EXHIBIT 6

Lease Agreement with Department of Conservation

416A

LEASE AGREEMENT

THIS AGREEMENT made this 2nd day of July, 1986, between CENTRAL ILLINOIS PUBLIC SERVICE COMPANY, an Illinois corporation ("CIPS"), and the STATE OF ILLINOIS, acting by and through the DEPARTMENT OF CONSERVATION ("DOC"),

W I T N E S S E T H:

WHEREAS, CIPS is the owner of certain property, located in Montgomery County, Illinois, shown on Exhibit A attached hereto and made a part hereof, and a reservoir constructed thereon known as Coffeen Lake and hereafter referred to as the "Lake"; and

WHEREAS, the Lake and certain surrounding property can be used for purposes of conservation and public recreation and the DOC desires to open the lake to the public for such purposes; and

WHEREAS, the parties recognize that said property and the Coffeen Station are solely owned by CIPS and that CIPS is entering this Agreement in its own right; and

WHEREAS, DOC is authorized and empowered to enter into this Agreement pursuant to and under the authority of Ill. Rev. Stat. 1985, Ch. 127, Par. 63a18; and

WHEREAS, the Lake was constructed and is used for the purpose of providing water for the operation of Coffeen Power Generating Station (the "Coffeen Station"); and

WHEREAS, it is essential that CIPS continue to have the use of the Lake for cooling water and other purposes for the Coffeen Station, and that its continued operation of the Coffeen Station be without interference from DOC or anyone using the Lake or any of the surrounding CIPS property; and

WHEREAS, the parties recognize that public use of the Lake and surrounding property must be restricted and regulated in order that such public use hereunder shall not conflict or interfere with the present and future operation and use of the Coffeen Station; and

WHEREAS, the parties recognize that CIPS' operation of the Coffeen Station and the uses of the property shown on Exhibit A are subject to existing and possible future regulations by governmental bodies having jurisdiction over CIPS and the operation of the Coffeen Station, including, without limitation, the Illinois Commerce Commission and the Illinois Environmental Protection Agency ("IEPA"), and this Agreement shall be amended as may be necessitated by any such regulations.

NOW, THEREFORE, the parties agree as follows:

1. For and in consideration of the covenants and agreements herein to be performed by DOC and CIPS, CIPS hereby leases to DOC and DOC leases from CIPS those portions of the property indicated on Exhibit A attached hereto and described on Exhibit B attached hereto and made a part hereof (referred to herein as the "Recreational Areas") for the purpose of providing the public with recreational facilities on the terms and under the conditions set forth in this Agreement. CIPS shall contribute $250,000.00 for capital improvements in the proposed DOC Recreational Areas. Within the Recreational Areas, CIPS shall have the right to establish restricted access zones. In the event of any disputes as to the areas included in or excluded from the Recreational Areas, the description in Exhibit B shall be controlling.

2. The initial term of this Agreement shall be for a period of twenty-five (25) years, commencing July 2, 1986, and ending June 30, 2011, provided that this Agreement may be extended as

follows: If, not less than 18 months before the end of the initial term of this Agreement, either party gives the other written notice of its desire to extend this Agreement, the parties thereafter shall negotiate in good faith, the duration, terms and conditions for such an extension, provided, however, that if the parties are not able to agree thereon by the expiration of the initial term hereof, this Agreement shall thereupon terminate.

3. DOC has prepared and CIPS has approved a Site Development and Management Plan (referred to herein as the "Plan") for the Recreational Areas. The Plan provides for a Recreation Program; the establishment of Day Use Zones and public use modes; the assignment of respective CIPS/DOC responsibilities for development, management and maintenance; and an implementaton schedule; however, the Plan does not provide for swimming, water skiing, diving, scuba diving, windsurfing, sailboating or hunting of any type. The Plan is attached to and made a part of this Agreement as Exhibit C, and may periodically be amended upon mutual consent of DOC and CIPS. Public camping and other related uses at the Indian Grove Campground may in the future be included, subject to the negotiation of an agreement between the private campground operator and DOC which is acceptable to CIPS. If CIPS and/or DOC determines that migratory waterfowl usage of Coffeen Lake has increased significantly and/or there is a widespread public support for a waterfowl hunting program at Coffeen Lake, the parties hereto agree to study the feasibility of implementing, on a trial basis, a waterfowl hunting program at Coffeen Lake managed by the DOC. This Agreement may be amended accordingly.

4. DOC shall use the Recreational Areas only for purposes of conservation and public recreation as outlined in Exhibit C (as updated and approved). DOC agrees not to (a) permit any unlawful or immoral practice to be carried on or committed on the Recreational Areas; (b) use or permit the Recreational Areas to be used, for any purpose whatsoever which, in the judgment of CIPS, may unreasonably interfere with the use by CIPS of the Lake in connection with the operation of the Coffeen Station; or (c) use the Recreational Areas or permit them to be used for the selling, giving, serving or consuming of intoxicating beverages except as is permitted by regulation at similar DOC operated facilities, consistent with any applicable State or local requirements.

5. DOC shall not discriminate or permit discrimination in the use by the public of the Recreational Areas on the basis of handicap, race, color, age, creed, marital status or sex.

6. CIPS shall have access at all times to the Recreational Areas to inspect, maintain, repair, install, construct and/or remove the Lake dikes, shoreline and lake bed, and for any other purpose CIPS deems necessary for the proper, safe and efficient maintenance and operation of the Coffeen Station. Before undertaking any such activity, CIPS shall, except in cases of emergency, give DOC thirty (30) days' notice of the place and nature of the activity to be undertaken and upon its completion CIPS shall restore, to the extent reasonably practical, any disturbance caused thereby.

7. CIPS reserves the right to construct, reconstruct, operate, repair, replace and maintain electric transmission and distribution lines, pipelines, generator cooling water facilities, instrument stations, roadways, pumping stations, dikes, ditches, and other facilities incidental to the operation of

the Coffeen Station and its business as a public utility, over, under, across and through any part of the Recreational Areas. Before undertaking any such activity, CIPS shall, except in cases of emergency or routine maintenance, give DOC thirty (30) days' notice of the place and nature of the activity to be undertaken and upon its completion CIPS shall restore, to the extent reasonably practical, any disturbance caused thereby.

8. CIPS may, anywhere on the property including the Recreational Areas, conduct such studies as it deems appropriate and necessary, including, but not limited to, studies that relate to CIPS' primary obligation to provide adequate and reliable service to its customers and/or to the implementation of the Plan. Before undertaking any studies which would involve placement of equipment in the Recreational Areas or would disturb the use of the Recreational Areas, CIPS shall give DOC thirty (30) days' notice of such studies and shall consult with DOC, and consider any recommendations of DOC, as to the implementation of such studies.

9. CIPS reserves the right, to the extent necessary to maintain the Lake for cooling water purposes and to comply with any restrictions imposed by any regulatory governmental agency, to vary the Lake's level and temperature, to withdraw water from and to dredge the Lake, to place riprap, piling or breakwater along or near its shorelines and dikes and to otherwise maintain the Lake in good condition. Earth and other matter produced in the course of dredging operations may be disposed of in a legally permitted method on any part of the property. However, except in cases of emergency, CIPS shall give DOC at least thirty (30) days' prior written notice of any proposed Lake level or temperature variance, or any proposed dredging, specifying to the extent

possible the location and extent of such dredging and the site for disposal of the dredged materials, and CIPS shall consult with DOC and other appropriate State and Federal agencies to fully consider their recommendations before undertaking any such dredging and disposal. CIPS also reserves the right to construct, operate and maintain pipes, conduits, ditches, dams and spillways now or hereafter constructed as a part of and in connection with the Coffeen Station. All withdrawals of water by DOC from the Lake or waters tributary thereto owned by CIPS shall be subject to the approval and control of CIPS to ensure that they do not threaten CIPS' supply of water for cooling purposes or otherwise for the Coffeen Station.

10. CIPS' and DOC's responsibilities with respect to implementing the recreation and conservation programs are enumerated in Exhibit C. All facilities provided by CIPS in the Recreational Areas, either before or after the date of this Agreement, including, but not limited to, roads, parking areas, and boat ramps, will remain the sole property of CIPS subject to the applicable provisions of this Agreement. DOC shall operate and provide the necessary routine maintenance for all public recreation facilities including any signs. DOC's obligation to operate and maintain facilities provided by CIPS shall arise upon receipt of written notification from CIPS that said facilities are completed and ready for operation. For purposes of this Agreement, maintenance items shall be determined on a case-by-case basis, providing no single expenditure on a facility which would exceed $5,000.00 or such other amount as may from time to time be provided by amendment to the Illinois Purchasing Act, Ill. Rev. Stat. 1985, Chapter 127, Section 132.1, et seq., shall be deemed a maintenance item; expenditures for maintenance of roads and buildings are not subject to this limitation.

11. With respect to the facilities referred to in Paragraph 10 hereof, the parties recognize that some of such facilities may require construction and/or operating permits from various governmental bodies. It shall be the DOC's responsibility to obtain all such permits or authorizations, and to comply with any requirements imposed thereunder. At DOC's request, CIPS will assist DOC in applying for such permits and authorizations.

12. With respect to the use of the Recreational Areas and facilities referred to in Paragraph 10 hereof, as well as to such access points, entrance roads and other use areas provided, DOC shall be responsible for appropriate and reasonable measures for the safety of the public and other users. DOC hereby covenants and agrees to:

(a) Develop and implement rules and regulations regarding the use of the Lake by the public and the use of all the Recreational Areas. Such rules and regulations, at a minimum, shall identify those areas which are open to the public and those areas which are off limits; include appropriate warnings as to hazardous areas within or adjacent to the Recreational Areas, including, but not limited to, the Discharge, Spillway, Dam, and Intake Areas previously posted by CIPS; and specify authorized and unauthorized uses;

(b) Develop and implement a program of dissemination of information to users which describes the rules and regulations governing use of the Recreational Areas, and post appropriate signs and notices to the public informing them of the requirements of such rules and regulations. Areas which shall be posted include, but are not limited to, hazardous areas, areas of potential trespass and areas where unauthorized uses are likely to occur, including, but not limited to, the Discharge, Spillway, Dam and Intake Areas previously posted by CIPS;

(c) Patrol and police the Recreational Areas and, to the fullest extent reasonably possible, prohibit all unauthorized uses, including any trespass to restricted areas or onto adjacent property owned by CIPS or others or activities which are prohibited, such as swimming or diving.

13. The parties hereto recognize that CIPS' primary obligation as a public utility is to provide adequate and reliable utility service to its customers. Therefore, CIPS shall have the right, upon 120 days' written notice to DOC, to terminate this lease as to any portion of the Recreational Areas which CIPS determines, in the exercise of its reasonable judgment, is necessary or appropriate for CIPS to utilize in providing adequate and reliable utility service. In the event of any such termination, CIPS may substitute new facilities for those terminated if acceptable to the DOC. In the event of any such termination of any portion of this lease, DOC shall have the right to terminate this Agreement, by written notice to CIPS within the 120-day notice period provided for above, if DOC concludes in its sole, reasonable judgment that it cannot efficiently provide an adequate recreational program on the remaining portion of the Recreational Areas.

14. CIPS may have granted, or from time to time during the term of this Agreement, may be requested to grant, to third parties easements on, over or under the Recreational Areas for such purposes as, but not limited to, pipelines, power lines or highways. CIPS therefore reserves the right, upon thirty (30) days' written notice to DOC and after consultation with DOC as to the location and design of any such facilities, to grant such rights to third parties, provided that such actions will not in DOC's opinion result in permanent disturbance to the Recreational Areas, and CIPS shall restore or replace or have restored or replaced, to the extent reasonably practical, any disturbance caused by the location, design, maintenance, reconstruction, or removal of such facilities.

15. DOC shall not knowingly undertake, without the prior written approval of CIPS, any activity which may adversely affect the quality or quantity of the Lake water.

16. DOC, within the areas operated by DOC, shall:

(a) Assume the management and regulatory authority for conservation and public recreation purposes for the entire Lake surface, with specific resource management activities subject to approval of CIPS;

(b) Undertake the following responsibilities regarding conservation and public recreation aspects of the implementaton of the Plan:

(i) Provide technical support as required and available for proper site management, including, but not limited to, law enforcement, biologists, foresters, site planner and engineer;

(ii) Provide adequate staffing as determined by DOC and assume the salaries and costs associated therewith;

(iii) Provide suitable operation equipment; and

(iv) Provide service facilities, incidental construction, and recreational equipment as needed.

(c) Undertake such maintenance as is reasonably necessary to keep the designated public Recreational Areas and public recreational facilities therein in a clean and sanitary condition and in a good state of repair.

17. CIPS shall be protected against liability for any injury to persons or property caused by, connected with or arising directly or indirectly, wholly or in part from any use or occupation of the Recreational Areas (including the Lake) by DOC, its agents, contractors, concessionaires,

employees, or members of the general public, in accordance with the Illinois Revised Statutes 1985, Chapter 70, Sections 31 through 37 inclusive, or in accordance with any amendments thereto or substitute legislation therefore hereafter adopted. Nothing in this lease shall be construed as denying or negating the applicability of the aforesaid Chapter 70.

DOC and CIPS shall require all contractors or concessionaires granted any right or rights to enter upon, use or occupy the Recreational Areas (including the Lake) to provide and maintain policies of insurance, insuring DOC and CIPS against liability for injury to persons arising out of such contractors' or concessionaires' exercise of rights so granted; the form and limits of such insurance and the insurance carrier shall be subject to DOC's and CIPS' approval, which will not be unreasonably withheld. At the end of each five-year period under this Agreement, DOC and/or CIPS may, by written notice to the other party, require that insurance limits be reasonably increased. Copies of such insurance policies shall be provided to both DOC and CIPS.

18. CIPS reserves the right upon delivery of notice, to close any or all portions of the Recreational Areas in the event of a strike involving its Coffeen Power Station or picketing at or around any portion of its Coffeen property or in the event of extreme weather conditions, which closing or closings shall remain in effect only during the existence of the aforementioned conditions. In this event, CIPS will provide appropriate informational signs describing the situation to the public.

19. DOC shall not permit any mechanic's lien or liens to be placed upon the Recreational Areas or any improvement thereon on account of any improvements made, authorized or permitted by DOC thereon; and in case of the

filing of any such lien, DOC will require the responsible party to promptly pay and discharge the same.

20. Either DOC or CIPS may terminate this Agreement by giving written notice to the other party, in the event of any of the following:

(a) the Recreational Areas shall cease to be used by DOC for conservation or public recreation purposes; or

(b) the DOC or any agency or instrumentality thereof shall exercise any regulatory right, jurisdiction, or power over the Recreational Areas or adjacent property owned by CIPS that is inconsistent with this Agreement and without the consent of CIPS; or

(c) The site is being adversely affected or the Lake is being polluted or contaminated from uses caused or permitted by the other party, thereby affecting the quality or efficient operation of the recreation facilities or the Coffeen Station; or

(d) The security of CIPS' Coffeen Station is endangered by the DOC's uses and operations hereunder and they become incompatible with the use and maintenance of the Lake for cooling water and other purposes for the Coffeen Station.

21. In addition to the rights specified under Paragraph 20 above, if either party shall fail or refuse to comply with or perform any term, condition or covenant of this Agreement and shall continue in such default for a period of ninety (90) days after written notice thereof from the other party, then this Agreement, at the option of the affected party, shall be and become void and the leasehold hereby created shall cease and terminate.

22. The damage or destruction of any of the facilities constructed in the Recreational Areas by any natural or man-made catastrophe; including, but not limited to fire, tornado, earthquake, flood, insurrection, or riot; shall not be grounds for termination of this Agreement. In the event of any such damage

or destruction, DOC and CIPS shall consult on the appropriateness of restoring, replacing or repairing such facilities and if the parties mutually agree, CIPS shall restore, replace or repair such facilities as promptly as it is able and reasonably practical to do so. Neither party shall be responsible for the loss by fire or other casualty of property or equipment owned by the other party or other agencies or instrumentalities of the State of Illinois.

23. In the event of the termination of this Agreement in whole or in part at any time for any reason, DOC may, within 120 days or some other mutually acceptable period after such termination, remove any improvements or equipment constructed or furnished by DOC in the Recreational Areas or the portion thereof so terminated; provided, however, that in the event of such removal, CIPS may require the premises to be restored as nearly as possible to the condition existing prior to construction or installation by DOC of its improvements or equipment.

24. No action or inaction (for purposes of this Section 24, a "Default") by either party which would serve as grounds for termination of this Agreement shall be grounds for termination until the party which did not commit such Default has given the other party written notice of such Default and the party committing such Default has failed to correct or cure the Default within ninety (90) days after such notice; provided, however, that in the case of a Default which is not continuing in nature or which cannot be corrected or cured, the party which has not committed the Default may terminate this Agreement as provided in Section 25 hereof. No failure of either party to exercise its right of termination hereunder because of any Default shall be deemed to be a waiver of its right to terminate this Agreement because of any subsequent similar or dissimilar Default.

25. Either party may terminate this Agreement for any reason permitted by law or provided for in this Agreement, provided that no such termination shall be effective if for a reason permitted by this Agreement except in accordance with this Agreement, or if for any other reason or if not otherwise provided in this Agreement, until ninety (90) days after the party exercising any such right of termination has given the other party written notice of termination.

