.1 Develop and maintain North Carolina's nationally superior business climate
that consists of affordable business costs, fair regulation, and an equitable tax system.**

Action Step 3.1.1 Review the W.S. Lee Act to determine the effectiveness of the Act and to recommend changes.	Accomplished	2007 was the final year of the William S. Lee program which was replaced by the Article 3J Credits for Growing Businesses program. The Department of Commerce provided a program evaluation to the General Assembly and helped created the new 3J program which replaces WSL.
Action Step 3.1.2 Develop legislative proposals for effective incentives.	Accomplished	In 2007, the "Article 3J Tax Credits for Growing Businesses" legislation replaced the William S. Lee tax credit program. Changes in the tax credit program included converting to a three-tier approach; revising tax credit rates, thresholds, and qualification requirements; and abolishing certain provisions in the original act. These changes aim to enhance North Carolina's economic competitiveness by helping the state attract new businesses and continue the state's economic growth.
Action Step 3.1.3 Find a dedicated source of funding for the One North Carolina Fund.	Ongoing	Priority Action Steps for 2008-2009
Action Step 3.1.4 Extend North Carolina's new Job Development Incentive Grant (JDIG).	Accomplished	In the 2007 legislative session the sunset for the Job Development Incentive Grant (JDIG) program was extended to 2010.
Action Step 3.1.5 Continue to fund the Site Infrastructure Fund for infrastructure and workforce training of large, high-multiplier industrial projects that locate in North Carolina.	Not Accomplished	Priorities were modified
Action Step 3.1.6 Reduce the corporate income tax rates to five percent, phased in over the next six to eight years.	Not Accomplished	Priorities were modified
Objective 3.2 Enable effective recruitment of both new economy and enduring traditional companies to North Carolina.		
Action Step 3.2.1 Implement the Economic Development Intelligence System through phase 5 in order to establish an economic intelligence capability within the Department of Commerce.	Accomplished	This action step has been moved to Goal 6 of the strategic plan.
Action Step 3.2.2 Recognize, support and quantify the effect that the Military has on North Carolina's economy. Encourage the development of industry in North Carolina directly related to the needs of the Military community.	Accomplished	Several organizations recently have been created to facilitate more recruitment and retention of military and defense companies. These efforts are being aided by the changes as a result of the 2005 Base Realignment and Closures (BRAC) decisions. The Department of Commerce recently estimated the impact of the military in North Carolina at \$23.4 billion annually.

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Action Step 3.2.3 Foster development of several mega-sites across the state.	Not Accomplished	Priorities were modified
Objective 3.3 Develop a model program of existing industry services.		
Action Step 3.3.1 Commission a benchmark study of other states' existing industry efforts, obtaining data to reveal the impact of various communication methodologies and their outcomes.	Accomplished	In 2004, the Economic Development Board and Duke Energy sponsored a comparative study of other states' growth strategies in order to develop recommendations for North Carolina economic development. Entitled the Ticknor Report, this study was endorsed by the Board through a formal resolution in February 2005. As a result of this study, the Department of Commerce received funding to finish the EDIS project, update the commerce website, and to hire additional staff.
Action Step 3.3.2 Help develop a marketing strategy for the Existing Industry ServiCenter, which may include tools like toll-free numbers, pro bono billboard advertising and public service announcements and other communications efforts with ServiCenter partners and their audiences.	Accomplished	The Business ServiCenter in the Department of Commerce received full funding in 2004 to implement a marketing strategy that would advertise its resources to business clients. By 2006 the Business ServiCenter was fully staffed and actively promoting its services to communities across the state. This service has continued to attract clients through regional trade shows, magazine ads, brochures, presentations to community development groups, and meetings with regional chambers of commerce. To increase its accessibility the Business ServiCenter allows anyone in North Carolina to make a toll-free call to a customer representative - including one Spanish speaking representative - who can address the needs of information startups and small business owners. Six business counselors make field visits and speak with economic development officials in local communities. As of 2006, the Business ServiCenter received 3,000 to 3,500 contacts from local businesses per month.
Objective 3.4 Develop an effective, coordinated statewide marketing/branding program.		
Action Step 3.4.1 Review the current marketing efforts by state agencies and the regional partnerships.	Accomplished	A marketing council has been created between the Marketing Division of the Department of Commerce and the regional partnerships. This group meets monthly to coordinate marketing efforts. Additionally, a marketing matrix has been developed to properly monitor the activities of each group.
Action Step 3.4.2 Integrate North Carolina's current brand strategy into a wider range of marketing products.	Accomplished	A branding campaign was developed by the N.C. Technology Association (NCTA) to provide a clear, unified message to the nation and world that positions or "brands" North Carolina in the eyes of business and industry leaders as a premier location for knowledge-driven, technology-based industrial development. DOC's Marketing Division is currently using the new logo "North Carolina - The State of Minds" in all advertisements, promotional materials, graphics and other signage.