26. The parties hereto recognize that the development, implementation and operation of the public recreation and conservation programs contemplated by this Agreement will require full cooperation between the parties and that they may encounter developments or occurrences that are not contemplated at the time of execution of this Agreement. The parties therefore agree to fully consult and cooperate in the implementation of their respective obligations under this Agreement and CIPS agrees to consult with DOC on any actions it takes in areas of the property not subject to this Agreement that may reasonably affect the achievement of the purposes of this Agreement. In the event of unforeseen occurrences requiring action to be taken, the parties shall mutually agree on the appropriate and necessary action provided that, if agreement cannot be reached within ninety (90) days, CIPS shall notify DOC that an impasse has been reached and CIPS may take such action as is reasonably necessary and appropriate. For all purposes under this Agreement, the following persons are hereby designated as the lead contacts for the parties and the persons to whom all notices given under this Agreement should be directed, all said notices to be sent by certified or registered mail:

For CIPS: Manager, Environmental Affairs Department
Central Illinois Public Service Company
607 East Adams Street
Springfield, Illinois 62701

For DOC: Regional Land Manager
Region 4 Office
34 West Broadway
Alton, Illinois 62002

Either party, by written notice to the other, may change the designated person or address or both, or may designate a position or title, rather than a specific person, to whom such notices shall be sent.

27. The parties hereby recognize that DOC's ability to perform its responsibilities hereunder are dependent on continuing State funding by the General Assembly. In the event that DOC in its sole judgment determines at any time that it has insufficient funds to fully perform its responsibilities hereunder, it shall promptly so notify CIPS in writing and the parties shall mutually agree on the appropriate action to be taken, such as, but not limited to, closing some or all of the facilities or having CIPS operate or maintain some or all of the facilities, provided, however, that if the parties cannot mutually agree on the action to be taken within ninety (90) days after the notice from the DOC, either party may terminate this Agreement.

28. All rates for the use of any facilities operated by DOC or any subcontractor or concessionaire from DOC pursuant to this Agreement shall be set by DOC, and may be changed or modified by DOC, consistent with the rates charged by DOC at similar facilities, and the funds received therefrom shall be the sole property of DOC, except as DOC may otherwise agree in any subcontract or concession permitted by this Agreement. No facilities shall be operated by any subcontractor or concessionaire unless approved by DOC with the written consent of CIPS, which consent shall not be unreasonably withheld.

29. DOC shall furnish to CIPS, at least once a year beginning with the fiscal year of July 1, 1986, through June 30, 1987, appropriate financial statements of its operations under this Agreement. Such financial statements shall show, in reasonable detail, the sources and amounts of revenues obtained and the nature and types of expenditures made. In addition, to the extent DOC prepares and has available a budget or forecasts of revenues and expenditures for or including the performance of its obligations under this Agreement for each upcoming year, a copy of such budget or forecasts shall be furnished to CIPS.

30. DOC and CIPS are and shall remain independent contractors in all matters involving this Agreement and their performance of their obligations hereunder. DOC is not an agent, partner or joint venturer of CIPS in any matter pertaining to this Agreement or either party's performance thereof.

31. Expiration or termination of this Agreement shall not release any party hereto from any liability or obligation hereunder, whether of indemnity or otherwise, resulting from any act, omission or event happening prior to such expiration or termination or thereafter if by the terms hereof it is provided that such act or event shall or may be done after the expiration or termination hereof.

32. This Agreement supersedes and terminates all prior understandings, memoranda, correspondence, agreements and negotiations between the parties relating to the subject matter hereof. No change, modification or alteration of this Agreement shall be valid unless it is in writing and signed by duly authorized representatives of the parties hereto.

33. The provisions of this Agreement shall inure to the benefit of, and be binding upon and enforceable against, the successors and assigns of the parties hereto, provided DOC shall not enter into any subcontract, sublease, grant any concession, execute any assignment, or transfer any right or interest it may have under this Agreement without in each case obtaining the prior written consent of CIPS, which consent may not be unreasonably withheld; nor shall DOC transfer its interest created hereby by operation of law and any such attempted transfer shall automatically terminate this Agreement and all rights or interest of DOC hereunder. No subcontract, sublease, concession, assignment or transfer of any kind shall release either party from the performance of any and all covenants of this Agreement.

34. This Agreement may be executed in any number of counterparts, which together shall constitute one document, and any one of which may be recorded.

IN WITNESS WHEREOF, the State of Illinois, through the Department of Conservation, and Central Illinois Public Service Company, have executed this Agreement as of the date first above written.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: _____
President

ATTEST:

_____
~~Assistant Secretary~~
Vice-President Power Supply
Central Illinois Public Service Co.

DEPARTMENT OF CONSERVATION
STATE OF ILLINOIS

BY: _____
Director

ATTEST:

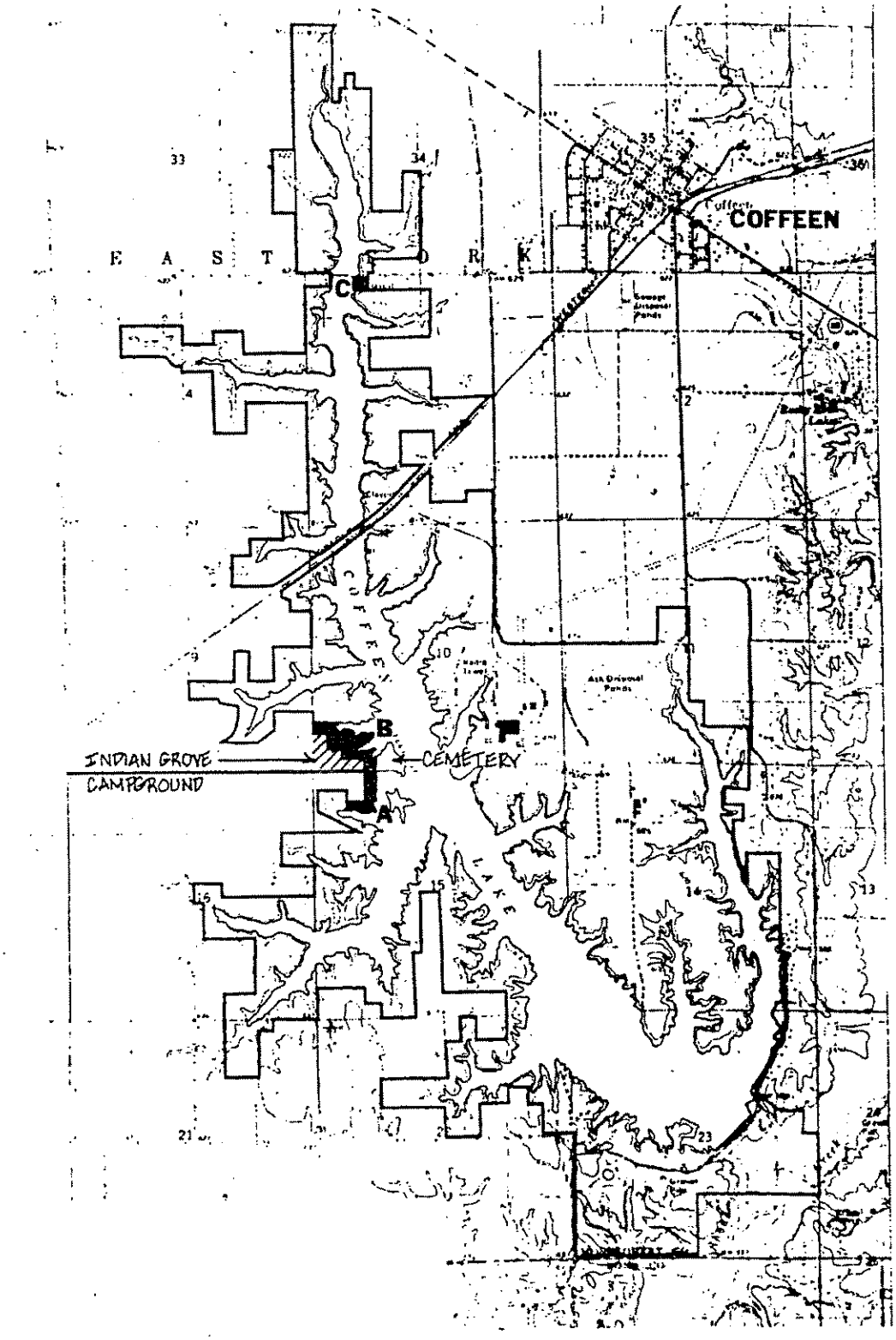
_____

APPROVED ~~BY~~ AND ON BEHALF
OF THE STATE OF ILLINOIS

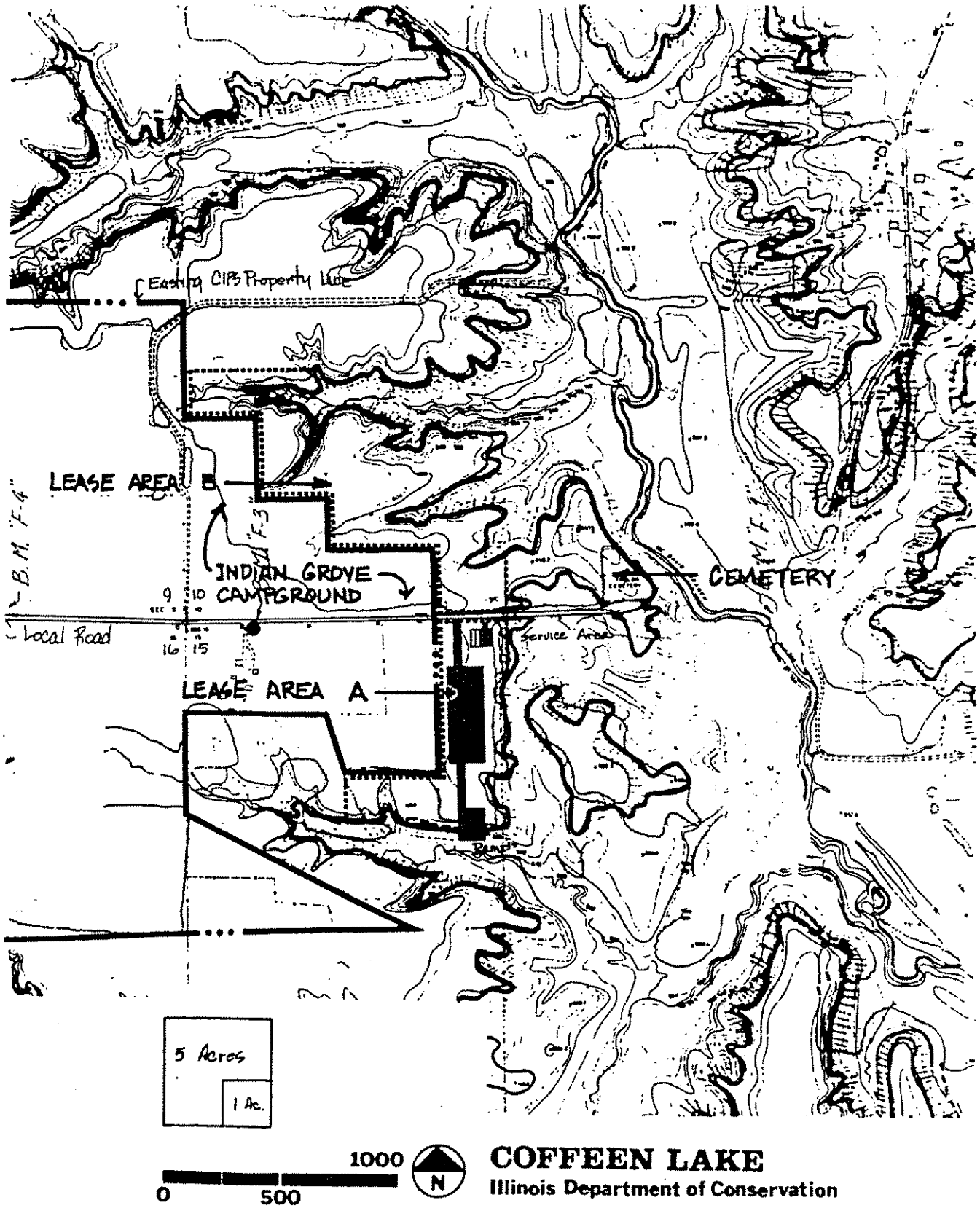
BY: _____
Governor of the
State of Illinois

EXHIBIT "A"

Maps Showing Lease Boundaries



COFFEEN LAKE
Illinois Department of Conservation
Lease Areas


Existing CIPS Property Line
LEASE AREA B
INDIAN GROVE CAMPGROUND
CEMETERY
B.M. "F-4"
M.M. "F-3"
9
10
16
15
Local Road
Service Area
LEASE AREA A
Ramp
5 Acres
1 Ac.
1000
0
500
N
COFFEEN LAKE
Illinois Department of Conservation

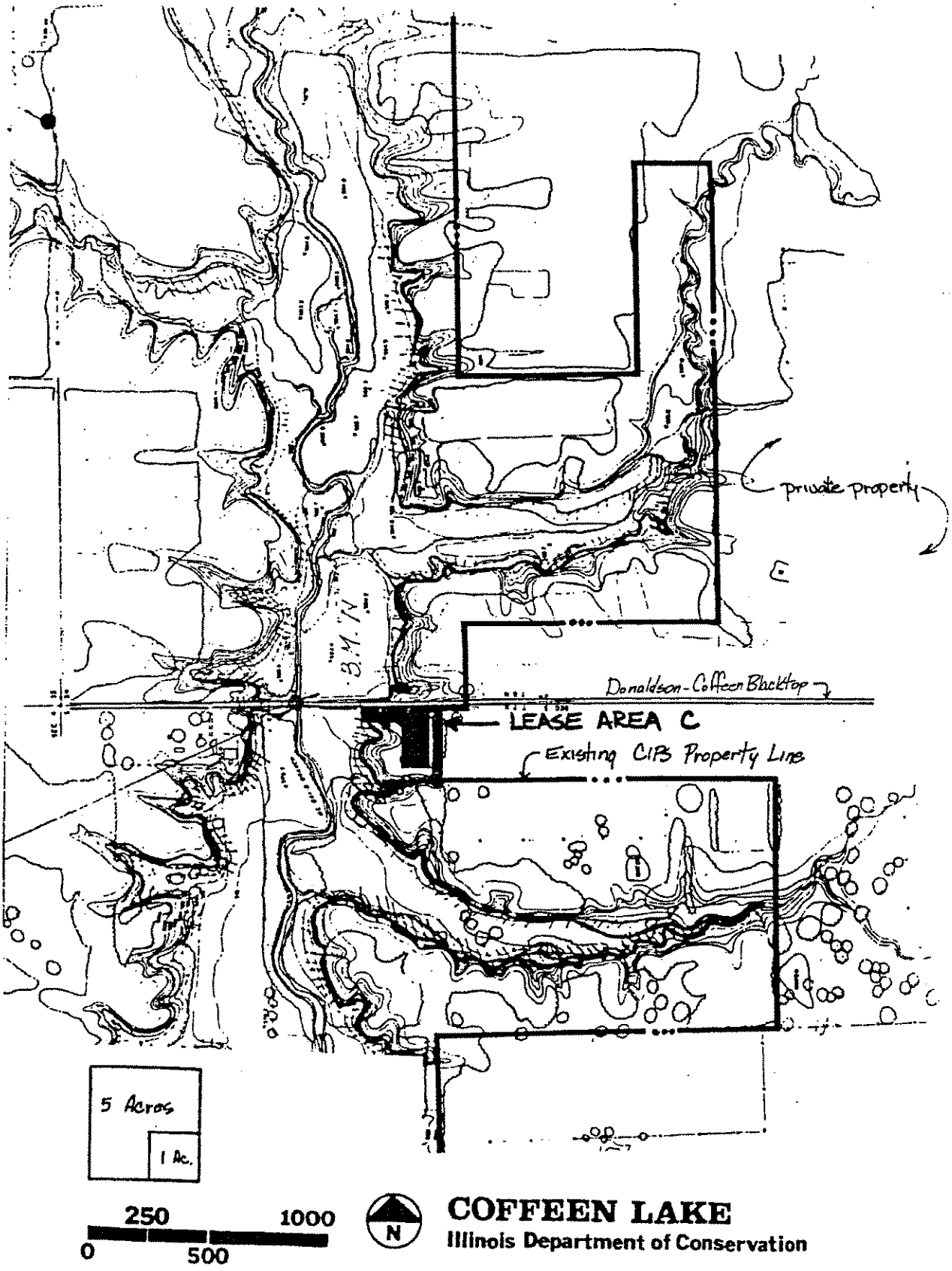

private property
B.M. 'N
Donaldson-Coffeen Blacktop
LEASE AREA C
Existing CIPS Property Line
5 Acres
1 Ac.
250
1000
0
500
N
COFFEEN LAKE
Illinois Department of Conservation

EXHIBIT "B"

Legal Descriptions of Lease Areas A, B, and C

and the Water Surface of Coffeen Lake

LEASE AREA "A"

All that part of the North Half of the Northwest Quarter of Section 15, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Northwest Corner of the Northeast Quarter of the Northwest Quarter of Section 15, Township 7 North, Range 3 West of the Third Principal Meridian, thence South 89°00'29" West, 249.93 feet to the Point of Beginning.

From said Point of Beginning thence South 0°26'02" East, 664.00 feet; thence South 89°00'29" West, 392.00 feet; thence South 03°00'27" East, approximately 220 feet to the north shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence eastwardly and northwardly along the shoreline of Coffeen Lake at elevation 590 feet above mean sea level to a point approximately 40 feet South of the North line of Section 15; thence North 0°26'02" West, 40.00 feet; thence South 89°00'29" West, 385.00 feet to the Point of Beginning, containing 8.84 acres, more or less.

LEASE AREA "B"

All that part of the Southwest Quarter of the Southwest Quarter of Section 10, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Southeast Corner of the Southwest Quarter of the Southwest Quarter of Section 10, Township 7 North, Range 3 West of the Third Principal Meridian, being the Point of Beginning.

From said Point of Beginning thence North 0°44'40" West, approximately 270 feet to the south shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence westwardly and northwardly along the shoreline of Coffeen Lake at elevation 590 feet above mean sea level to a point approximately 730 feet east of the west line of Section 10 and approximately 1,022 feet north of the Southwest Corner of Section 10; thence South 89°15'20" West, 730 feet to the west line of Section 10; thence South 0°16'32" East, 150 feet; thence North 89°15'20" East, 286.73 feet; thence South 0°44'40" East, 360.00 feet; thence North 89°15'20" East, 300.00 feet; thence South 0°44'40" East, 180.00 feet; thence North 89°15'20" East, 460.00 feet; thence South 0°44'40" East, 330.00 feet; thence North 89°00'29" East, 249.93 feet to the Point of Beginning, containing 11.8 acres, more or less.

LEASE AREA "C"

All that part of the Northwest Quarter of the Northwest Quarter of Section 3, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Northeast Corner of the Northwest Quarter of the Northwest Quarter of Section 3, Township 7 North, Range 3 West of the Third Principal Meridian, being the Point of Beginning.

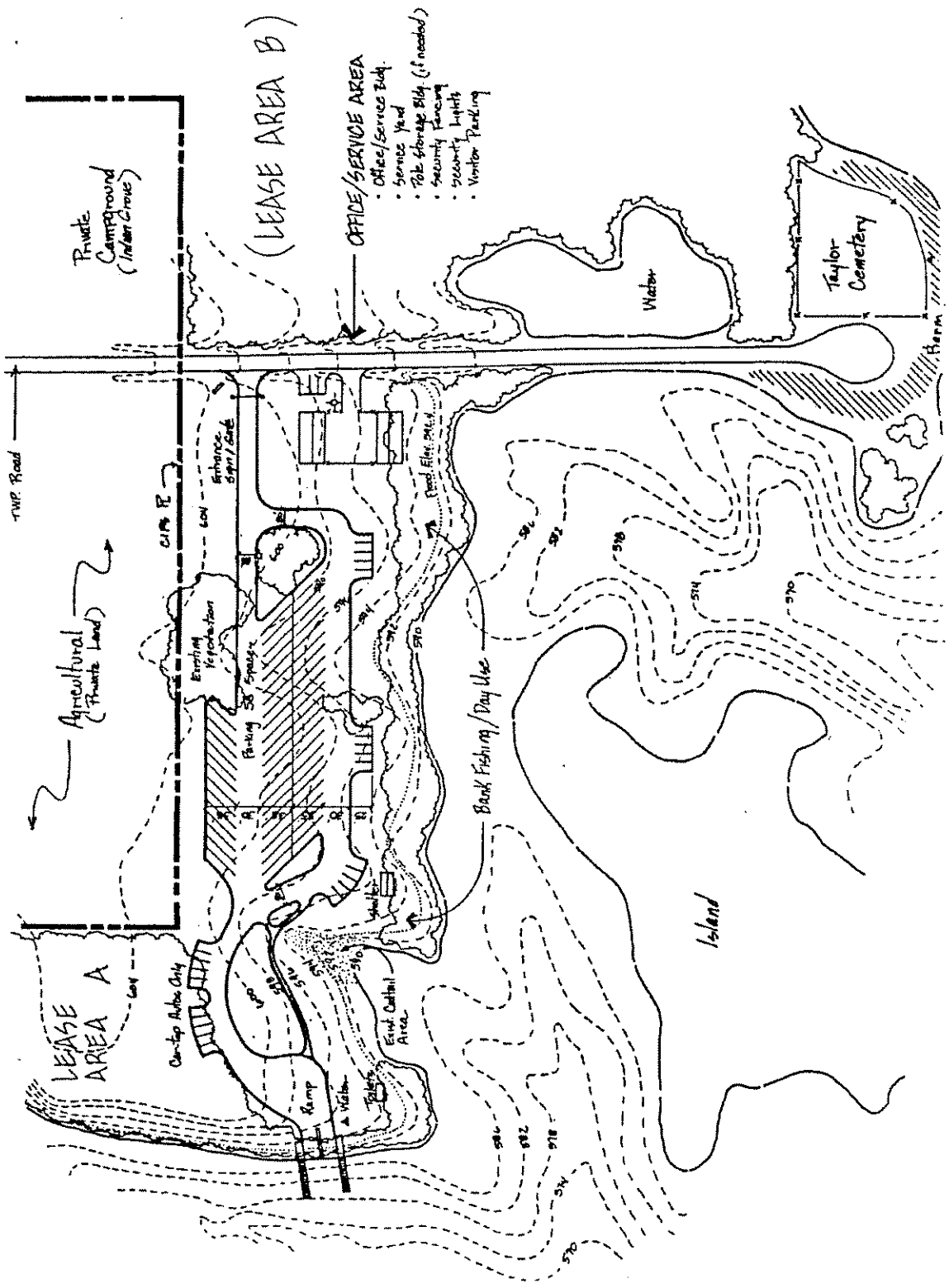
From said Point of Beginning thence South 0°10'53" East, 291.09 feet; thence North 89°59'47" West, approximately 300 feet to the east shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence northwardly along the shoreline of Coffeen Lake at elevation 590 feet above mean sea level to the north line of Section 15; thence South 89°59'47" East, approximately 300 feet to the Point of Beginning, containing 1.4 acres, more or less.

WATER SURFACE

The water surface of Coffeen Lake, to a normal pool elevation of 590 feet above mean sea level, within the boundaries of Central Illinois Public Service Company property at the Coffeen Station in Montgomery County, Illinois.

EXHIBIT "C"

Site Development and Management Plan



COFFEEN LAKE

LOWER POOL BOAT ACCESS AREA

Schmatic Design

PRELIMINARY COST ESTIMATE

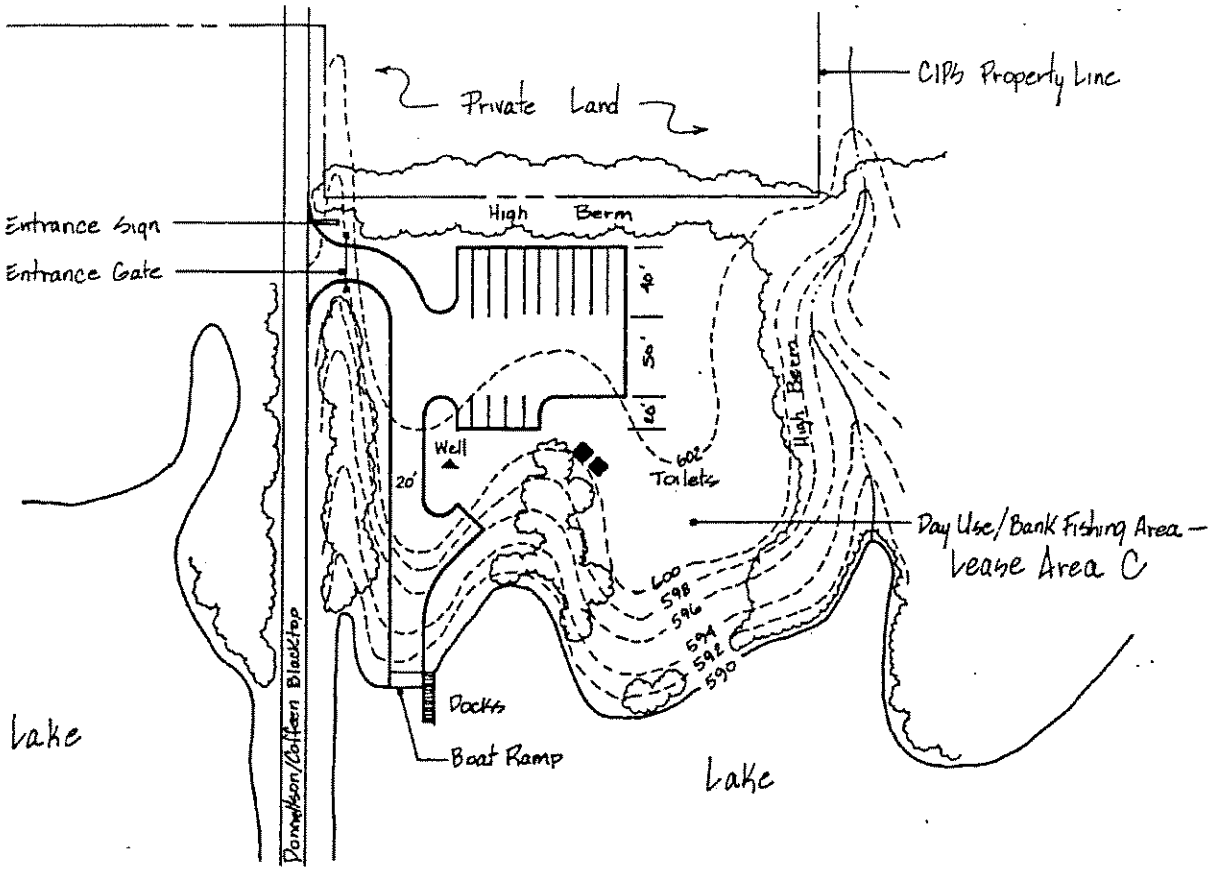
COFFEEN LAKE

Lower Pool Boat Access Area
FY 86 Estimating guidelines
May, 1986

ITEM (CONTRCTOR CONSTRUCT)	QUANTITY		COST
Roadway/Trailer Parking (Gravel)	7802	S.Y.	$ 106.5
Boat Ramp (2 lane concrete-coffer const.)		Lump	40.7
Seed/Mulch	3	Acres	3.3
Wood Deck w/stairs (at ramp)	200	S.F.	5.7
Clearing	1/4	Acre	.4
CMP 24"	70	L.F.	1.2
Entrance Gate		Lump	3.3
Entrance Sign		Lump	1.6
Vault Toilets (double unit)		Lump	12.2
Well w/hand Pump		Lump	2.4
Bumper Blocks (auto/trailer)	58	Each	.4
Traffic Signage		Lump	.5
Auto Parking (gravel)	695	S.Y.	9.5
Bumper Blocks (auto)	25	Each	.2
Walkway (4' gravel)	100	S.Y.	1.0
Construction Cost			$ 188.9
Contingency (10%)			18.9
Total Construction Cost			$ 207.8
A/E Fees & Reimb. (15%)			31.2
Total Project Cost			$ 239.0

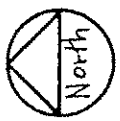
ITEM (PURCHASES)	QUANTITY		COST
Boat Docks (floating 10' sections)	8	Each	$ 1.6
Water Buoys	2	Each	.4
Picnic Shelter		Lump	5.4
Trash Receptacles	7	Each	.1
Picnic Tables	12	Each	1.8
Tree Replacement		Lump	1.7
Total Purchases			$ 11.0

(LOWER POOL BOAT ACCESS AREA)



PRELIMINARY COST ESTIMATE

ITEM	QUANTITY	COST
Circulation Road (gravel)	350 LF	$10,500.00
One Lane Boat Ramp (gravel)	1 Ea.	5,000.00
Parking Area (gravel)	1,223 SY.	16,694.00
Entrance Sign (1/2 size)	1 Ea.	800.00
Seeding/Mulch	1 Ac.	1,100.00
Floating Dock	3 Sec.	600.00
Pit Privies	2 Ea.	6,000.00
Picnic Tables	5 Ea.	650.00
Grills	5 Ea.	300.00
Trash Receptacles	5 Ea.	50.00
Landscaping	25-2" trees	3,000.00
Well w/hand pump	1 Ea.	2,300.00
Construction Sub-Total		$46,994.00
Planning & Contingencies (25%)		11,749.00
CONSTRUCTION TOTAL		$58,743.00



No Scale

COFFEEN LAKE
UPPER POOL BOAT ACCESS AREA
Schmatic Design / Preliminary Cost Estimate

INTAKE AND DISCHARGE CHANNELS - BUOY LOCATIONS

WEST (INTAKE) CHANNEL

A line located in the Southeast Quarter of Section 10, Township 7 South, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Southeast Corner of Section 10, Township 7 North, Range 3 West of the Third Principal Meridian, thence South 89°00'29" West, approximately 2180 feet to the Point of Beginning.

From said Point of Beginning thence along a line bearing North 35°59'31" West, approximately 1040 feet to CIPS monument #6 (R-4); said line extending across Coffeen Lake, being the buoy line in the vicinity of the intake temperature monitor, located west of the CIPS Coffeen Power Plant.

EAST (DISCHARGE) CHANNEL

A line located in the Southwest Quarter of the Southeast Quarter of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Southwest Corner of the Southeast Quarter of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian, thence North 0°04'12" East, approximately 475 feet to the Point of Beginning.

From said Point of Beginning thence along a line bearing North 34°04'12" East, approximately 360 feet to CIPS monument #49; said line and extension thereof across Coffeen Lake, being the buoy line to prevent access to the area of the discharge temperature monitor located east of the CIPS Coffeen Power Plant.

Illinois Department of Conservation
life and land together

LAKE MANAGEMENT PLAN

REGION	DISTRICT	COUNTY	LAKE NAME	ACREAGE
IV	12	Montgomery	Coffeen Lake	1102.0

INTRODUCTION The signing of the lease agreement between Central Illinois Public Service Company and the Illinois Department of Conservation will establish Coffeen Lake as a state lake for the duration of, and as specified by, the terms of the lease. Coffeen Lake was impounded in 1963 to provide cooling water for the coal-fired Coffeen power Station. The Station has a two unit generating capability. Unit 1 began operation in 1965 with a generating capacity of 350 MeW. Unit 2 began operation in 1972 with a generating capacity of 595 MeW. The cooling loop is 4.1 miles.

MORPHOMETRY

Maximum depth - 58.0'. Mean Depth - 18.7'. Shoreline length - 49.9 mi.. Shoreline development index - 10.6. 73% of the surface area is affected by the heated discharge.

SPECIES MANAGEMENT OBJECTIVES

Species composition of the lake is approximately 22 species. There are eight major species which will provide angling (L.M. bass, white crappie, bluegill, channel catfish, black bullhead, yellow bullhead, carp, yellow bass) and three forage species (Gizzard shad, golden shiner, and blackstripe top minnow).

LARGEMOUTH BASS: This species is the single most important predator in the lake. The health and abundance of this species is directly related to the quality of the existing fish population. Maintaining a well balanced bass population, that is, an abundant number of fish with a desirable length frequency, is essential. Population survey should indicate: C/E=0.5 bass/minute, PSD=40-70%, $RSD_{8-11.9}$=30-60%, $RSD_{12-14.9}$=30-60%, RSD_{15-20}= 10-30%, Wr=90-110%, maintain 5 year classes, compensate for increased angling pressure through regulation.

WHITE CRAPPIE: Maintain the population structure to support a harvestable population of fish 8.0 inches and larger. PSD=10-30%, Wr=90-110%.

CHANNEL CATFISH: Monitor the harvest to determine length frequency and 165/acre harvested.

BLUEGILL, BLACK & YELLOW BULLHEAD & YELLOW BASS: These species will provide limited angling, but of low quality. Maintaining a good predator population is the best management tool.

GIZZARD SHAD: This species is the primary forage for the predators. Adequate numbers, of a suitable size, appears to be present to maintain the population.

Coolwater species introduction will be evaluated, and recommendations submitted as to potential species and probability of success.

Increased useage by anglers could cause severe overharvest of the major Sport Species if not properly regulated. Close species monitoring will be undertaken as needed.

A maximum limit of 25 horsepower is recommended for all motorboats using the lake, and that sailboats be prohibited.

GM = 6-6-86

SPECIES MANAGEMENT OBJECTIVES

Three restricted areas need to be established by the use of buoy's*. (1) The west buoy line should be located in the vicinity of the intake temperature monitor (see attachment LM1). (2) The East buoy line should be located in the vicinity of the discharge temperature monitor (see attachment LM2). (3) The spillway area, at the approximate southeast corner of the dam, should be buoyed at an approximate distance of 25 yards from the center of the spillway out toward the middle of the lake (the primary buoy)

Two secondary buoys, one on each side of the primary buoy, midway between the primary buoy and each shoreline, should be placed 25 yards from the middle of the spillway out toward the open water. Thus a restricted area would be designated by the arch created by the three buoys.

* These areas were proposed and described by CIPS. I have no problem with the recommended locations of buoys.

CM = 6-6-80

SPECIES MANAGEMENT ACTIVITIES

1. Monitor the population structure through biological surveys utilizing standard sampling procedures. Standard gear types of electrofishing, hoop nets, and experimental gill nets would be used as needed.

2. Regulations:

   a. Maximum motor rating of 25 horsepower on motorboats.

3. Creel survey from opening date for a period of one year.

4. Prohibit sailboats and trespassing in restricted buoy areas by posting as in accord with Administrative Order 110.40.

5. The power station is being operated as a "base load" station. If time of operation decreases significantly, management objectives and regulations may have to be revised. A significant decrease in thermal discharge into the water could change the fish population and adjustments in the management scheme might become necessary.

EVALUATION OF SPECIES MANAGEMENT OBJECTIVES

1. Conduct fish population surveys as needed to monitor the structure of the fish population. Calculate PSD's, Wr, and RSD's and compare to established objectives.

2. The creel survey, if funds are available, to determine angling pressure, harvest per species, catch and release and angler preferences.