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Action Step 3.4.3 Identify new funding sources, as well as underutilized current funding sources, for marketing.	Accomplished	Recurring funds of \$500,000 are now available in the Department of Commerce Marketing Division budget to execute state-level marketing programs.
Action Step 3.4.4 Orchestrate a limited, low-cost outreach campaign to advertise North Carolina's recent efforts in economic development.	Accomplished	With the new Commerce website now online, the state can distribute more information to the site-selection community at a lower cost.
Action Step 3.4.5 Advocate for adequate levels of funding for the N.C. Department of Commerce so that the Department may fulfill its obligations as the state's lead economic development agency.	Accomplished	The Board has encouraged the General Assembly to provide financial support for Commerce activities such as the EDIS system, the new department website, and the business ServiCenter.
GOAL 4: CREATE STRONG METROPOLITAN GROWTH CENTERS THAT GENERATE REGIONAL BUSINESS DEVELOPMENT, SHARED PROSPERITY, AND A HIGH QUALITY OF LIFE, IN PARTNERSHIP WITH SURROUNDING AREAS.		
Objective 4.1 Promote a state growth framework that stimulates urban development with beneficial regional economic influences.		
Action Step 4.1.1 Coordinate state investments toward existing downtowns and promote sound urban and regional development.	Not Accomplished	Priorities were modified.
Action Step 4.1.2 Identify development hubs with regional significance (beyond the three largest metropolitan areas) and develop strategies to strengthen them and make them more competitive.	Ongoing	Priority Action Steps for 2008-2009
Objective 4.2 Promote more efficient use of existing buildings, sites, facilities, and infrastructure.		
Action Step 4.2.1 Provide additional State incentives and local options to promote Brownfield redevelopment under the Brownfield Property Reuse Act of 1997 [G.S. 130A-310.30], redevelopment of brown buildings, and productive reuse of "White Elephant" buildings.	Accomplished	Division of Community Assistance at Commerce has worked with Department of Environment and Natural Resources (DENR) on a joint Brownfield redevelopment program. As of September 2007, there are 121 active eligible projects and 40 pending eligible projects. Division of Waste Management at DENR is planning a statewide Brownfield workshop in Raleigh for October 2008 for developers and local governments.
Objective 4.3 Strengthen central cities to reestablish their role as the economic core and engine of metropolitan areas.		
Action Step 4.3.1 Expand and improve State Development Zone (SDZ) incentives.	Accomplished	During the 2006 legislative session the 3J tax credit program was approved which created Urban Progress Zones and Agrarian Zones to replace the existing State Development Zones. As part of North Carolina's Article 3J tax credits program, the Agrarian Growth Zone and the Urban Progress Zone programs provide economic incentives to stimulate new investment and job creation in economically distressed areas.
Action Step 4.3.2 Request new funding to recapitalize the Main Street Financial Incentive Fund with its 10:1 leverage to increase the number of buildings rehabilitated in downtowns.	Ongoing	Priority Action Steps for 2008-2009

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Action Step 4.3.3 Expand the Department of Commerce's successful small towns improvement program statewide.	Ongoing	Priority Action Steps for 2008-2009
Action Step 4.3.4 Provide tax credits for homeowners that purchase and/or renovate downtown housing.	Accomplished	There are several programs providing tax credits for downtown housing. The Mill Rehabilitation Credit established in 2006 supports housing investment in downtown. As of February 2008, a total of 12 proposed projects are currently under review. North Carolina is one of the top four states in use of Historic Preservation Tax Credits to provide tax incentives to encourage rehabilitation of historic houses and buildings in large and small cities and towns across the state.
Action Step 4.3.5 Establish an Urban Development Incentive Fund within the North Carolina Department of Transportation, similar to the Industrial Access Fund, to provide money for parking, sidewalks, and other public improvements necessary to solidify private development commitments.	Not Accomplished	Priorities were modified.
Action Step 4.3.6 Promote school site standards to make it easier to build and rehabilitate public schools in central cities.	Accomplished	The Department of Public Instruction's School Planning Section has prepared numerous guide and reference publications on various aspects of K-12 school facility planning and design. These publications are updated periodically and new versions are placed on this web site. State educational planners, architects, engineers, and schools of education and architecture are partnered in the development of these publications. The staff of School Planning provides workshops and presentations on facility design, planning, and management to a wide variety of groups with interest in building and renovation of educational facilities in central cities.
Objective 4.4 Provide local governments with a more complete set of development tools.		
Action Step 4.4.1 Continue to develop legislative proposals that allow local governments to finance development projects through alternative revenue producing methods.	Accomplished	In 2004, North Carolina became the 49th state in the nation to approve the use of self-financing bonds for local development purposes. This amendment provides a significant finance tool for local governments.
Action Step 4.4.2 Develop a legislative proposal to give local governments broader authority to defer increases in tax value for redeveloped property beyond that currently available for Brownfield projects.	Not Accomplished	Priorities were modified.
Action Step 4.4.3 Develop a legislative proposal to give local governments explicit authority to use local funds for downtown housing.	Not Accomplished	Priorities were modified.

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GOAL 5: DEVELOP THRIVING RURAL AREAS THAT MAINTAIN A HIGH QUALITY OF LIFE; ACHIEVE ONE NORTH CAROLINA BY MOBILIZING THE STATE'S RESOURCES TO CREATE STRONG REGIONAL PARTNERSHIPS AND PROGRAMS THAT FOSTER BROADER ECONOMIC DEVELOPMENT OPPORTUNITIES IN RURAL NORTH CAROLINA

Objective 5.1 Explore strategies that would increase localities' ability to pay for infrastructure and services.

Action Step 5.1.1 Evaluate funding formulas that utilize ability to pay (ATP) measures and suggest how the General Assembly and local governments can streamline and alter programs with problematic funding formulas.	Not Accomplished	Priorities were modified.
Action Step 5.1.2 Encourage the Local Government Commission to provide outreach and technical assistance to municipal governments through cash management workshops, fiscal management assessments, and recommendations for strengthening accountability and fiscal controls.	Accomplished	The School of Government at UNC-Chapel Hill and the Local Government Commission work together on a regular basis to provide technical assistance via workshops and training programs
Action Step 5.1.3 Increase the capacity of local governments to effectively communicate with the General Assembly regarding needs and ability to pay, and increase awareness of existing funding programs such as CDBG and others.	Accomplished	NC Association of County Commissioners serves as the counties' advocate before the executive, legislative and judicial branches of state government and often holds regular district meetings across the state to update county officials on important issues and funding programs. In addition to the Annual Conference and Town Hall Day, NC League of Municipalities offers regular regional meetings across the state in the Spring and Fall covering legislative matters and dealing with risk management, as well as programs in conjunction with the UNC School of Government to educate local officials.
Action Step 5.1.4 Increase the capacity of major local investors to communicate with the League of Municipalities, Association of County Commissioners, the School of Government, and Local Government Commission about fiscal management difficulties that are encountered when working with local governments.	Not Accomplished	Priorities were modified.

Objective 5.2 Provide comparable infrastructure to make rural North Carolina competitive for economic development.