3. Evaluate and revise administrative orders as needed.

DISTRICT FISHERIES MANAGER'S SIGNATURE	DATE 6-6-86
REGIONAL ADMINISTATOR'S SIGNATURE	DATE 6-11-86
MANAGEMENT SECTION HEAD'S SIGNATURE	DATE 6-18-86

PROPOSED ADMINISTRATIVE ORDER FOR COFFEEN LAKE

1. Proposal - It shall be unlawful for any person to operate a motorboat larger than 25 horsepower on Coffeen Lake.

2. Need - The lake will be receiving increased boating useage as a State Lake with improved launching facilities. The lake is long and narrow. Until a reliable estimate of useage, as maximum number of boats per day, can be determined this horsepower limit will provide reasonable travel time to any portion of the lake and still allow a margin of safety.

3. Adverse Impacts - Many anglers have larger motors and would not be allowed to operate them on the lake.

4. Expected Benefits - Reduce speed boats travel on the lake and improve traffic flow because of the reduced speed. Provide a longer operator response time for the boat operator to avoid collision.

Submitted by: Stanley Michaels Date: 6-6-86

ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES
524 South Second Street, Springfield 62701-1787
Jim Edgar, Governor ● Brent Manning, Director

July 23, 1997

Mr. Mark A. Dyer
Central Illinois Public Service Co.
607 East Adams St.
Springfield, IL 62739

Coffeen Lake
Lease No. 416A
Amendment No. 6

Dear Mr. Dyer:

Enclosed for your records is a fully executed Amendment.

Sincerely,

T. Tim Werner, Manager
Legal Agreements Section
Concession and Lease Management

TTW:af

Enclosures

cc: Mike McCulley
Rick Messinger
Rose Ragland

Agreement No.: 416A - Amendment No. 6
Site Name: Coffeen Lake
Location Code: 50-6321-4

STATE OF ILLINOIS
DEPARTMENT OF NATURAL RESOURCES
AND
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

AMENDMENT #6 TO THE COFFEEN CIPS/DNR LEASE

THIS AMENDMENT is made this 30TH day of June, 1997, by and between CENTRAL ILLINOIS PUBLIC SERVICE COMPANY ("CIPS"), an Illinois corporation, and the STATE OF ILLINOIS, acting by and through the DEPARTMENT OF NATURAL RESOURCES ("DNR") as successor to the Department of Conservation, with respect to Lease Agreement No. 416A made by these same parties on the Second day of July, 1986, and amended previously in 1988, on 11 November 1989, on 11 June, 1991, on 1 October, 1995, and on 20 August, 1996, pertaining to certain lands in Montgomery County, Illinois, known as the Coffeen Power Generating Station and Coffeen Lake (the "Lease Agreement").

WHEREAS, the Lease Agreement provides CIPS and its successors and assigns certain rights to terminate the Lease Agreement; and

WHEREAS, in order to fully utilize available resources and opportunities, DNR must have assurances of CIPS' intent to allow the Lease Agreement to run its full term;

NOW THEREFORE, in consideration of the mutual and reciprocal benefits to be derived by each, the parties agree as follows:

1. CIPS agrees not to terminate the agreement except to the extent required by circumstances beyond CIPS' control and jurisdiction, including merger or acquisition of CIPS or unforeseen regulatory decrees by Commissions or Boards that have jurisdiction over the utility. In the event these circumstances arise which necessitate that CIPS consider terminating the Lease Agreement under its provisions, CIPS will make every reasonable effort to reach an accommodation with DNR that will allow the Lease Agreement to continue through its natural termination.

IN WITNESS WHEREOF, the State of Illinois, through the Department of Natural Resources and the Office of the Governor, and Central Illinois Public Service Company have executed this Amendment as of the date first above written by their duly authorized representatives.

AGREED

STATE OF ILLINOIS
DEPARTMENT OF NATURAL RESOURCES

BY: Brent Manning Jr.
July 2, 1997
Legal Counsel S. Yurkanin

AGREED

CIPS
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: J.T. Birkett
mbc

DATE: June 27, 1997

APPROVED BY AND ON BEHALF
OF THE STATE OF ILLINOIS

BY: Jim Edgar
GOVERNOR OF THE STATE OF ILLINOIS

C/amend/db050797
416a-no6.amd

ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES

524 South Second Street, Springfield 62701-1787 Jim Edgar, Governor ● Brent Manning, Director

EXHIBIT A

SIGNATURE AUTHORIZATION

As an official agent of Central Illinois Public Service Company
(Lessee or Licensee – Company / Corporation / Municipality)

I certify that J. T. Birkett
(Name of executive or official who will sign the agreement)

is an authorized representative of said organization and is legally empowered to act on its behalf in executing this agreement.

Signed: _____
(Person affirming signature authority of above official; must not be the same individual)

Title: Vice President and Secretary

Date: June 27, 1997

Effective July 1, 1995, the Illinois Department of Natural Resources was created through the consolidation of the Illinois Department of Conservation, Department of Mines and Minerals, Abandoned Mined Lands Reclamation Council, the Department of Transportation's Division of Water Resources and the Illinois State Museum and Scientific Surveys from the Illinois Department of Energy and Natural Resources

printed on recycled and recyclable paper

CIPS MEMORANDUM

TO: BOB PORTER
FROM: MARK DYER
SUBJECT: CORPORATE LEGAL FILES
DATE: SEPTEMBER 23, 1996

Attached is a fully executed agreement for the Corporate Secretary's files.

Name of Contractor: Illinois Department of Natural Resources

Date of Agreement: August 20, 1996

Expiration Date: June 30, 2021

General Subject Matter: Extension of the CIPS-DNR lease at Coffeen. This extension would allow qualification for Federal reimbursement for a capital improvement project at the boat access facilities for Coffeen Lake.

RECEIVED
SEP 23 1996
ENVIRONMENTAL

ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES
524 South Second Street, Springfield 62701-1787
Jim Edgar, Governor ● Brent Manning, Director

September 20, 1996

Mr. Mark A. Dyer
C.I.P.S.
607 East Adams St.
Springfield, IL 62739

RE: Coffeen Lake
Lease No. 416A
Amendment No. 5

Dear Mr. Dyer:

Enclosed for your records is a fully executed Amendment which will allow the Department of Natural Resources to qualify for a Federal reimbursement for the proposed boat access project at Coffeen Lake.

Sincerely,

Dave Kruger

Dave Kruger
Legal Agreements Section
Division of Concession and Lease Management

DK:js

Enclosure

cc: Mike McCulley
Rick Messinger
Deck Major
Larry Cruse
Rose Ragland

Effective July 1, 1995, the Illinois Department of Natural Resources was created through the consolidation of the Illinois Department of Conservation, Department of Mines and Minerals, Abandoned Mined Lands Reclamation Council, the Department of Transportation's Division of Water Resources, and the Illinois State Museum and Scientific Surveys from the Illinois Department of Energy and Natural Resources.

[printed on recycled and recyclable paper]

Agreement No.: 416A - Amendment No. 5
Site Name: Coffeen Lake
Location Code: 50-6321-4

STATE OF ILLINOIS
DEPARTMENT OF NATURAL RESOURCES
AND
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

AMENDMENT #5 TO THE COFFEEN CIPS/DOC/DNR LEASE

THIS AMENDMENT is made this 20TH day of August, 1996, by and between CENTRAL ILLINOIS PUBLIC SERVICE COMPANY ("CIPS"), an Illinois corporation, and the STATE OF ILLINOIS, acting by and through the DEPARTMENT OF NATURAL RESOURCES ("DNR") as successor to the Department of Conservation, with respect to Lease Agreement No. 416A made by these same parties on the Second day of July, 1986, and amended previously in 1988, on 11 November 1989, on 11 June, 1991, and on 1 October, 1995, pertaining to certain lands in Montgomery County, Illinois, known as the Coffeen Power Generating Station and Coffeen Lake (the "Lease Agreement").

WHEREAS, CIPS and DNR heretofore entered into a certain Agreement Number 416A covering property described in said agreement for a period of twenty-five (25) years, commencing on the 1st day of July, 1986, and terminating on the 30th day of June, 2011; and

WHEREAS, DNR has agreed to construct a new Boat Ramp according to approved plans and specifications; and

WHEREAS, CIPS agrees to the construction of the proposed boating improvement; and

WHEREAS, DNR has requested an extension of said Agreement in order to capture available matching funds from the Federal government; and

WHEREAS, CIPS and DNR have agreed to an extension of said Agreement in order to guarantee the public access to these facilities throughout the useful life of this project; and

WHEREAS, both parties are authorized and empowered to enter into this Agreement and to perform the covenants and promises herein made and undertaken;

NOW THEREFORE IT IS HEREBY AGREED between DNR and CIPS as follows:

1. Agreement Number 416A is hereby extended, now terminating on the 30th day of June, 2021, subject to all terms, conditions, covenants, and provisions of the original Agreement, except as hereinafter modified.

2. The parties to this Amendment #5 agree to comply with all terms, covenants, conditions and provisions of said original Agreement, including all revisions or amendments thereto set forth herein.

IN WITNESS WHEREOF, the State of Illinois, through the Department of Natural Resources and the Office of the Governor, and Central Illinois Public Service Company, have executed this Amendment as of the date first above written by their duly authorized representatives.

AGREED

STATE OF ILLINOIS
DEPARTMENT OF NATURAL RESOURCES

BY: Brent Manning

AGREED

CIPS
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: J T Birkett

DATE: August 12, 1996

APPROVED BY AND ON BEHALF
OF THE STATE OF ILLINOIS

BY: Jim Edgar
GOVERNOR OF THE STATE OF ILLINOIS

C/leases1/db071996
govexag1

C/amend/db072396
416a-no5.amd

ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES
524 South Second Street, Springfield 62701-1787 Jim Edgar, Governor ● Brent Manning, Director

EXHIBIT A

SIGNATURE AUTHORIZATION

As an official agent of Central Illinois Public Service Company
(Lessee or Licensee -- Company / Corporation / Municipality)

I certify that J. T. Birkett
(Name of executive or official who will sign the agreement)

is an authorized representative of said organization and is legally empowered to act on its behalf in executing this agreement.

Signed: _____
(Person affirming signature authority of above official; must not be the same individual)

Title: CEO

Date: 5/7/96

Effective July 1, 1995, the Illinois Department of Natural Resources was created through the consolidation of the Illinois Department of Conservation, Department of Mines and Minerals, Abandoned Mined Lands Reclamation Council, the Department of Transportation's Division of Water Resources, and the Illinois State Museum and Scientific Surveys from the Illinois Department of Energy and Natural Resources.

[printed on recycled and recyclable paper]

416A, Amendment #4
Site Coffeen Lake
Code 50-6321-4

AMENDMENT #4 TO THE COFFEEN CIPS/DOC LEASE

This Amendment is made this 1ST day of OCTOBER 1995, by and between CENTRAL ILLINOIS PUBLIC SERVICE COMPANY, an Illinois corporation ("CIPS") and the STATE OF ILLINOIS, acting by and through the Department of Natural Resources ("DNR") as successor to the Department of Conservation, with respect to Lease Agreement No. 416A made by these same parties on the Second day of July 1986, and amended previously in 1988, on 11 November 1989, and on 11 June, 1991 pertaining to certain lands in Montgomery County, Illinois known as the Coffeen Power Generating Station and Coffeen Lake (the "Lease Agreement").

WHEREAS, it is burdensome, cumbersome, and impractical for the parties to formally amend or supplement the Lease Agreement periodically, or even on a regular annual basis, to take into account, or take advantage of, changes in conditions and opportunities for public recreational use of the land subject to the Lease Agreement.

WHEREAS, the general purpose of the Lease Agreement is to establish a relationship between CIPS as the owner of the land subject to the Lease Agreement and DNR as a public agency interested in the conservation of natural resources and the safe enjoyment of those resources for recreational purposes by the general public, to make available the certain specified areas of CIPS' Coffeen Power Generating Station property

for the conservation and recreational purposes under all of the conditions set forth in the Lease Agreement.

WHEREAS, the establishment of that relationship and the rights and responsibilities of each party to the other are all satisfactory and do not require modification, but the stated general purpose and intent of the Lease Agreement would be facilitated if the specific Recreational Areas and/or the prescribed conservation and public recreation activities to be available from time to time were susceptible to modification without the time and effort necessary for formal modification or amendment of the Lease Agreement.

WHEREAS, the parties have developed a procedure to provide for the designated officials of each to periodically agree to modifications of area and use/activities within the confines of the terms of the Lease Agreement.

NOW, THEREFORE, in consideration of the mutual and reciprocal benefits to be derived by each, the parties agree as follows:

1. By reference to this Amendment and the Lease Agreement, CIPS, by its Vice President, and DNR by its Director, or their respective designated representatives, may from time to time specify various conservation and public recreation purposes to be carried out that are not already set forth in the Lease Agreement.

2. The parcel subject to the Agreement shall be divided into six geographic units as shown and described on Exhibit 1 attached hereto and made a part hereof. The legal land description will be the governing portion of Exhibit #1 if it is found to be in conflict with the map.

3. Not less often than annually, and from time to time more frequently than annually if agreed, the parties shall execute a "Management Agreement" each to be dated and numbered in sequence, designating (a) the particular conservation and/or recreational uses to be conducted, (b) the geographic areas subject to such uses referring to their numbers, one through six designated on Exhibit 1 to this Amendment, (c) the time period for each such use and (d) any special terms and conditions or restrictions and obligations not provided in the Lease Agreement.

4. It is agreed and acknowledged that certain of the lands within the area subject to the Lease Agreement are subject to farm leases; that the growing crops are the personal property of the farm lessees and entitled to be secure from theft or damage whether from intentional vandalism or negligence; that free access by the farm lessees on and across the lands to cultivate and harvest the crops has priority over the rights of others; and that the safety of the farm lessees, their employees and agents and their respective vehicles, implements, and other personal property from intentional or unintentional damage by their parties on the land subject to the Lease Agreement for recreational purposes will be respected by those there for conservation or recreational purposes.

5. It is intended, not as an exclusive listing, but for example only, that Management Agreements may authorize the use of certain areas during certain times for the hunting of specified wild game for some or all of the season prescribed for that species by state law; fish management; hiking; the observation, study, or research of soil, plants or animals by students or faculty of public or private institutions of learning; and such other "outdoor" activities or endeavors as the parties may from time to time agree appropriate.

6. Neither the purpose and intent of the Lease Agreement nor the rights and responsibilities of DNR to CIPS and of CIPS to DNR established thereby are intended to be modified in any manner by this Amendment to the Lease Agreement, except as expressly set forth herein by establishing a procedure for the periodic modification of specific uses of specific areas for specific periods of time. No periodic Management Agreement shall be utilized to add or decrease the area subject to the Lease Agreement nor to authorize uses of the land other than for conservation and public recreation or a combination thereof.

IN WITNESS WHEREOF, the State of Illinois, through the Department of Natural Resources and the Office of the Governor, and Central Illinois Public Service Company, have executed this Amendment as of the date first above written by their duly authorized representatives.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

By: J T Birkett
Vice-President

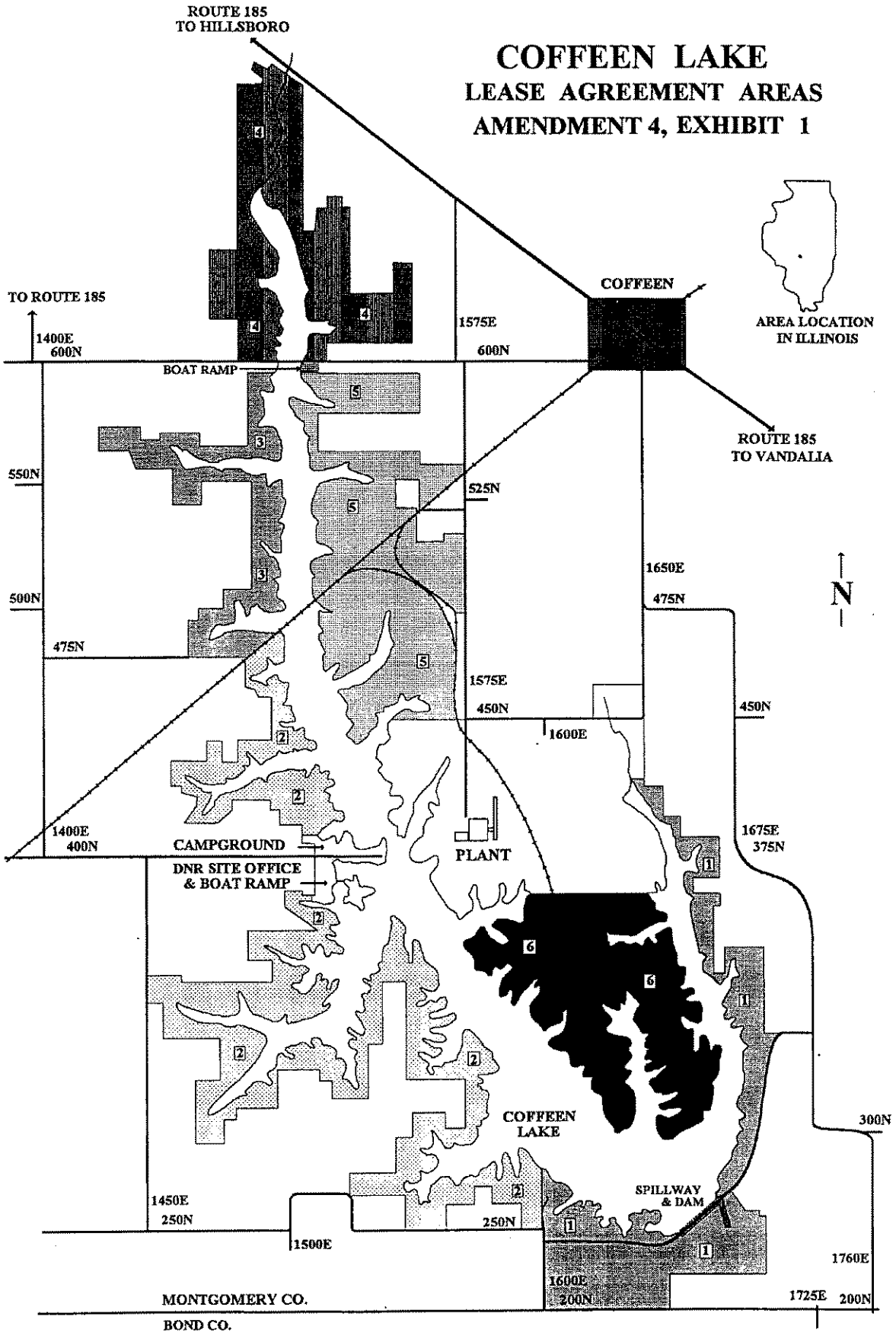
ATTEST:

DEPARTMENT OF NATURAL RESOURCES
STATE OF ILLINOIS

By: Brent Manning
Director

ATTEST:

APPROVED: Jim Edgar
Jim Edgar, Governor


ROUTE 185
TO HILLSBORO
COFFEEN LAKE
LEASE AGREEMENT AREAS
AMENDMENT 4, EXHIBIT 1
AREA LOCATION
IN ILLINOIS
COFFEEN
TO ROUTE 185
1400E
600N
1575E
600N
BOAT RAMP
ROUTE 185
TO VANDALIA
550N
525N
1650E
500N
475N
N
475N
1575E
450N
450N
1600E
1400E
400N
CAMPGROUND
DNR SITE OFFICE
& BOAT RAMP
PLANT
1675E
375N
COFFEEN
LAKE
300N
1450E
250N
1500E
250N
SPILLWAY
& DAM
1760E
1600E
200N
1725E
200N
MONTGOMERY CO.
BOND CO.
CMNUNIT1.PCX

"Coffeen Amendment 4, Exhibit 1"

Those portions of the following described tracts of land lying above the surface elevation of Coffeen Lake:

AREA 1

Tracts located in T7N, R3W, 3rd PM, Montgomery County, Illinois.