Action Step 5.2.1 Increase rural competitiveness and sustainability by creating a dedicated source of funding for rural water and sewer improvements, updating and maintaining the existing rural water and sewer database to assist with local planning, and establishing an incentive program for rural local governments to support regional water and sewer initiatives. Designate a significant portion of the water and sewer funds for initiatives that are regional in scope and directly support the broader "economic development center."	Accomplished	During its 2007 session, the North Carolina General Assembly authorized \$138.5 million to aid rural development through infrastructure and job creation. The North Carolina Rural Center, charged with administering the funds, has allocated \$100 million appropriation for Clean Water Partners Grants for FY08-09 to meet the water and wastewater needs of rural communities. North Carolina communities will share a total of \$596,000 in Community Development Block Grants in 2008 to connect 208 families to public water and/or sewer lines. Grants ranged from \$35,000 to \$75,000, depending on the number of houses being connected, their location and the area's topography.

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Action Step 5.2.2 Provide natural gas service to four remaining unconnected counties in North Carolina.	Not Accomplished	Priorities were modified.
Action Step 5.2.3 Increase access to rural areas by funding and implementing the NC Department of Transportation's Strategic Highway Corridor Initiative. Prioritize the completion of interstate corridor projects that help connect communities in rural areas to regional economic centers.	Accomplished	The Strategic Highway Corridors Initiative, adopted by the N.C. Department of Transportation is a long term planning vision for the State to support and improve 55 critical highway facilities that move people and goods across regions and throughout the state. The Strategic Highway Corridors Initiative is being implemented in a project by project and incremental fashion within the DOT's ongoing planning and project development processes. DOT adopted a vision map of these corridors as part of the adoption of the 2004 Statewide Transportation Plan.
Action Step 5.2.4 Continue to ensure that rural communities have affordable access to information/Internet technology and other related advances.	Accomplished	The e-NC Authority continues to expand high-speed internet access to rural counties across the state.
Objective 5.3 Build social capacity to enhance community livability.		
Action Step 5.3.1 Continue promoting citizen involvement in the design and implementation of economic development projects by providing statewide access to programs that support broad-based collaboration.	Accomplished	An extensive effort has been made to include individuals and communities in state economic development initiatives. The Small Town Main Street Program, the 21st Century Community Program, CDBG Small Business and Entrepreneurial Assistance Program, and several Rural Center programs have intensified focus on local involvement in rural development.
Action Step 5.3.2 Continue promoting participative and comprehensive approaches to economic development by making a refined 21st Century Communities Initiative available to 50 percent of rural communities.	Ongoing	Priority Action Steps for 2008-2009
Action Step 5.3.3 Emphasize technical assistance to enhance the organizational capacity of rural local governments to engage in economic development. Programmatic efforts would include infrastructure, small town development (e.g. the Main Street Program and the Small Towns Development Program) and leadership development. Establish a training program that include a focus on defining the regional center concept and demonstrates the benefits of building the region, as opposed to the town or county.	Accomplished	The Department of Commerce's Community Planning Assistance help local governments to enhance the economic development capacity of small towns through three community development programs: Community Planning; NC Main Street program; and 21st Century Community Program.
Action Step 5.3.4 Develop a core set of community livability/readiness indicators that can be used to inventory and benchmark rural communities within the context of regional centers	Not Accomplished	Priorities were modified.

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Objective 5.4 Stimulate and support entrepreneurial activities.		
Action Step 5.4.1 Create and support a Micro enterprise State Association/Network that would enhance existing agencies' capacity to serve rural communities and conduct research on the impact of small business on the state's economy.	Accomplished	While the network has not been formally established yet, the New Opportunities for Workers (NOW) program from NC Rural Center has created a joint effort of the Rural Dislocated Worker Initiative and the Institute for Rural Entrepreneurship. It also involves collaboration with the Commission on Workforce Development, the N.C. Department of Commerce's Division of Employment and Training, the community college system's N.C. Small Business Center Network and N.C. REAL Enterprises. Together they devised a program of training and encouragement for dislocated workers who dream of starting and running a business.
Action Step 5.4.2 Utilize technology applications to make entrepreneurial training and assistance available on-line.	Accomplished	The e-NC Authority works with e-NC Business & Technology Telecenters and e-Communities statewide to develop model programs and value-added products that enhance economies in their regions. This partnership also provides assistance with new technologies for citizens and businesses and conducts research to prototype programs that can support the sustainability of these Telecenters' efforts. Seed and matching funds will be made available through a competitive grants program to support the development of initiatives and their extension to other communities and Telecenters across the state.
Action Step 5.4.3 The Department of Public Instruction should continue promoting entrepreneurship as a viable career pathway across all 11 established pathways and make youth entrepreneurship training programs available to all students through on-site and on-line instruction. The Department of Public Instruction should explore the feasibility of providing seamless entrepreneurial training from K-12 to expose students at an early age to entrepreneurship as a potential career/life path.	Accomplished	In 2007 the N.C. Department of Public Instruction participated in a joint partnership with Jr. Achievement, 4-H Youth Organization, NC Rural Center and NC REAL to sponsor a statewide Business Plan competition called "Hop On the Bus" for North Carolina students (grade 9-12) to gain knowledge of entrepreneurship. There were 196 participants and the top five finalists were presented awards at the 2007 Entrepreneurship Summit. 2008 Hop on the BUS! will take place again during the 2008 fall semester. At the 2007 Entrepreneurship Summit, a joint venture among the Department of Public Instruction, community colleges, university system and private universities were announced. This group committed to working together in the newly originated North Carolina Consortium for Entrepreneurship Education. The consortium will develop and implement a curriculum that incorporates entrepreneurial skills beginning in kindergarten and continuing through adult education programs.