Within Section 23

S1/2 of the NW1/4, South of Lake Coffeen

SW1/4

N1/2 of the SE1/4

SW1/4 of the NE1/4

Within Section 14

That part of the SE1/4 of the SE1/4 lying West of the center line of the public road running through the West part of said quarter quarter section, excepting the South 198 feet of the E1/2 of said quarter quarter section.

That part of the following lying East of Lake Coffeen: The W1/2 of the E1/2, excepting the two following described tracts of land:
(1) Commencing at the SE corner of the North 15 acres of the SW1/4 of the NE1/4; thence West along the South line of said 15 acre tract 315 feet; thence North 563 feet parallel with the East line of said NE1/4; thence East 165 feet; thence North 320 feet parallel with the East line of said NE1/4; thence West 460 feet; thence North 320 feet; thence East 610 feet to the East line of said NE1/4; and thence South 1203 feet to the point of beginning, containing 9.51 acres, more or less, and
(2) Commencing at the NE corner of the South 25 acres of the SW1/4 of the NE1/4 measure South 730 feet, thence deflecting to the right at an angle of 90°, measure 100 feet West, thence in a Northwesterly direction 750 feet more or less to a point on the North line of said South 25 acres of the SW1/4 of the NE1/4 to a point, which point is 260 feet West of the point of beginning, thence East 260 feet to the point of beginning.
EXCEPTING AND RESERVING from all the real estate above described the following described tract: That part of the West 5/8 described as follows: Commencing at a steel stake located at a point 190 feet, more or less East of the NW corner of the NE1/4, which said point is also 2831.53 feet, more or less, East of the Northwest corner, thence South 621 feet, thence West by deflection 90° 880 feet, thence South by deflection 90° 479 feet, thence East by deflection 90° 374 feet, thence South by deflection 90° 592 feet, thence West by deflection 90° 834 feet, thence South by deflection 90° 618 feet, thence East by deflection 90° 1510 feet, thence South by deflection 90° 458 feet, thence West by deflection 90° 200 feet, thence South by deflection 90° 300.79 feet, thence East by deflection 90° 260 feet, thence South by deflection 90° 1345.21 feet, thence West by deflection 90° 370 feet, thence North by deflection 90° 648 feet, thence West by deflection 90° 245 feet, thence North by deflection 90° 709 feet, thence West by deflection 90° 905 feet, thence South by deflection 90° 1033 feet, thence East by deflection 90° 128 feet, thence South by deflection 90° 540 feet, thence East by deflection 90° 334.45 feet, thence South by deflection 90° 69.63 feet, thence West by deflection 90° 94.45 feet, thence South by deflection 90° 621.66 feet; more or less to the South section line,
thence West by deflection 90° 138 feet, thence North by deflection 90° 171.59 feet,

thence West by deflection 90° 235.07 feet, thence North by deflection 90° 467 feet, thence West by deflection 90° 200 feet, thence North by deflection 90° 239 feet, thence West by deflection 90° 357 feet, thence North by deflection 90° 1130.52 feet, thence West by deflection 90° 569 feet, thence North by deflection 90° 655.07 feet, thence West by deflection 90° 368.58 feet, more or less to the West line of Section 14, thence Northerly along the West line of said Section 910 feet, along a line which forms an angle to the right of 89° 36' 40" from the last described line extended, thence Eastwardly 383 feet along a line which forms an angle to the right of 90° 23' 20" from the last described line extended, to a point which is 1759.83 feet South of the North line of Section 14, thence North by deflection 90° 1759.83 feet, more or less, to a point 420 feet, more or less, East of the NW corner of said Section 14, thence Easterly by deflection to the right of 90° 14' from the last described line extended 2411.53 feet, more or less, to the point of beginning.

Within Section 11

SE1/4 of the SW1/4

The SW1/4 of the SE1/4 excepting:
a) The North 660' of the East 995'
b) The West 397' of the East 665' of the South 649'

AREA 2

Tracts located in T7N, R3W, 3rd PM, Montgomery County, Illinois

Within Section 22

N1/2 of the S1/2 of the NW1/4 of the NE1/4

Within Section 21

NW1/4 of the NE1/4

NW1/4 of the NW1/4 of the NE1/4 of the NE1/4

Within Section 16

SE1/4 of the SW1/4 of the SE1/4

SW1/4 of the SE1/4 of the SE1/4

NE1/4 of the SE1/4

E1/2 of the SE1/4 of the SE1/4

NW1/4 of the SE1/4 of the SE1/4

NW1/4 of the SE1/4 EXCEPTING therefrom 3 tracts:
(1) A strip of land of uniform width of 9 rods off of the N side of said NW1/4 of the SE1/4
(2) A tract of land beginning 9 rods South of the NW corner of said NW1/4 of the SE1/4 and running thence South 16 rods; thence East 15 rods; thence North 16 rods; thence West 15 rods to the point of beginning;
(3) A tract of land beginning at the SW corner of the NW1/4 of the SE1/4; running thence

East 1325 feet; thence North 460 feet; thence West 1091 feet; thence North 472 feet, thence West 234 feet, thence South to the point of beginning.

S1/2 of the SW1/4 of the SW1/4 of the NE1/4

Part of the NW1/4 as follows: Part of the NW1/4 of the SE1/4, bounded and described as follows: Beginning at the center of said section, and measure thence South 8 rods along the Westerly line of said quarter quarter section; measure thence Eastwardly 15 rods parallel with the Northerly line of said quarter quarter section; thence South 1 rod, thence East 65 rods parallel with the Northerly line of said quarter quarter section; thence North 9 rods along the Easterly line of said quarter quarter section to the NE corner of said quarter quarter section; thence West 80 rods along the North line of said quarter quarter section to the point of beginning.

Within Section 15

NW1/4

SE1/4

NW1/4 of the SW1/4

NW1/4 of the SW1/4 of the SW1/4

NE1/4 of the SW1/4 except East 500'

W1/2 of the SE1/4 of the SW1/4

NE1/4 of the SW1/4 of the SW1/4

NE1/4 of the SE1/4 of the SW1/4 of the SW1/4

Within Section 10

NW1/4, West of Lake Coffeen and South of N&W Railroad

SW1/4, West of Lake Coffeen excepting cemetery therein

Within Section 9

A part of the SE1/4 of the SE1/4 bounded and described as follows: Commencing at the NW corner of said quarter quarter section, and measure thence Southwardly along the Westerly line of said quarter quarter section 660 feet, measure thence Northeastwardly in a straight line to a point which point is 481 feet East of the West line of said quarter quarter section and 420 feet South of the Northerly line of said quarter quarter section, measure thence Northwardly 420 feet parallel to the Westerly line of said quarter quarter section, measure thence Westwardly 481 feet along the Northerly line of said quarter quarter section to the point of beginning.

The N 655 feet of even width of the East 300 feet of even width, of the NW1/4 of the SE1/4.

That part of the NE1/4 of the SE1/4 bounded and described as follows: Commencing at the NE corner of said quarter quarter section and measure thence Westwardly along the Northerly line of said quarter quarter section, 817 feet, measure thence Southwardly in a straight line to a point which point is 657 feet South of the Northerly line of said quarter quarter section and 840.5 feet West of the Easterly line of said quarter quarter section, measure thence Eastwardly in a straight line to a point on the East line of said quarter

quarter section which point is 650 feet South of the NE corner of said quarter quarter section and measure thence Northwardly along the Easterly line of said quarter quarter section 650 feet to the point of beginning.

The N1/2 of the SW1/4 of the NW1/4 of the SE1/4

The S1/2 of the E3/4 of the N1/2 of the SE1/4

The NE1/4 of the SW1/4 of the SE1/4 excepting the following described tract: Beginning at the SW corner of the NE1/4 of the SW1/4 of the SE1/4 of said section for this excepted tract and measure thence Northwardly along the Westerly line of the E1/2 of the W1/2 of the SE1/4 of said section, 18 feet; thence deflecting to the right 59° 19', measure Northeastwardly 321.5 feet; thence deflecting to the left 41° 13' measure 352.5 feet Northwardly; thence deflecting 14° 41' to the left measure 298 feet Northwardly; thence deflecting 82° 57' to the left measure 422.5 feet Westwardly; and measure thence Southwardly 871.5 feet along said Westerly line of the E1/2 of the W1/2 of the SE1/4 of said section to the point of beginning.

AREA 3

Tracts located in T7N, R3W, 3rd PM, Montgomery County, Illinois.

Within Section 9

That part of the following lying West of Lake Coffeen and North of the N&W RR Right of Way: Part of the N1/2 of the NE1/4 of the NE1/4, bounded and described as follows: Beginning at the NE Corner and measure Westwardly 660 feet along the North line of said Section; measure thence Southwardly 260 feet parallel to the East line of said Section; measure thence Westwardly 660 feet parallel to the North line of said Section; thence Southwardly parallel to the East line of said Section to the South line of said N1/2 of the NE1/4 of the NE1/4 of said Section, and measure thence Eastwardly along the South line of said half quarter quarter section to the center line of the Public Road; measure thence Northwardly and Eastwardly along and curving with the center line of the Public Road to the East line of said Section; and measure thence Northwardly along the East line of said Section to the point of beginning.

A part of the N1/2 of the NE1/4, bounded and described as follows: Beginning at the SW corner of the NE1/4 of the NE1/4, and measure thence Westwardly along the South line of said N1/2 of the NE1/4, 362 feet, more or less, to the West line of the S1/2 of the E1/2 of the E1/2 of the NW1/4 of the NE1/4, and measure thence Northwardly at right angles, 214 feet, measure thence Eastwardly at right angles, 275 feet, measure thence Southwardly at right angles 114 feet, measure thence Eastwardly at right angles, 90 feet, measure thence Northwardly at right angles 200 feet, measure thence Eastwardly at right angles, 630 feet to the center line of the Public Road, measure thence Southwardly and Westwardly curving with the center line of said Public Road along the center line of said Public Road to the point of beginning.

The S1/2 of the NE1/4 of the NE1/4

The S1/2 of the E1/2 of the E1/2 of the NW1/4 of the NE1/4

NE1/4 of the SW1/4 of the SE1/4 excepting the following described tract: Beginning at the SW corner of the NE1/4 of the SW1/4 of the SE1/4 of said section for this excepted tract and measure thence Northwardly along the Westerly line of the E1/2 of the W1/2 of the SE1/4 of said section, 18 feet; thence deflecting to the right 59° 19', measure Northeastwardly 321.5 feet; thence deflecting to the left 41° 13' measure 352.5 feet Northwardly; thence deflecting 14° 41' to the left measure 298 feet Northwardly; thence

deflecting 82° 57' to the left measure 422.5 feet Westwardly; and measure thence Southwardly 871.5 feet along said Westerly line of the E1/2 of the W1/2 of the SE1/4 of said section to the point of beginning.

Within Section 3

W1/2, West of Lake Coffeen

Within Section 10

NW1/4 of the NW1/4, North of N&W Railroad

Within Section 4

N1/2 of the N1/2 of the SE1/4 of the NW1/4

Part of the NW1/4, bounded and described as follows: Beginning at the SE corner of the West 7 1/2 acres, in the form of a rectangle, of the N1/2 of the N1/2 of the SE1/4 of the NW1/4, and measure thence Southeastwardly in a straight line to a point in the South line of the N1/2 of the SE1/4 of the NW1/4, which point is 130 feet West of the SE corner of said N1/2 of the SE1/4 of the NW1/4, measure thence East 130 feet to the SE corner of said N1/2 of the SE1/4 of the NW1/4, and measure thence Northwardly 529 feet along the East line of the NW1/4, measure thence Westwardly to the East line of said West 7 1/2 acres in the N1/2 of the N1/2 of the SE1/4 of the SW1/4, and measure thence South to the point of beginning.

The N1/2 of the N1/2 of the SE1/4 of the NW1/4, excepting the West 7 1/2 acres, in the form of a rectangle, of the N1/2 of the N1/2 of the SE1/4 of the NW1/4.

The South 780' of the E1/2 of the N 3/4 of the W 1/2 of the NE1/4

The South 540' of the NW1/4 of the SW1/4 of the NE1/4

The South 30 acres of the E1/2 of the NE1/4

AREA 4

Tracts located in T8N, R3W, 3rd PM, Montgomery County, Illinois.

Within Section 33

East 15 acres of E1/2 of the NE1/4 of the SE1/4

Within Section 34

NW1/4 of the SW1/4

SE1/4 of the NW1/4 except East 30 acres

W1/2 of the W1/2 of the NE1/4 of the SW1/4

E1/2 of the E1/2 of the NE1/4 of the SW1/4 except the North 500'

S1/2 of the SW1/4 except the East 900' of the South 330'

Within Section 27

That part of the SW1/4 of the SW1/4 described as follows: Beginning at a stone at the SW corner, and measure thence Eastwardly 366 feet along the South line to the actual point of beginning, thence deflection 58° 21' to the left, measure 245.73 feet, thence deflecting 98° 1' 15" to the left, measure 437.3 feet; thence deflecting 80 ° to the right, measure 109.35 feet; thence deflecting 86° to the right, measure 590 feet, thence deflecting 83° 9' 15" to the left, measure 505.28 feet; thence deflecting 101 ° 59' to the right, measure 530.85 feet parallel to the center line of State Route 185, thence deflecting 95° 22' to the right, measure 759.30 feet to the South line of said Section; thence deflecting 62° 1' 15" to the right, measure 532 feet along the South line of said Section to the actual point of beginning.

AREA 5

Tracts located in T7N, R3W, 3rd PM, Montgomery County, Illinois.

Within Section 10

NW1/4, East of Lake Coffeen

W1/2 of the NE1/4

Within Section 3

The South 32 acres of the NE1/4 of the NW1/4, EXCEPTING therefrom the following: Beginning at the SE Corner of said quarter quarter section, thence South 89° 50' 51" West 100.00 feet along the South line of said quarter section; thence North 0° 58' 14" East 250.00 feet; thence North 89° 50' 51" East 100.00 feet to the East line of said quarter section; thence South 0° 58' 14" West 250.00 feet along the East line of said quarter section to the point of beginning, said description being taken from that survey made on the 17th day of January, 1984 by Robert E. French and recorded January 20, 1984 as Document No. 285361 in the Office of Recorder of Deeds, Montgomery County, Illinois, in Book Two of Surveys, at Page Two, said tract containing 0.57 acres.

SE1/4 of the SW1/4 of the SE1/4

Commencing at a stone marking the SW Corner of the N1/2 of the SW1/4 of the SE1/4; thence Northerly along the West line of the SE1/4 a distance of 744.02' to the place of beginning; thence Northeasterly by deflection to the right 45° 51' a distance of 1759.46', more or less, to the North line of the SE1/4; thence Westerly along the North line of the SE1/4 a distance of 1263.2', more or less, to the West line of the SE1/4; thence Southerly along the West line of the SE1/4 a distance of 1224.79', more or less, to the place of beginning.

SW1/4 of the SW1/4 of the SE1/4 excepting the North 2 acres thereof.

AREA 6

Tracts located in T7N, R3W, 3rd PM, Montgomery County, Illinois.