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Action Step 5.4.4 Enlist entrepreneurial service providers to participate on Rapid Response Teams that work with displaced factory workers.	Accomplished	In its initial meetings with the employer management teams, the Rapid Response Teams include information on entrepreneurial resources. These meetings are held in advance of employee services and employee orientation sessions provided by the local Rapid Response teams. The local teams also include information on North Carolina Rural Entrepreneurship through Action Learning (NC Real), New Opportunities for Workers by Institute for Real Entrepreneurship (NOW) and the Community College's Small Business Centers in their employee presentations and handout materials.
Action Step 5.4.5 Continue providing financial institution lending for business start-ups, expansions and modernization through additional investments in the NC Rural Center's Capital Access Program and Department of Commerce programs.	Accomplished	Since its inception in October 2002 until the end of the Capital Access Program II in February 2008, the program allowed over \$70 million in loans to be made available that served more than 1,100 businesses. The Capital Access Program helped to create or retain almost 12,000 jobs in North Carolina. The \$6.8 million Rural Venture Fund was created in late 2007 as part of a broader effort to boost entrepreneurship in the state. It was capitalized by investments from the N.C. General Assembly, Golden LEAF and the Rural Center.
Objective 5.5 Utilize agriculture and natural resources for economic development.		
Action Step 5.5.1 Coordinate the utilization of existing public and private infrastructure and resources to assist entrepreneurs in the production of value-added agricultural commodities and products.	Accomplished	In 2006, the N.C. Department of Agriculture along with other state agencies hosted a series of entrepreneurial and business development training sessions for agribusiness service providers. A web site was developed as a training tool and resource guide for future agribusiness entrepreneurs. In collaboration with other agencies, the Department of Agriculture and the Department of Commerce continue to provide assistance to agricultural products processors in rural North Carolina.
Action Step 5.5.2 Continue to provide business, marketing and technical assistance to entrepreneurs in value-added agricultural commodities, natural resources and products.	Accomplished	As an emerging catalyst for rural economies, agri-product incubators continue to be developed and supported at North Carolina's community colleges. In 2006 the Department of Agriculture, working primarily with Advantage West, established a value-added food business incubator in Asheville. The N.C. Department of Commerce, through the Community Development Block Grant program, is supporting a kitchen incubator in Ashe County and another incubator in Pender County.

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Action Step 5.5.3 Assist additional value-added agricultural products processors with expanding or locating in rural areas of North Carolina.	Accomplished	As an emerging catalyst for rural economies, agri-product incubators continue to be developed and supported at North Carolina's community colleges. In 2006 the Department of Agriculture, working primarily with Advantage West, established a value-added food business incubator in Asheville. The Department of Commerce, through the Community Development Block Grant program, is supporting a kitchen incubator in Ashe County and another incubator in Pender County.
Action Step 5.5.4 Continue to support the establishment of satellite agri-products incubators in rural areas of the state at existing facilities such as community colleges and county business incubators and continue to advocate for program funding.	Accomplished	As an emerging catalyst for rural economies, agri-product incubators continue to be developed and supported at North Carolina's community colleges. In 2006 the Department of Agriculture, working primarily with Advantage West, established a value-added food business incubator in Asheville. As a result of this project more small food business incubators are being planned and have opened throughout North Carolina. The Department of Commerce, through the Community Development Block Grant program, is supporting a kitchen incubator in Ashe County and another incubator in Pender County.
Action Step 5.5.5 Continue to develop and implement an e-agriculture strategy to increase the rate at which farm operators and employees utilize Internet resources.	Ongoing	Priority Action Steps for 2008-2009
Action Step 5.5.6 Continue to promote the diverse roles of agriculture in our economy, culture and environment and agriculture's contributions to improving the quality of life.	Accomplished	In an effort to promote environmental sustainability, the Department of Agriculture continues to offer a variety of programs that support alternatives for farm families who wish to practice farmland preservation. Agriculture Commissioner Steve Troxler has identified himself as an advocate of federal and state incentive programs targeted at farm operators who conserve and restore wildlife habitats, streams and rural landscapes. In recognition of the potential of agriculture-based tourism in rural areas of North Carolina, the Department of Agriculture has maintained an agritourism office in Raleigh since 2003.
Action Step 5.5.7 Encourage state economic development agencies to allocate significant additional points in funding formulas for projects that commit to the sustainable use and protection of critical natural resources. Give priority to proposals that address the needs of the broader region, and will impact multiple counties.	Not Accomplished	Priorities were modified

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ACTION STEPS PROGRESS**GOAL 6: DEVELOP A COMPETITIVE REGIONALLY BASED INFRASTRUCTURE AND PROMOTE SUSTAINABLE ECONOMIC DEVELOPMENT****Objective 6.1 Streamline the environmental permitting process for economic development projects to ensure competitiveness with neighboring states.**

Action Step 6.1.1 Implement statewide the Department of Environment and Natural Resource's streamlined process to coordinate environmental reviews and permitting for economic development projects.

Accomplished

The One-Stop Permit Program and the Express Permit Program are operating in each region designated by the Department of Environment and Natural Resources. One Stop Permit Coordinators serve as a single point of contact to help businesses, local governments, citizens and others identify potential environmental requirements and guide applicants through the permitting process. The Express Permit Program offers quicker permit decisions and certification than the standard program and provides consultation to help clients identify necessary environmental requirements. Over 1,500 permits have been issued through the Express Permit Program since the program was piloted in 2004.

Action Step 6.1.2 Implement the Economic Development Information System through phase 5, including a Geographic Information System (GIS) component to aid in the site selection process by identifying the optimum amalgamation of infrastructure needs and environmentally compatible buildings and sites.

Accomplished

In December 2007, EDIS was released to the public. The Policy, Research & Strategic Planning Division, along with the Business and Industry Division, are working to redesign the entire Buildings and Sites/ Certified Sites programs and systems.

Action Step 6.1.3 Develop an interagency leadership plan for North Carolina to balance successfully mobility, natural and cultural resource protection, community values and economic vitality at the confluence of our missions.

Accomplished

The Interagency Leadership Team (ILT), a consortium of state and federal agencies, has met quarterly since 2004 to discuss ways to align the goals of economic development and environmental sustainability. In 2005, the ILT issued a strategic plan, its mission statement stating that the state transportation system "should be planned hand-in-hand with economic development and the protection and enhancement of our State's cultural and natural resources".

Objective 6.2 Support a system of regionally based inter-modal transportation that promotes economic development throughout North Carolina.

Action Step 6.2.1 Expand airports in order to promote increased commercial carrier service to enhance economic development in all regions of North Carolina.

Accomplished

In the fall of 2006, the Department of Transportation and North Carolina State University released a report which quantified the impact of airports on the state economy. The results of this report will affect future resource allocation.