Within Section 14

S1/2 of the NW1/4, West of Lake Coffeen

SE1/4, West of Lake Coffeen

SW1/4, East of Lake Coffeen main body

S1/2 of the NE1/4, West of Lake Coffeen

Within Section 15

S1/2 of the NE1/4, East of Lake Coffeen main body

SE1/4, East of Lake Coffeen main body

Within Section 23

N1/2, North of Lake Coffeen

P555

AMENDMENT TO LEASE WITH
STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION

Lease No. 416A is hereby amended as follows:

Leased premises are expanded to include the following described tracts of land indicated on the attached Exhibit G-1:

AREA "J"

Tracts located in T.7.N., R.3.W. of the 3rd P.M., Montgomery County, Illinois:

Within Section 16

Those portions of the following tracts lying Westwardly of Coffeen Lake;

SW 1/4 of SE 1/4 of SE 1/4
S 1/4 of W 1/2 of SW 1/4 of NE 1/4
SE 1/4 of SW 1/4 of SE 1/4
SW 1/4 of SE 1/4 of SE 1/4
W 1/2 of NE 1/4 of SE 1/4
The E 1/2 of the SE 1/4 of the SE 1/4 of Section 16 in T.7.N., R.3.W. of the 3rd P.M. and the NW 1/4 of the SE 1/4 of the SE 1/4 of said Section 16 and also the NW 1/4 of the SE 1/4 of said Section 16 except the following three tracts:

1. A strip of land of uniform width of 9 rods off of the North side of the NW 1/4 of the SE 1/4 of said Section 16.

2. A tract of land beginning 9 rods South of the NW Corner of said NW 1/4 of the SE 1/4 of said Section 16 and running thence South 16 rods; thence East 15 rods; thence North 16 rods; thence West 15 rods to the point of beginning and

3. A tract of land beginning at the SW Corner of the NW 1/4 of the SE 1/4 of said Section 16; running thence East 1325 feet; thence North 460 feet; thence West 1091 feet; thence North 472 feet; thence West 234 feet thence South to the point of beginning.

Within Section 21

Those portions of the following tracts lying Westwardly of Coffeen Lake;

E 1/2 of the NW 1/4 of the NE 1/4
NW 1/4 of the NW 1/4 of the NE 1/4 of the NE 1/4

K-555

AREA "K"

Within Section 14

Those portions of the following tracts lying Eastwardly of Coffeen Lake;

SW 1/4 of the SE 1/4 of the NE 1/4
W 1/2 of the NE 1/4 of the SE 1/4
W 1/2 of the SE 1/4 of the SE 1/4
That part of E 1/2 of the SE 1/4 of the SE 1/4 lying West of public road
SW 1/4 of the NE 1/4 of Section 14 except 150 feet off the East side thereof
W 1/2 of the NW 1/4 of the NE 1/4
E 1/2 of the NW 1/4 of the NE 1/4 except a part of SE Corner measuring approximately 100 feet North and South and 200 feet East and West. Also excepting, beginning at a point approximately 300 feet North of the SE Corner of said NW 1/4 of the NE 1/4; thence West 450 feet; thence North 350 feet; thence East 450 feet; thence South 350 feet to the point of beginning.

Within Section 11

Those portions of the following tracts lying Eastwardly of Coffeen Lake;

The South 750 feet of the SW 1/4 of the SE 1/4

Within Section 23

Those portions of the following tracts lying Eastwardly of Coffeen Lake;

W 1/2 of the SE 1/4 of the NE 1/4
E 1/2 of the SW 1/4 of the NE 1/4
NW 1/4 of the NE 1/4 of the NE 1/4

The areas added under this amendment are intended to provide for expansion of public recreation programs, including bank fishing at Coffeen Lake. All other conditions within Lease No. 416A remain the same.

Accepted and agreed to this 11th day of June, 1991.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: _____
Vice President, Power Supply

ATTEST

BY: _____

APPROVED
SORLING, NORTHRUP, HANNA
CULLEN AND COCHRAN, LTD.
BY _____
DATE 22 May 1991

DEPARTMENT OF CONSERVATION
STATE OF ILLINOIS

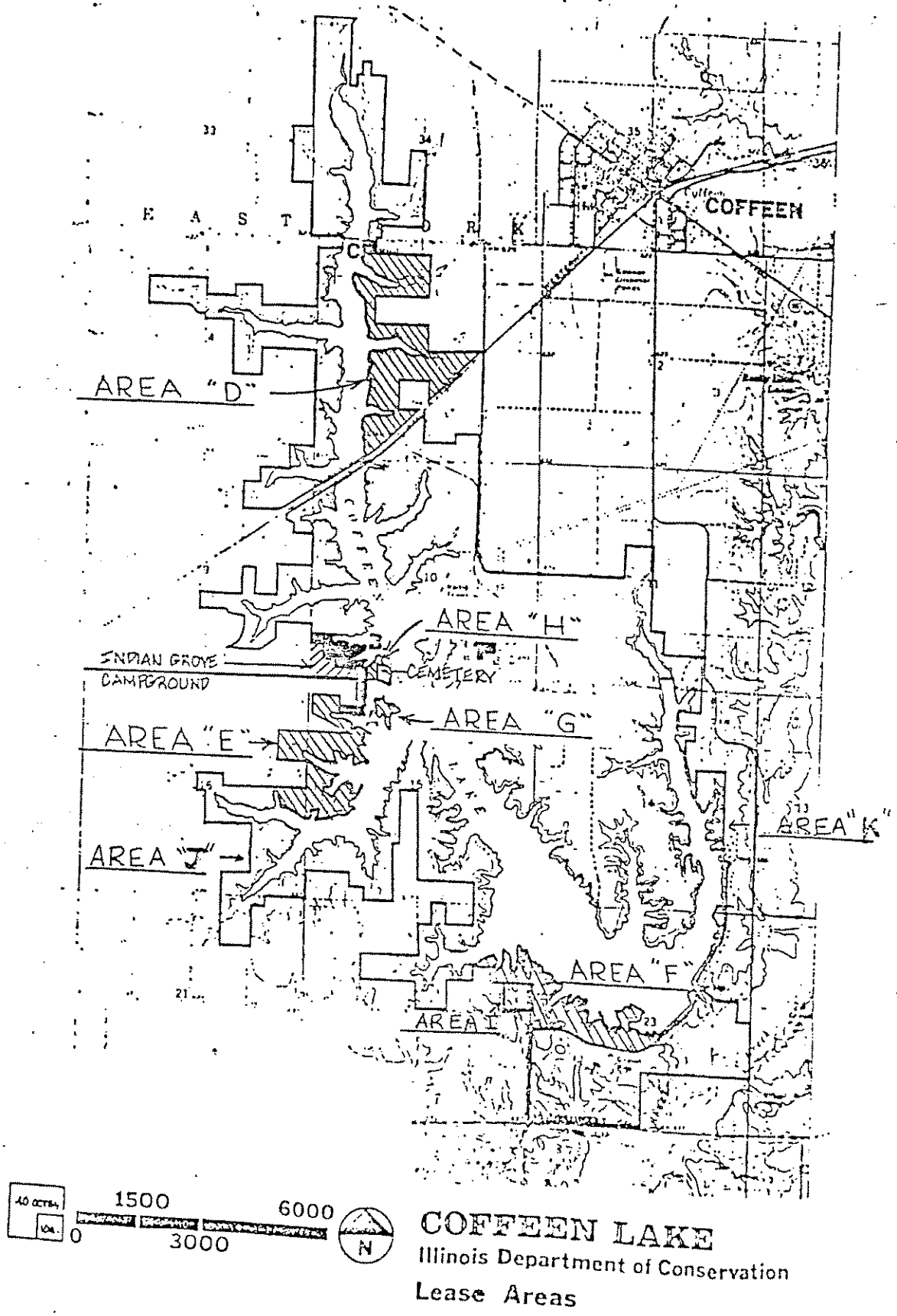
BY: _____
Director

APPROVED BY AND BEHALF OF THE
STATE OF ILLINOIS

BY: _____
Governor of the State of Illinois

P-555

EXHIBIT "G-1"



COFFEEN LAKE

Illinois Department of Conservation

Lease Areas

AMENDMENT TO LEASE WITH
STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION

Lease No. 416A is hereby amended as follows:

Leased premises are expanded to include the following described tracts of land indicated on the attached Exhibits F and G:

Area "I"

All that part of the Southeast Quarter of the Southeast Quarter of the Northeast Quarter of Section 22, Township 7 North, Range 3 West of the Third Principal Meridian, Montgomery County, Illinois.

The area added under this amendment is intended to provide for expansion of public recreation programs, including bank fishing at Coffeen Lake. All other conditions within Lease No. 416A will remain the same.

Accepted and agreed to this 1st day of November, 1989.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: G. W. Morrison

Vice President, Power Supply

DEPARTMENT OF CONSERVATION
STATE OF ILLINOIS

BY: Mark Frech

Director

ATTEST

BY:

APPROVED BY AND BEHALF
OF THE STATE OF ILLINOIS

BY:

Governor of the State of Illinois

Amend.dsb,40

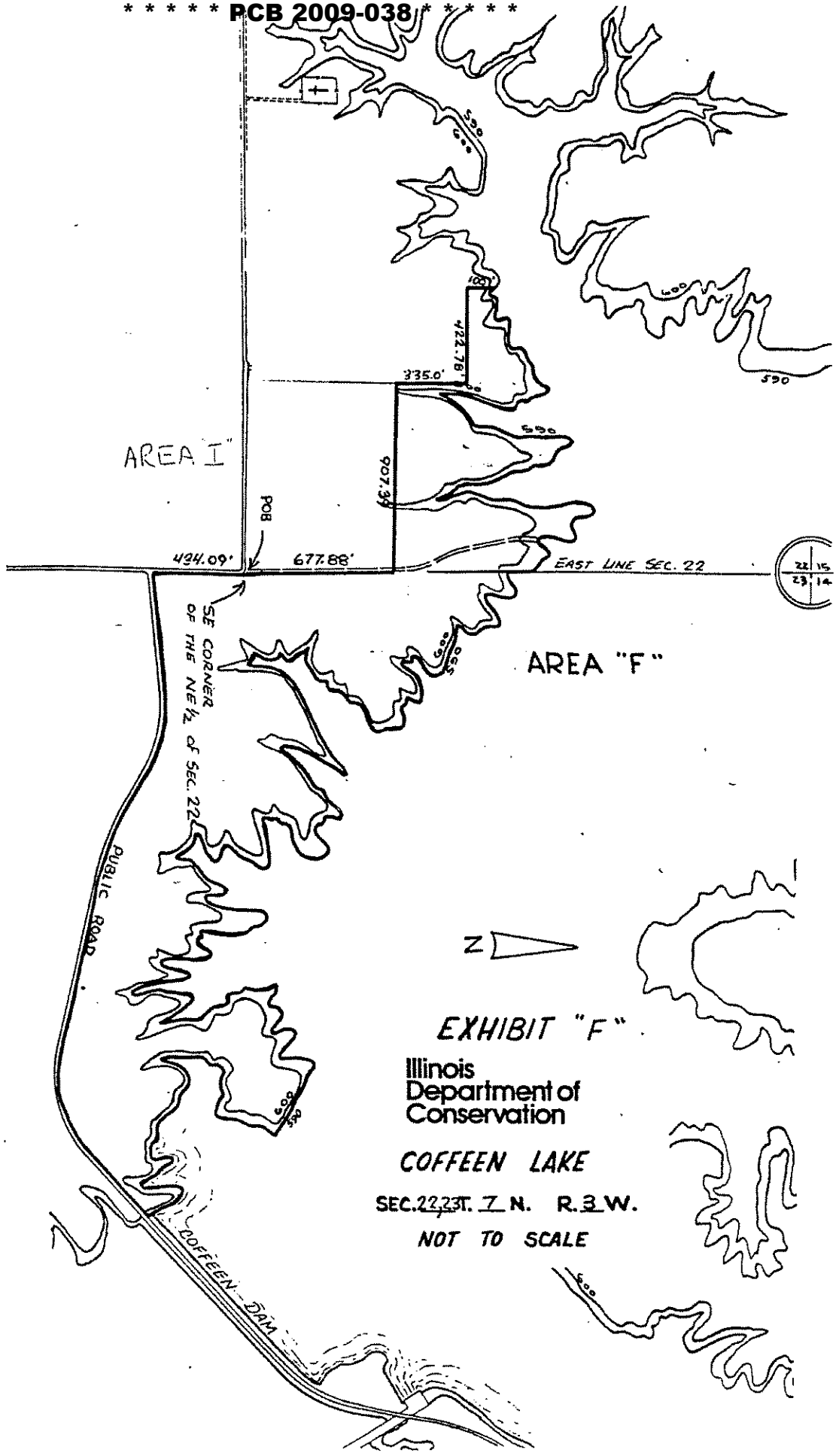
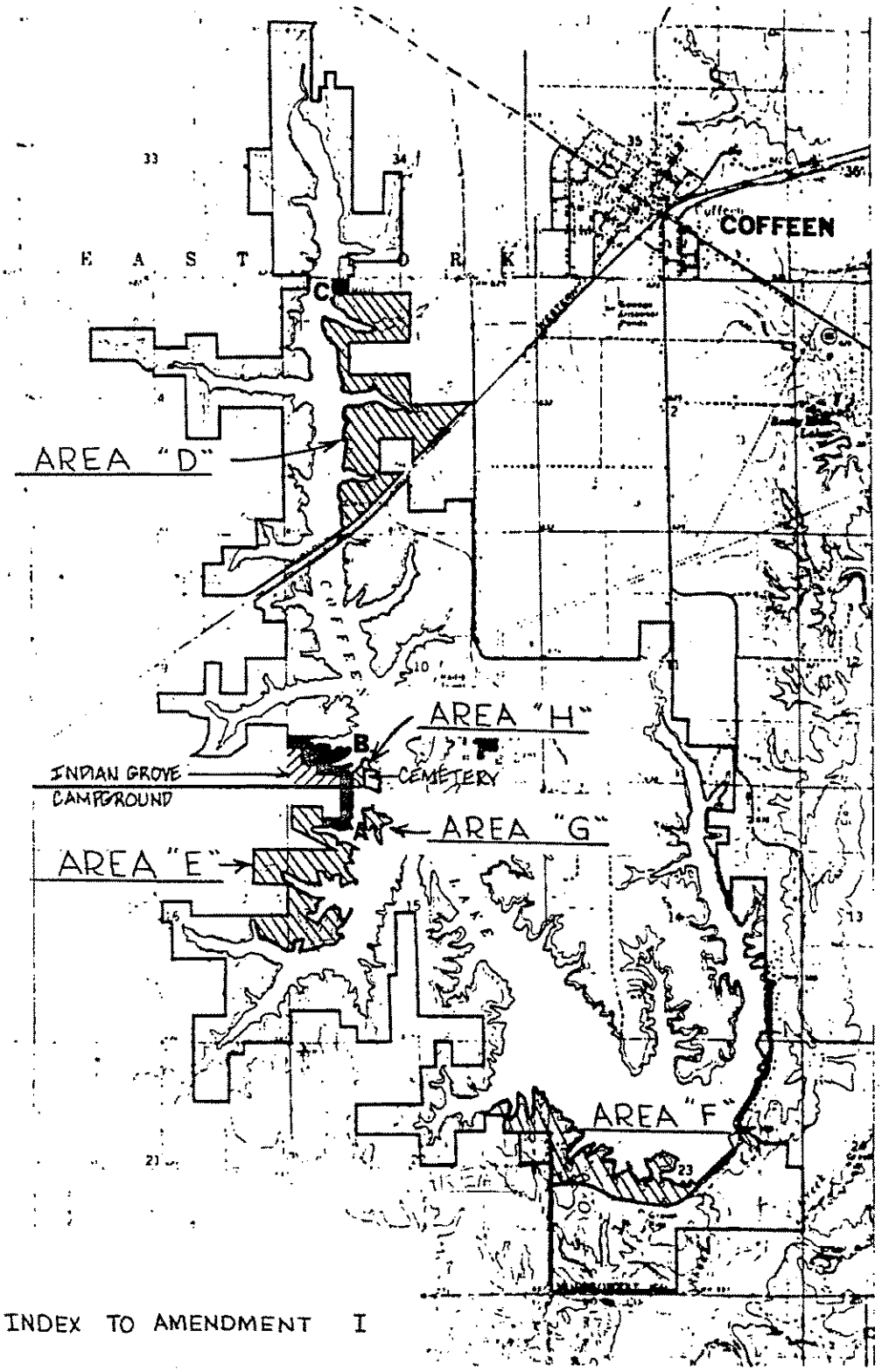

AREA I
AREA "F"
422.78'
335.0'
907.39'
POB
434.09'
677.88'
EAST LINE SEC. 22
22 15
23 14
SE CORNER OF THE NE¼ of SEC. 22
PUBLIC ROAD
COFFEEN DAM
590
580
570
N
EXHIBIT "F"
Illinois
Department of
Conservation
COFFEEN LAKE
SEC. 22,23 T. 7 N. R. 3 W.
NOT TO SCALE

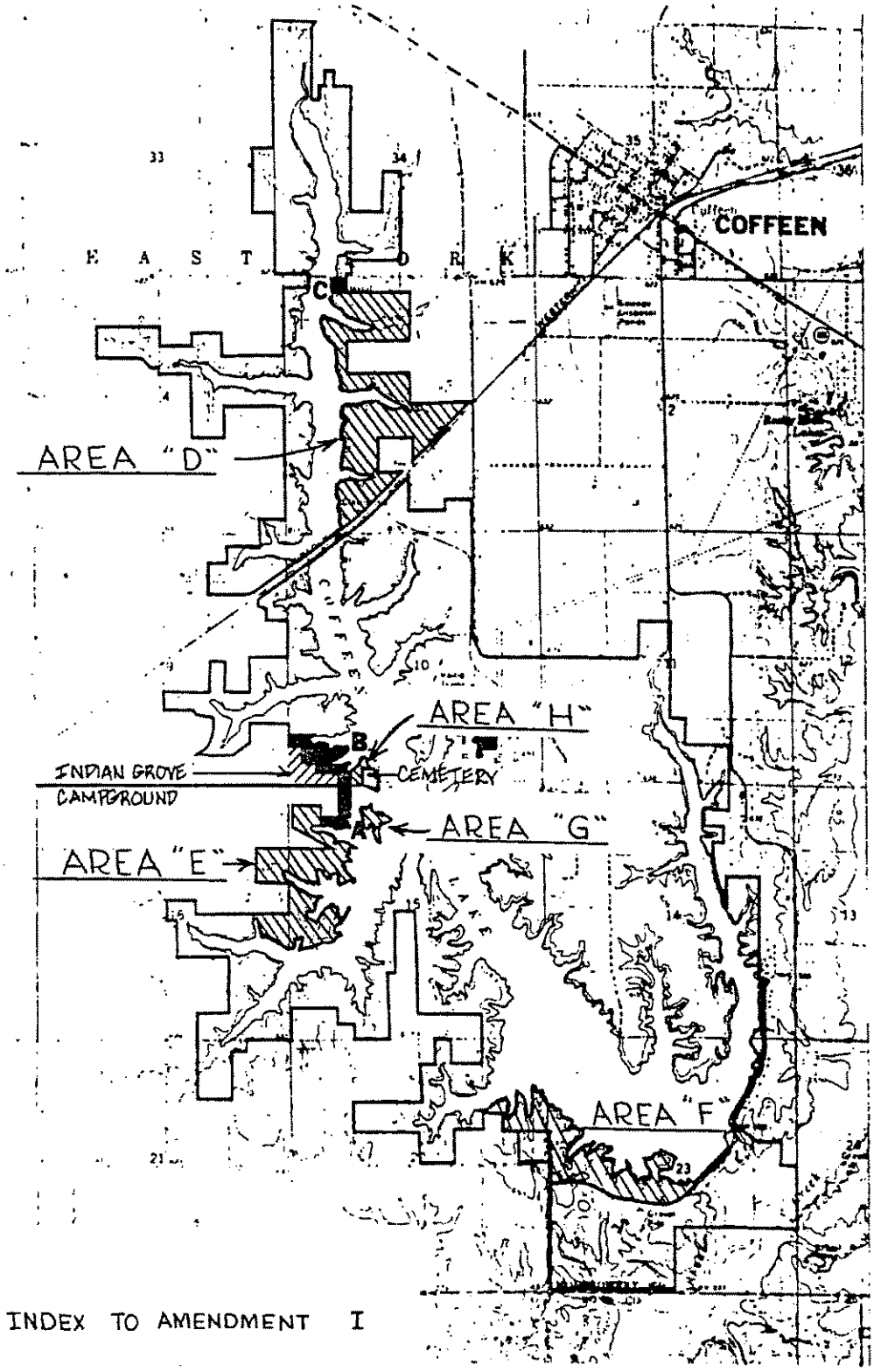
EXHIBIT "G"



COFFEEN LAKE
Illinois Department of Conservation
Lease Areas

P-555

EXHIBIT "G"



COFFEEN LAKE
Illinois Department of Conservation
Lease Areas

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
MARK FRECH, DIRECTOR

September 30, 1988

Mr. Richard J. Grant, Manager
Environmental Affairs Dept.
Central Illinois Public Service Co.
607 East Adams Street
Springfield, IL 62739

RE: Coffeen Lake
Lease No. 416A/Amendment

Dear Mr. Grant:

A fully executed Amendment to Lease No. 416A is enclosed for your files.

Thank you for your assistance regarding this matter.

Sincerely,

Ronald E. Chezem, Manager
Division of Special Services

REC/DK/sks
Enclosure
cc: Jack Price
Ron Hallberg
Jerry Beverlin
Mark Phipps

AMENDMENT TO LEASE WITH
STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION

Lease No. 416A is hereby amended as follows:

Leased premises are expanded to include the following described tracts of land indicated on the attached Exhibits D, E, F, G:

Area "D"

All that part of Section 3, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Northeast Corner of the Northwest Quarter of the Northwest Quarter of Section 3, Township 7 North, Range 3 West of the Third Principal Meridian, thence South 00 degrees 10'53" West, 291.09 feet to the Point of Beginning.

From said Point of Beginning thence North 89 degrees 50'51" East, 1351.11 feet; thence South 00 degrees 58'14" West, 1037.23 feet; thence South 89 degrees 50'51" West, 1336.82 feet; thence South 00 degrees 10'52" West, 664.07 feet; thence North 89 degrees 46'03" East, 1327.71 feet; thence South 00 degrees 58'14" West, 662.33 feet; thence North 89 degrees 02'35" East, 1251.68 feet to the West right-of-way line of the Norfolk and Western Railroad; thence South 44 degrees 33'11" West along said right-of-way line, 1751.99 feet; thence North 01 degrees 02'39" West, 572.04 feet; thence South 89 degrees 32'35" West, 660.14 feet; thence South 00 degrees 58'08" East, 657.37 feet; thence North 89 degrees 24'01" East, 576.21 feet to the West right-of-way line of the Norfolk and Western Railroad; thence South 44 degrees 32'50" West along said right-of-way line, 940.89 feet; thence South 50 degrees 00'38" West, 729.71 feet; thence South 55 degrees 35'46" West approximately 290 feet to the East shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence northwardly along said East shoreline of Coffeen Lake at elevation 590 feet above mean sea level to a point approximately 300 feet South of the North line of said Section 3, Township 7 North, Range 3 West of the Third Principal Meridian; thence North 89 degrees 50'51" East approximately 300 feet to the Point of Beginning, containing 131 acres, more or less.

Area "E"

All that part of the West Half of Section 15 and the East Half of Section 16, all in Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Northwest Corner of the Northeast Quarter of the Northwest Quarter of Section 15, Township 7 North, Range 3 West of the

Third Principal Meridian, thence South 89 degrees 00'29" West, 249.93 feet; thence South 00 degrees 26'02" East, 664.0 feet; thence South 89 degrees 00'29" West, 392.00 feet to the Point of Beginning.

From said Point of Beginning thence North 03 degrees 00'27" West, 256.00 feet; thence South 89 degrees 00'29" West, 605.00 feet; thence South 00 degrees 06'26" East, 417.00 feet; thence South 62 degrees 50'44" East, 1068.52 feet; thence South 89 degrees 05'39" West, 990.00 feet; thence North 89 degrees 53'15" West, 800.00 feet; thence South 00 degrees 06'26" East, 660.00 feet; thence South 89 degrees 53'15" East, 800.00 feet; thence South 00 degrees 06'26" East, 667.79 feet; thence North 89 degrees 53'27" West, 750.00 feet; thence South 00 degrees 06'26" East approximately 80 feet to the North shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence Eastwardly and Northwardly along said shoreline of Coffeen Lake at elevation 590 feet above mean sea level to a point approximately 220 feet south of the Point of Beginning; thence North 03 degrees 00'27" West approximately 220 feet to the Point of Beginning, containing 84 acres, more or less.

Area "F"

All that part of the East Half of the Northeast Quarter of Section 22 and all that part of Section 23, all in Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Southeast Corner of the Northeast Quarter of Section 22, Township 7 North, Range 3 West of the Third Principal Meridian, being the Point of Beginning.

From said Point of Beginning thence North 01 degrees 57'14" West, 677.88 feet along the East line of said Section 22; thence South 89 degrees 21'42" West, 907.39 feet; thence North 00 degrees 15'16" West, 335.00 feet; thence South 89 degrees 23'30" West, 422.78 feet; thence North 00 degrees 09'02" West approximately 100 feet to the South shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence Eastwardly and Southwardly along said shoreline at Coffeen Lake at elevation 590 feet above mean sea level to the South end of the Coffeen Lake Dam; thence Southwestwardly and Westwardly along the North right-of-way line of the public road running East and West through the Southeast Quarter and the Southwest Quarter of Section 23 to a point on the West line of said Section 23; thence North 05 degrees 29'16" East 434.09 feet to the Point of Beginning, containing 80 acres, more or less.

Area "G"

All that part of the Northeast Quarter of the Northwest Quarter of Section 15, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

All land comprising an island which is situated East of the Department of Conservation Lease Area "A", and whose shoreline is 590 feet above mean sea level on Coffeen Lake, containing 4.4 acres, more or less.

Area "H"

All that part of the Southeast Quarter of the Southwest Quarter of Section 10 and all that part of the Northeast Quarter of the Northwest Quarter of Section 15, all in Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Southwest Corner of the Southeast Quarter of the Southwest Quarter of Section 10, Township 7 North, Range 3 West of the Third Principal Meridian, being the Point of Beginning.

From said Point of Beginning thence North 00 degrees 44'40" West, approximately 270 feet to the south shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence eastwardly and northwardly along the shoreline of Coffeen Lake at elevation 590 feet above mean sea level and southwardly and westwardly through Sections 10 and 15 along said shoreline of Coffeen Lake at elevation 590 feet above mean sea level to a point approximately 40 feet south of the Point of Beginning; thence North 00 degrees 26'02" West, approximately 40 feet to the Point of Beginning, containing 4.0 acres, more or less, exclusive of the Traylor Cemetery.

The areas added under this amendment are intended to provide for expansion of public recreation programs, including bank fishing at Coffeen Lake. All other conditions within Lease No. 416A will remain the same.

Accepted and agreed to this _____ day of _____, 1988.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: H W Mommen
1KC

DEPARTMENT OF CONSERVATION
STATE OF ILLINOIS

BY: Mark Fredd
Director

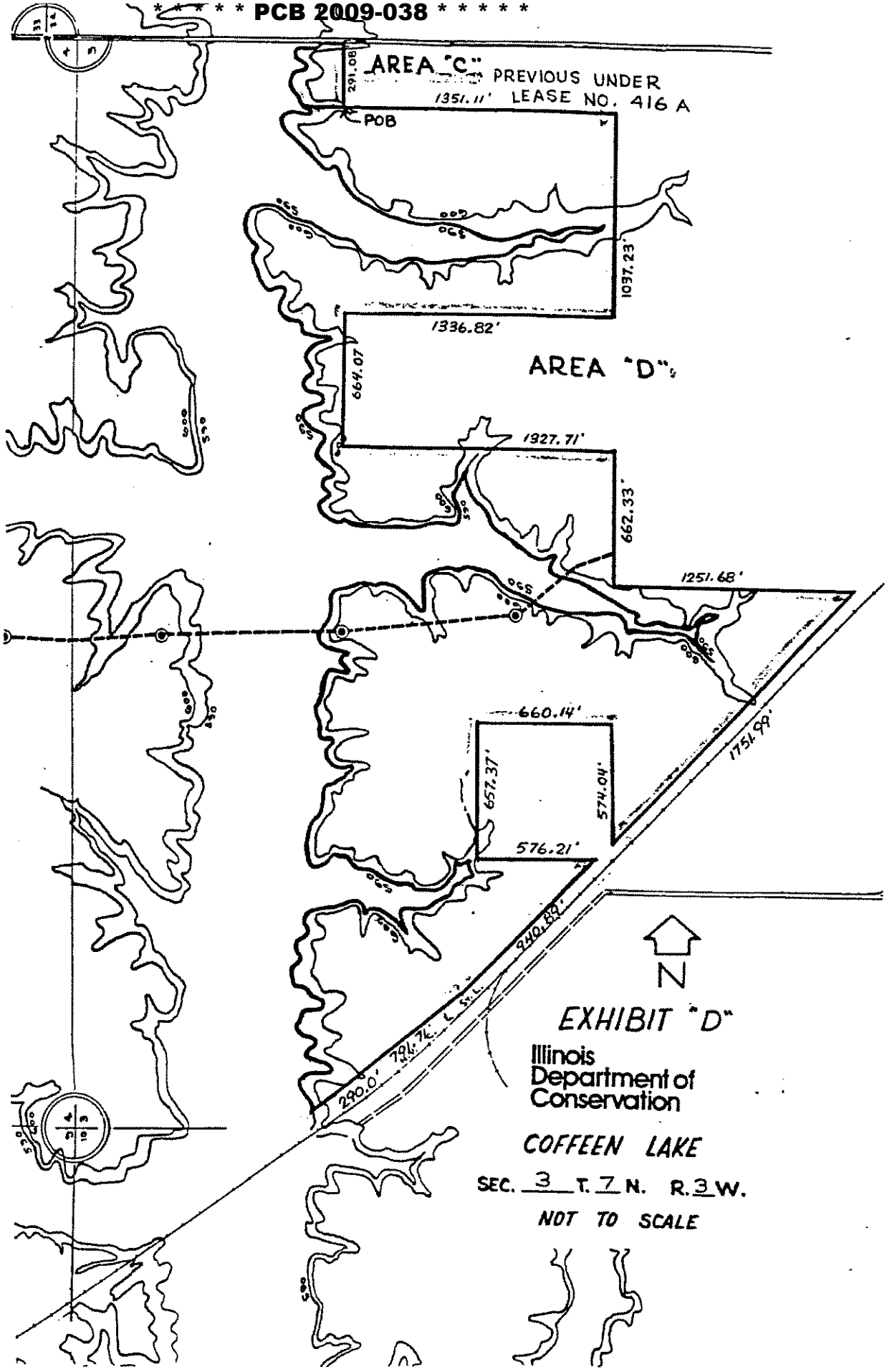
ATTEST

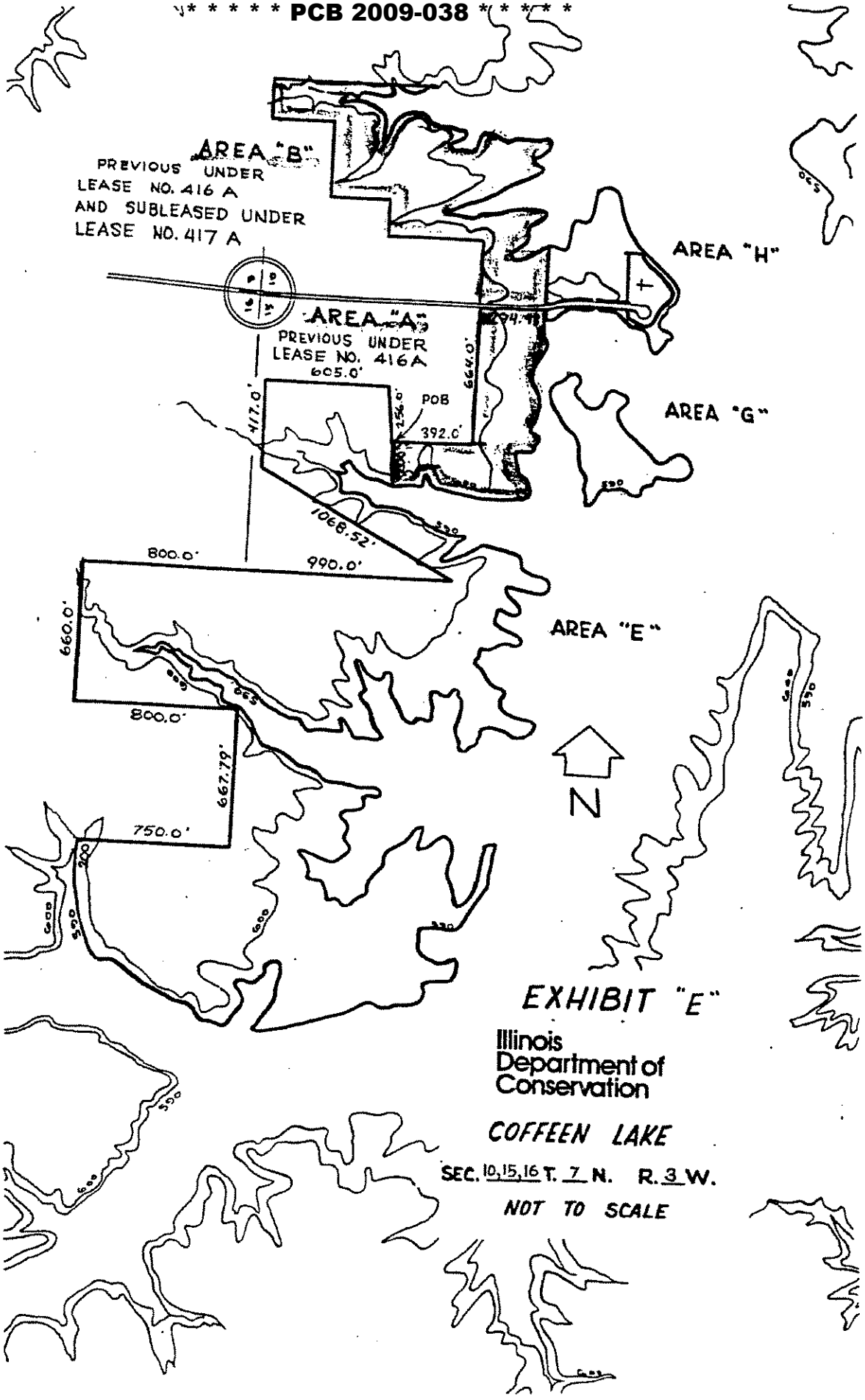
BY: Deborah L. Bruce

APPROVED BY AND BEHALF
OF THE STATE OF ILLINOIS

Governor of the State of Illinois

804H


AREA "C"
PREVIOUS UNDER
LEASE NO. 416 A
291.08'
1351.11'
POB
1037.23'
1336.82'
664.07'
AREA "D"
1927.71'
662.33'
1251.68'
660.14'
657.37'
574.04'
576.21'
1751.59'
940.89'
794.74'
290.0'
N
EXHIBIT "D"
Illinois
Department of
Conservation
COFFEEN LAKE
SEC. 3 T. 7 N. R. 3 W.
NOT TO SCALE