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Action Step 6.2.2 Make improvements to ports in order to expand ocean carrier service to enhance economic development opportunities, including passenger service, and provide North Carolina's business and industry more cost efficient options for the import and export of their goods.	Accomplished	North Carolina's regional infrastructure has been strengthened by the growth of the state port system. Ongoing construction and redevelopment projects managed by the North Carolina Ports Authority promise to deliver a statewide economic impact of \$14.4 billion in jobs, taxes and industry over the span of ten years - beginning in 2006. These projects include the expansion and development of the Port of Wilmington and the Port of Morehead City Radio Island. Planning is also underway on the North Carolina International Port - a major international port container terminal.
Objective 6.3 Support policy initiatives to stimulate multi-county business/industrial parks supported by regional infrastructure with shared tax revenues.		
Action 6.3.1 Continue to develop legislative proposals that allow the creation of additional infrastructure financing sources for economic development projects through alternative revenue producing methods.	Accomplished	In 2004, North Carolina became the 49th state in the nation to approve the use of self-financing bonds for local development purposes. This amendment provides a significant finance tool for local governments.
Action Step 6.3.2 Encourage private investment in advanced telecommunications infrastructure and services through changes in state and local tax policies and regulations.	Accomplished	In August 2007, the General Assembly approved legislation to extend the e-NC Authority for five additional years. The Authority works to expand access to technology across the state. As of late 2006, 82 percent of North Carolina households have access to high-speed Internet service if they choose to subscribe. However, five counties still have less than 50 percent access and another 21 counties have less than 70 percent access. This progress has been achieved primarily through the use of grants to private companies to stimulate investment in small markets.
Objective 6.4 Foster sustainable economic development through maximum utilization of existing by-products and smart growth strategies.		
Action Step 6.4.1 Determine the best approach to recruit and support companies that utilize agriculture and industry-generated by-products in manufacturing.	Accomplished	The promotion of businesses that use industrially generated by-products in manufacturing is a successful effort run jointly by the N.C. Department of Commerce and the N.C. Department of Environmental and Natural Resources. Through the Recycling Business Assistance Center (RBAC), these two departments have actively recruited by-product recycling industries to the state. Since 2004, RBAC has awarded grant funding totaling \$1.06 million to recycling companies operating in North Carolina. This investment has leveraged an additional \$13.3 million in matching funds from private sector recycling companies.

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ACTION STEPS PROGRESS**GOAL 7: MAINTAIN AND STRENGTHEN TOURISM, FILM, AND SPORTS INDUSTRIES;
PRESERVE, PROTECT, AND PROMOTE OUR STATE'S CULTURAL, NATURAL, AND HERITAGE ASSETS****Objective 7.1 Ensure expansion and continued development of cultural
and heritage tourism, craft, and film industries in North Carolina.**

Action Step 7.1.1 Promote and increase marketing budget for all forms of leisure and business tourism to maintain and expand NC's national and regional tourism market share, to create jobs, and to encourage related economic development.	Accomplished	The N.C. Division of Tourism, Film, and Sports Development has realized only modest budget increases in recent years and those have not kept up with inflation and increased media rates and marketing costs. The division's current budget for tourism and film marketing is currently fixed at \$13.6 million. This budget ranks North Carolina 22nd among all state tourism and film budgets. Meanwhile, neighboring states which compete directly with North Carolina in targeting consumers to visit their states have realized budget increases.
Action Step 7.1.2 Implement incentives for tourism product development.	Not Accomplished	Priorities were modified.
Action Step 7.1.3 Implement incentives for filmmaking.	Accomplished	Sunset for Film Tax credit was extended during the 2008 Legislative Session.
Action Step 7.1.4 Integrate existing research data into decision-making processes for Tourism, Film, and Cultural Resources.	Accomplished	In early 2007, the updated Tourism Satellite Account was completed. Results show that travel and tourism in NC is a \$23 billion industry. The Division of Tourism plans to update the study again in 2009 (using 2007 data).
Action Step 7.1.5 Foster greater marketing collaboration and cross-promotion between activities in the Department of Transportation, the Department of Cultural Resources, and the Department of Commerce's Tourism, Film, and Sports Development Division.	Accomplished	In 2005 the NC Civil War Trails Program was created to promote the state's historical heritage and generate tourism revenues. This marketing collaboration between NCDOT, NCDCCR, and NCDOC is an ongoing project that takes advantage of the common goals and shared resources of several state agencies.

Objective 7.2 Protect and promote our natural, cultural, artistic, and heritage assets.

Action Step 7.2.1 Maintain the state rehabilitation tax credit for historic preservation and increase county, municipal, and private understanding of preservation programs.	Accomplished	With increased state revenues, legislative funds have been applied toward the repair and renovation of state historic sites. Through supportive legislation from the General Assembly, the Historic Preservation Office now charges a fee to process applications for state rehabilitation tax credits and uses the additional revenue to hire extra staff, which will reduce backlogs and enable the office to work more efficiently. SB 352, a bill to offer income tax credits for the rehabilitation of historic mills, was approved in 2006.

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Action Step 7.2.2 Inventory and objectively compare North Carolina's cultural resources as economic assets to those competitor states that are "Best in Class."	Accomplished	The "Creative Economy: The Arts Industry in North Carolina" report identified that in 2006 arts industry wages alone infused more than \$3.9 billion into North Carolina's economy, according to research by Regional Technology Strategies (RTS). Creative sector employment is estimated at more than four percent of total employment in North Carolina.
Action Step 7.2.3 Increase state funding for cultural sites so that they can remain in good physical condition, be adequately staffed, and promoted to the general public.	Accomplished	The N.C. Department of Cultural Resources received additional institutions during the 2008 session, the Graveyard of the Atlantic and Southeast Center for Contemporary Art, and funds for restoration of the CSS Neuse, construction of the North Carolina History Education Center at Tryon Palace and new Western Regional Records Center.
Action Step 7.2.4 Create a greater level of private support for cultural amenities by reinstating the Governor's Business Council on the Arts and Humanities.	Not Accomplished	Priorities were modified.
Action Step 7.2.5 Increase per capita funding for the North Carolina Arts Council from the 2003 level of \$0.60 to \$1.50.	Accomplished	The North Carolina Arts Council received increased per capita funding from \$.60 to just over \$1.00.
Objective 7.3 Develop and utilize cultural resources to support broader economic development.		
Action Step 7.3.1 Develop a plan to strengthen existing, strategically, important state and other cultural organizations and demonstrate the link between cultural resources and economic development.	Accomplished	Increased collaboration between the N.C. Department of Cultural Resources and the N.C. Department of Commerce through both the 21st Century Communities Program and the Place-based Economic Development Initiative.
Action Step 7.3.2 Creation of a state program to underwrite bonds for the construction and development of cultural, heritage, and tourism destinations.	Not Accomplished	Priorities were modified.
Action Step 7.3.3 Fully develop North Carolina's Heritage and Cultural Tourism Programs.	Accomplished	The N.C. Department of Cultural Resources has expanded its assets to include a contemporary arts center in Winston Salem and a shipwreck museum in Hatteras. The literary Trails of North Carolina Mountains travel guide and the Homegrown Handmade: Art Roads and Farm Trails travel guide, covering 76 counties with 1300 sites were published. A national Gullah-Geechee Commission was established by Congress and includes North Carolina representation. The General Assembly appropriated \$32,500 in FY 2008 to establish a North Carolina African American Heritage Commission to preserve African American history, arts and culture, to support African American heritage education in K-12 schools, to catalog, preserve, assess and interpret all aspects of African American history, arts and culture.

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Attachment XVIII

The Estimated Economic Impact
of Closure of Alcoa's Aluminum
Smelting Facility in North Carolina
N.C. Department of Commerce
Division of Policy, Research and Strategic Planning
(Aug. 26, 2009)

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The Estimated Economic Impact of Closure of Alcoa's Aluminum Smelting Facility in North Carolina Department of Commerce, Division of Policy, Research and Strategic Planning August 26, 2009

1. Introduction

In August 2002, Alcoa Badin Works, located in Badin, North Carolina (Stanly County), curtailed its aluminum smelting operations. Under full capacity, the Badin, NC facility operated two potlines and produced 60,000 metric tons per year (MTPY) of aluminum. The purpose of this study is to estimate the lost economic impact associated with the closed Alcoa Badin Works aluminum smelting facility on the North Carolina economy. This analysis focuses on the estimated economic impacts of two scenario facilities, one "conservative" and one "average" in terms of production capacity.

2. Methodology and Key Assumptions

Economic Impact Software

The N.C. Department of Commerce relied on IMPLAN to complete this economic impact analysis. IMPLAN 2.0 is an economic impact software system developed by the Minnesota IMPLAN Group (MIG). Impacts are estimated using data on inputs needed to produce products or services for 500+ industries. IMPLAN allows the user to develop local-level input-output models that can estimate the total economic impact of a specific project. Total economic impacts include the direct, indirect, and induced effects. Direct effects are the impacts that an initial investment, hiring event, or change in output have upon the economic area. Indirect effects are the change in demand that regional suppliers will experience because of the initial project investment. Induced effects are the changes in household purchasing due to changes in compensation. The IMPLAN model used to evaluate economic impacts contains data for all 100 counties in the state and North Carolina as a whole.

Analysis Scenarios and Input Data

Since Alcoa Badin Works is out of production, and because limited historical data exists related to its operations and capital investment, this study estimates the impacts of two hypothetical scenarios. The first scenario is based on employment, capital investment and production capacity figures obtained for Alcoa's Mt. Holly, South Carolina smelting facility. Production capacity at the Mt. Holly facility is 229,000 MTPY of aluminum¹, slightly above the median production capacity (205,000 MTPY) for all ten of Alcoa's U.S. smelting operations. This scenario assumes Alcoa builds a new smelting facility at an "average" production capacity. In addition to being an "average" production facility, the Mt. Holly, SC site was chosen for several reasons:

- It is the only Alcoa smelting facility in the U.S., including Alcoa Badin Works, where the research team was able to obtain data on employment², capital investment³, and production capacity.
- As of March 31, 2009, the facility was operating at full capacity, one of only two U.S. facilities.
- The Mt. Holly, SC facility and the former facility in Badin, NC share the same primary industry: North American Industry Classification System (NAICS) code 331312 – Primary Aluminum Production; IMPLAN industry code 172 – Aluminum Refining and Primary Aluminum Production.

¹ Smelting capacity figures were obtained from Alcoa's website: http://www.alcoa.com/primary_na/en/alcoa_primary_na/capacity.asp

² Employment data for Alcoa's Mt. Holly site was obtained from two sources. The first source was the online profile for Alcoa's Mt. Holly Smelter (http://www.alcoa.com/locations/usa_mt_holly/en/about/profile.asp). The second source was Harris Infosource (<http://www.harrisinfo.com/>). Alcoa lists the facility's employment at 600; Harris lists it at 620.

³ Capital investment data for Alcoa's Mt. Holly site was obtained from the online profile for Alcoa's Mt. Holly Smelter (http://www.alcoa.com/locations/usa_mt_holly/en/about/profile.asp). The profile lists the original capital investment at more than \$340 million in 1980. This figures was inflated to 2009 dollars (\$887.4 million)

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Table 1 - Economic Impact Scenarios

Scenario	Likely Impact	Employment	Investment (2009 dollars)	Capacity (MTPY)
Mt. Holly, SC Scenario	Average	610	\$887,400,000	229,000
Old Badin, NC Scenario	Conservative	160	\$232,506,550	60,000

Sources: Alcoa; Harris; N.C. Dept of Commerce

A conservative scenario is based on the production capacity (60,000 MTPY) of Alcoa Badin Works, the smelting facility that used to exist in North Carolina. This scenario assumes Alcoa builds a new smelting facility at the production capacity that existed prior to the plant being curtailed. Because current and historical employment and capital investment data is not available for the Badin, NC facility, the research team used ratios derived from the Mt. Holly site to estimate input figures.⁴ Following are the calculations and assumptions used to determine employment and capital investment for the Badin, NC facility:

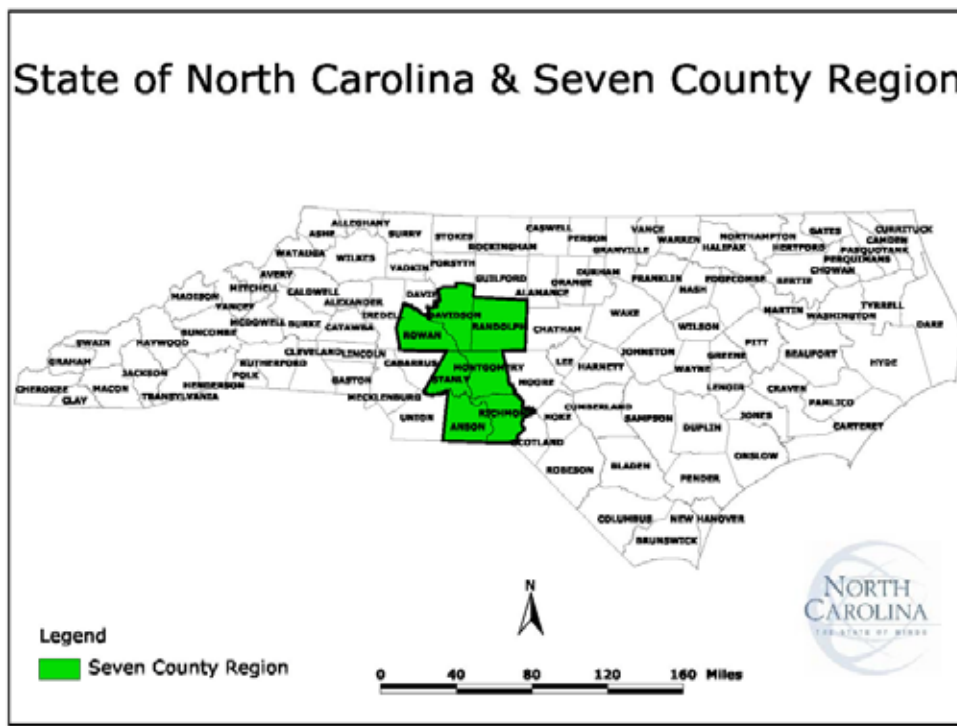
- The production capacity per worker for the Mt. Holly, SC facility is 375 MTPY (229,000 MTPY/610 workers). Employment is derived by dividing the Badin, NC production capacity reported by Alcoa by the per worker production capacity from the Mt. Holly, SC facility. Annual employment for the Badin, NC facility is estimated at 160 workers (60,000 MTPY/375 workers).
- At the Mt. Holly, SC facility the ratio of capital investment per metric ton produced is \$3,875 (\$887,400,000/229,000 MTPY). Badin, NC investment is derived by multiplying the Badin, NC production capacity as reported by Alcoa by the investment/metric ton figure (60,000 MTPY*\$3,875). Investment for the Badin, NC facility is estimated at \$232,506,550.

Analysis Regions

This study estimates impacts for North Carolina as a whole and a seven county region near the Badin, NC site. The seven counties are: Stanly, Anson, Richmond, Montgomery, Randolph, Davidson and Rowan.

⁴ It is very likely that the employment and capital investment inputs derived for the Badin, NC scenario (conservative scenario) are low. A case could be made that the size of smelting facilities does not increase proportionally and are subject to high initial capital costs and employment requirements.

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3. Employment Impacts

Employment, or the number of people with jobs, is an important indicator of economic health. When employment is growing, companies experience demand for their products and expand their workforce. An aluminum smelting facility in North Carolina would have significant impact on employment in the seven-county region and the state as a whole. For analysis purposes, employment impacts are estimated separately for facility construction (one-time capital investment) and facility operations (ongoing under full operational capacity).

Facility Operations (Ongoing)

According to the IMPLAN model, the annual total employment impact (direct + indirect + induced) in North Carolina associated with facility operations could range from 571 under a “conservative” smelting production capacity scenario to upwards of 2,100 under an “average” scenario (Table 2). These estimates include jobs directly associated with facility operations, indirect jobs associated with the change in demand for regional suppliers, as well as jobs induced by increased consumer spending. Direct jobs alone range from 160 to 610. Annual employment impacts for the seven-county region are slightly lower than the state, ranging from 469 under the “conservative” production capacity scenario to 1,790 under the “average” scenario.

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Table 2 - Estimated Annual Employment Impacts - Operations		
	Badin Scenario - Prod = 60K MTPY (Conservative)	Mt. Holly Scenario - Prod = 229K MTPY (Average)
Total Region Employment	469	1,790
Direct Employment	160	610
Indirect Employment	188	718
Induced Employment	121	461
Total State Employment	571	2,176
Direct Employment	160	610
Indirect Employment	247	941
Induced Employment	164	625

Source: IMPLAN Model, August 2009.

Facility Construction (One-Time Capital Investment)

In addition to recurring employment, a smelting facility in North Carolina would also have a significant one-time employment impact associated with the construction of the plant and the required capital investments. According to the impact model, the one-time total employment impact (direct + indirect + induced) associated with capital investment in North Carolina could range from 3,352 under a “conservative” scenario to more than 12,700 under an “average” scenario (Table 3). Most of the employment impacts would likely occur in the seven-county region.

Table 3 - Estimated Employment Impacts - Capital Investment		
	Badin Scenario - Prod = 60K MTPY (Conservative)	Mt. Holly Scenario - Prod = 229K MTPY (Average)
Total Region Employment	3,038	11,596
Total State Employment	3,352	12,793

Source: IMPLAN Model, August 2009

4. Economic Contribution

The lost output, value-added, and employee compensation associated with the closed Alcoa smelting facility results in a significant economic loss for both the state of North Carolina and the seven-county region.

Output, a general measure of economic health, is the total value of all of the goods and services produced in an economy. For an aluminum producer like Alcoa this would be sales plus/minus change in inventory. Consumption from households and companies, government and business spending, investment, and exports out of the region all stimulate output. The estimated total output (direct + indirect + induced) associated with aluminum smelting operations ranges from \$223 million a year under the “conservative” production model to more than the \$850 million associated with the “average” production model (Table 4). One-time output impacts associated with the construction of a smelting facility ranges from \$368 million to just under \$1.5 billion (Table 5). Regional output impacts for both facility operations and capital investment are slightly lower than the estimated statewide impacts. According to IMPLAN annual output per worker associated with aluminum smelting in North Carolina is \$919,801.

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Table 4 - Estimated Annual Economic Impacts - Operations (2009 dollars)		
	Badin Scenario - Prod = 60K MTPY (Conservative)	Mt. Holly Scenario - Prod = 229K MTPY (Average)
Total Output		
Region	\$196,533,488	\$749,283,912
State	\$223,503,653	\$852,107,661
Total Value Added		
Region	\$64,553,129	\$246,108,808
State	\$71,711,276	\$273,399,238
Total Employee Compensation		
Region	\$26,625,819	\$101,510,935
State	\$32,079,352	\$122,302,527

Source: IMPLAN model, August 2009.

Value added is the difference between an establishment's total output and the cost of its intermediate inputs. It is a measure of the contribution to Gross Domestic Product (GDP) made by an individual producer; the difference between the cost of materials and labor to produce a product and the sale price of a product. Total value added (direct + indirect + induced) associated with the scenario smelting operations range from just under \$72 million a year under the "conservative" production model to more than the \$273 million associated with the "average" production model (Table 4). One-time value added impacts associated with the construction of a smelting facility range from \$174 million to \$663 million (Table 5).

Table 5 - Estimated Economic Impacts - Capital Investment (2009 dollars)		
	Badin Scenario - Prod = 60K MTPY (Conservative)	Mt. Holly Scenario - Prod = 229K MTPY (Average)
Total Output		
Region	\$319,067,474	\$1,217,774,298
State	\$368,568,311	\$1,406,702,513
Total Value Added		
Region	\$131,941,269	\$503,575,901
State	\$173,838,836	\$663,484,939
Total Employee Compensation		
Region	\$82,718,053	\$315,707,251
State	\$111,465,596	\$425,427,058

Source: IMPLAN model, August 2009.

Employee compensation is wage and salary payments as well as benefits, including health and life insurance, retirement payments, and any other non-cash compensation. It includes all income to workers paid by employers. Under the "conservative" model, the 571 annual jobs created or retained from smelting operations results in more than \$32 million in annual (direct + indirect + induced) employee compensation (Table 4). This number increases to \$122 million in the "average" production scenario. Employee compensation impacts associated with capital investment are significantly higher, but non-recurring (Table 5). According to IMPLAN annual earnings per worker associated with aluminum smelting in North Carolina is \$91,847.

Attachment XIX

Aff. J. Keith Crisco,
North Carolina Secretary of Commerce

ATTACHMENT XIX

IN THE UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Alcoa Power Generating, Inc.)
)
Yadkin Hydroelectric Project) P-2197-073
) Application for a New Major License

STATE OF NORTH CAROLINA)
) ss.:
COUNTY OF WAKE)

J. KEITH CRISCO, being first duly sworn, deposes and says as follows:

1. I am the duly appointed and duly sworn Secretary of the North Carolina Department of Commerce and have been at all times relevant to this Affidavit.

2. I make this Affidavit on personal knowledge and, if called upon to do so, could competently testify under oath to the matters stated herein.

3. That document entitled “The State of North Carolina’s 21st Century Plan for the Use of the Yadkin River Resources,” (the “Plan”) to which this Affidavit is a part, is composed of information that was gathered, collected and written by the members of my professional staff at the North Carolina Department of Commerce.

4. Attachment XVIII to the Plan is likewise information that was developed and written by the members of my professional staff at the North Carolina Department of Commerce.

5. The information contained and written in the items referred to in paragraphs 3-4 of this Affidavit were gathered, collected and written by these members of my professional staff while acting in their official capacities as employees and staff members of the North Carolina Department of Commerce.

ATTACHMENT XIX

6. At all times while these persons were gathering, collecting and writing the information set forth in the 21st Century Plan, they were acting at my direction and under my supervision and control, in the normal course of their professional duties.

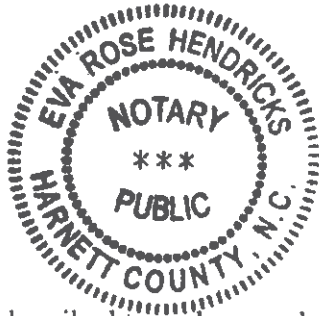
7. The documents, records, memoranda, reports, data compilations and other sources of information that were used, relied upon and/or included by my staff members in the preparation of the Plan and Attachment XVIII to the Plan are data compilations that were and are kept by the North Carolina Department of Commerce in the regular course and conducted of its business and official activities, and it is the regular practice of the North Carolina Department of Commerce to make, generate and write memoranda, reports, records and other data compilation similar to that contained in the Plan.

8. The documents, records, memoranda, reports, data compilations and other sources of information that were used, relied upon and/or included by my staff members in the preparation of the Plan and Attachment XVIII to the Plan are also the types of data compilations that I and the professional staff at the North Carolina Department of Commerce regularly rely upon in creating official documents, records, memoranda and reports for the North Carolina Department of Commerce for use in its official duties and business on behalf of the State of North Carolina.

9. The Plan and Attachment XVIII to the Plan are typical of data compilations and data analyses that are regularly prepared by members of my professional staff at the North Carolina Department of Commerce for use in the Department's execution of its official duties and business on behalf of the State of North Carolina.

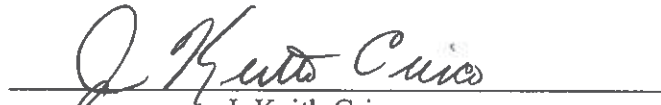
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10. To the best of my knowledge, the contents of the Plan are true and correct.



Subscribed to and sworn before me
this 3rd day of September 2009.


Notary Public


J. Keith Crisco

My commission expires: Nov. 5, 2012



Document Content(s)

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