AREA "B"
PREVIOUS UNDER
LEASE NO. 416 A
AND SUBLEASED UNDER
LEASE NO. 417 A
AREA "H"
AREA "A"
PREVIOUS UNDER
LEASE NO. 416A
605.0'
417.0'
664.0'
294.4'
POB
256.0'
392.0'
AREA "G"
1068.52'
800.0'
990.0'
660.0'
AREA "E"
800.0'
667.79'
750.0'
N
EXHIBIT "E"
Illinois
Department of
Conservation
COFFEEN LAKE
SEC. 10,15,16 T. 7 N. R. 3 W.
NOT TO SCALE

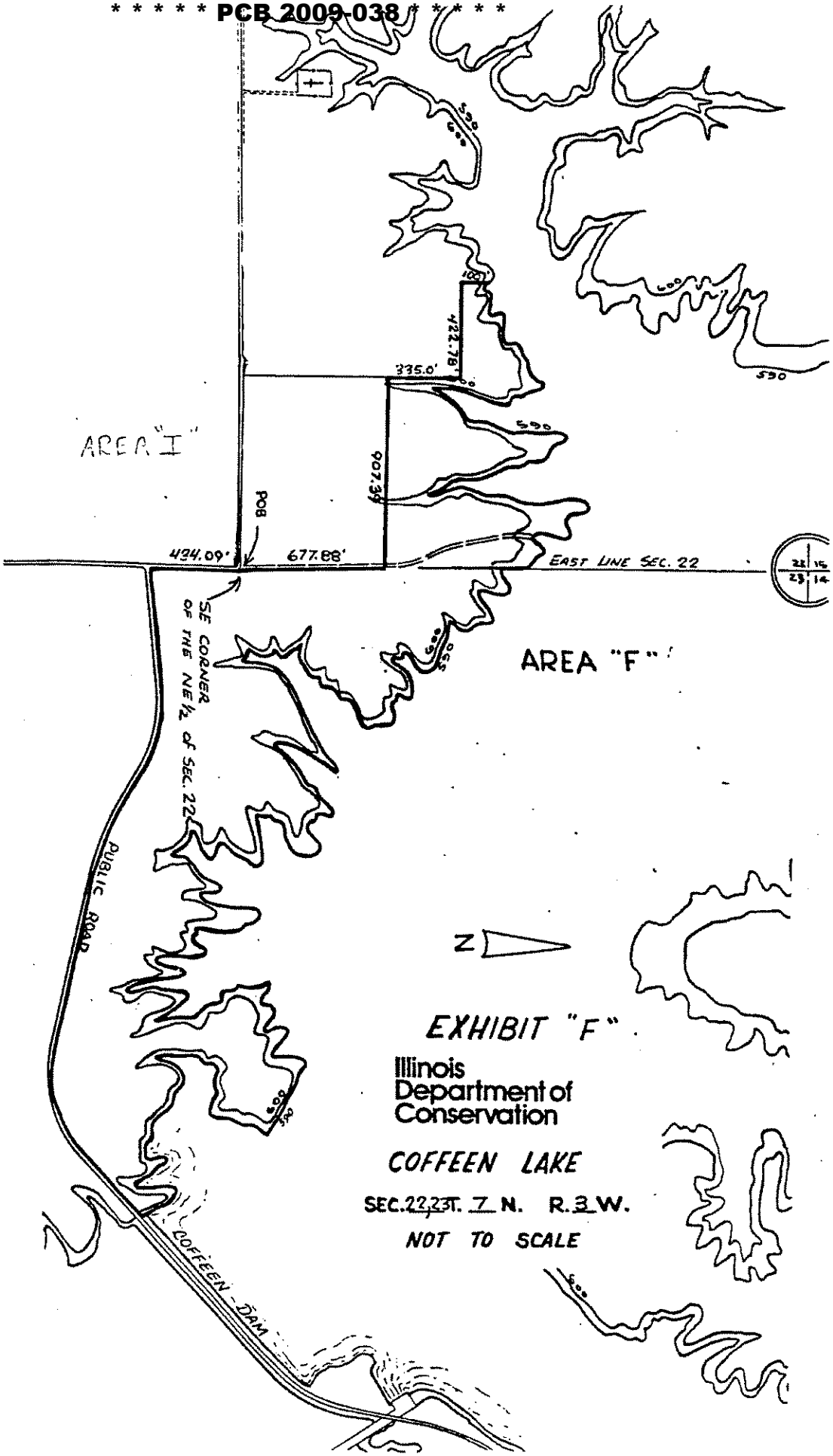
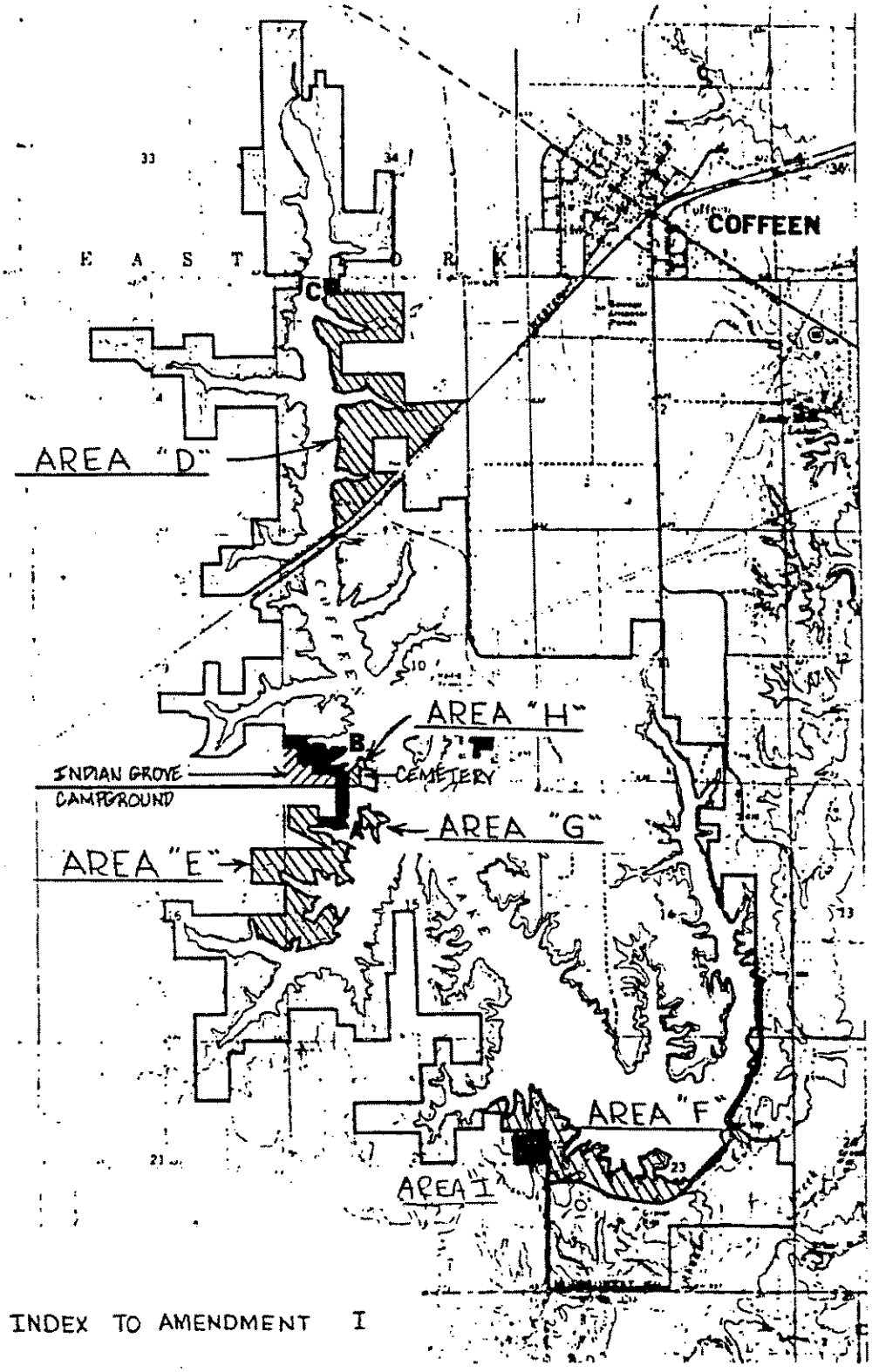

AREA "I"
AREA "F"
POB
434.09'
677.88'
335.0'
422.78'
907.39'
EAST LINE SEC. 22
SE CORNER OF THE NE¼ of SEC. 22
PUBLIC ROAD
COFFEEN - DAM
N
EXHIBIT "F"
Illinois Department of Conservation
COFFEEN LAKE
SEC. 22,23 T. 7 N. R. 3 W.
NOT TO SCALE

EXHIBIT "G"



COFFEEN LAKE
Illinois Department of Conservation
Lease Areas

EXHIBIT 7

IDNR Internet Website for Coffeen Lake State Fish and Wildlife Area

Coffeen Lake - State Fish and Wildlife Area

West-Central Region

15084 N. 4th Avenue
P.O. Box 517
Coffeen, IL 62017
217.537.3351
E-mail

Site Map | Directions | Lake
Boating | Fishing | Tournament Schedule | Natural Features
Camping | History | Picnicking
Concession | Hunting | Trapping

Update: 04/30/08 - Watch the Bald Eagles at Coffeen Lake at the Eagle Cam Link

Coffeen Lake is an attractive site with history of providing anglers and hunters success. The site was opened in 1986 and currently operates under a long term lease and management agreement between the Illinois Dept. of Natural Resources and Ameren Energy Generating Company. This agreement grants authority to the State to open the lake and certain lands to the public for recreational activities such as fishing, boating, picnicking and hunting.

History

The original power company built a 75-foot high earthen dam on a branch of the east Fork of Shoal Creek in 1963. The lake was completely filled by 1966 and now serves as cooling water for the coal-fired Coffeen Power Station. The power station has a generating capacity of 945 megawatts of electricity, with the first unit coming into operation in 1965 and the larger, second unit in 1972. The heated discharge affects 73% of the surface water. The cooling loop is 4.1 miles.

Natural Features

The oak-hickory forests surrounding Coffeen Lake are representative of the native cover found within the Southern Till Plain Natural Division of central and southern Illinois. Soils are of loess and till, rather light

Parks & Recreation
State Parks
- Northwest - R1
- Northeast - R2
- East-Central - R3
- West-Central - R4
- South - R5
- All Regions
Recreation
- Biking(Mountain Biking)
- Birding
- Boating
- Camping
- Canoe/Kayak
- Equestrian
- Fishing
- Geocaching
- Grand Illinois Trail
- Hand Trap/Archery
- Hiking
- Hunting
- Interpretive programs
- Rock Climbing
- Shelter Reservations
- Skiing
- Snowmobiling
. About
. Code of Ethics
. Illinois Laws
. About the ISAC
- Swimming (Beaches)
Programs
- Game Breeding & Hunting Preserve Areas
- Field Trials
- Sporting Dog Training
- Wingshooting Clinics
Regulations
- Camping
- Firewood Collection
- Use of State Parks
Contact Us
Illinois Dept.of Natural Resources
Office of Land Management
One Natural Resources Way
Springfield, IL 62702
E-mail
Becoming an Outdoors Woman
Interpretive Programs
Website Map
FAQ's
Visitor Comment Card
Recreation.gov

and a characteristic "claypan" can be found. Pre-settlement vegetation was a mixture of 60 % forest to 40% prairie and wetlands. A variety of trees, woodland and prairie plants cover the slopes of the stream valley. Visitors may also find a diverse wildlife community. Muskrats, turtles, herons and mussels are seen in or near the water. Red-tailed hawk, blue jay or a dragonfly might be seen in the air. Bobwhite, coyote, white-tailed deer and black rat snake are common to the area. The opportunity to observe and enjoy the area's rich wildlife heritage is available.

Lake

Coffeen Lake boasts an excellent largemouth bass and channel catfish population. Twenty-two species of fish are present in the lake, but most anglers seek largemouth bass, white crappie, channel catfish and striped bass. The lake is deeper than most Illinois lakes, averaging nearly 19 feet with a maximum depth of 59 feet. Coffeen Lake has nearly 50 miles of shoreline. Power plant operation noticeably influences fish activity and fishing success. Fish growth appears to be faster than in many other lakes, however.

Facilities

Boating

The Main Access (lower pool) provides a two lane ramp and a newly constructed parking lot with a handicap accessible loading platform and reserved handicap parking stalls. The North Access (upper pool) provides a newly constructed single lane ramp and a handicap accessible courtesy dock and parking lot.

Motors of 25 horsepower or less are allowed to operate on the lake. Boats with motors larger than 25 horsepower are allowed on the lake, but are restricted to trolling motor operation only. However, motors larger than the 25 horsepower can be used for loading and unloading a trailered watercraft, provided the watercraft over the horsepower limit is operated at a no-wake speed within 150 feet of the loading ramp itself.

Fishing

Bank fishing is available at all boat access area. Considerable acreage is open for bank fishing where parking is present. Posted site specific regulations for bass and crappie are enforced. All fishing tournaments must be scheduled through the site office. Fishing Tournament Schedule

Picnicking, Camping & Concessions

Toilets, drinking water and picnic facilities are available at the main access area. A private campground is located just to the north of the main access area. Bait, supplies and food can be obtained there.

Hunting

Deer, squirrel, turkey, coyote and waterfowl hunting are allowed on site. Check site specific regulations at site office. Site permits are required. **Hunter Fact Sheet**

Trapping

A controlled aquatic furbearer trapping program allows the harvest of a valued renewable resource. A public drawing is held for site trapping permits the last Saturday of October prior to each trapping season. **Trapping Regs**

Please do you part in maintaining a clean area. Place all litter in the nearest trash container. If you need help or have a question, contact site personnel.

Location/Directions

Located in Montgomery County approximately 3 miles east northeast of Donnellson, Illinois and State HWY 127. Approximately 2 miles west southwest of Coffeen, Illinois and State Highway 185.

From Springfield, IL take I 55 South to Hwy 127 south to Hillsboro, IL. Take Hwy 185 east to E. 14th Road, south to N. 4th Avenue, east to Main Access and Office.

From St. Louis, MO take I 70 east to Greenville, IL exit Hwy 127, north to Donnellson. Just north of Donnellson take N. 3rd Avenue, east to Buckeye Trail, north to N. 4th Avenue, east to Main Access and Office.

From Effingham, IL take I 70 west to Vandalia exit, Hwy 185 west to Coffeen, IL, west to Hwy 185 east to E. 14th Road, south to N. 4th Avenue, east to Main Access and Office.

From Decatur, IL take Hwy 48 south to Raymond, IL Hwy 127 south to Hillsboro, IL, Hwy 185 east to E. 14th Road, south to N. 4th Avenue, east to Main Access and Office.

- While groups of 25 or more are welcome and encouraged to use the park's facilities, they are required to register in advance with the site office to avoid crowding or scheduling conflicts.
- At least one responsible adult must accompany each group of 15 minors.
- Pets must be kept on leashes at all times.
- Actions by nature can result in closed roads and other facilities. Please call ahead to the park office before you make your trip.
- We hope you enjoy your stay. Remember, take only memories, leave only footprints.
- For more information on tourism in Illinois, call the Illinois Department of Economic Opportunity, Bureau of Tourism at 1-800-2Connect.
- Telecommunication Device for Deaf and Hearing Impaired Natural Resources Information **(217) 782-9175 for TDD only** Relay Number **800-526-0844.**

EXHIBIT 8

Sublease Agreement with Indian Grove Campground

Lease No. 412A

ILLINOIS DEPARTMENT OF CONSERVATION
SUBLEASE AGREEMENT
FOR RECREATIONAL PURPOSES

THIS AGREEMENT entered into by and between the STATE OF ILLINOIS, DEPARTMENT OF CONSERVATION, hereinafter referred to as the "DEPARTMENT", and INDIAN GROVE CAMPGROUND, hereinafter referred to as the "SUBLESSEE";

W I T N E S S E T H:

WHEREAS, the DEPARTMENT has jurisdiction over the real estate hereinafter described under a Master Lease from Central Illinois Public Service Company (CIPS); and

WHEREAS, it is in the best interests of the DEPARTMENT and CIPS to promote public recreation by granting this Sublease; and

WHEREAS, the property herein described is not otherwise needed immediately or in the near future for development by the DEPARTMENT or CIPS; and

WHEREAS, the DEPARTMENT is authorized and empowered to enter into this Sublease Agreement subject to the terms of the Master Lease, pursuant to and under the authority of Section 63a21 of the "Civil Administrative Code", (Ill. Rev. Stat. 1985, Ch. 127, Par. 63a21); and

WHEREAS, the SUBLESSEE is authorized and empowered to enter into this Sublease Agreement and to perform and discharge the covenants and promises herein made and undertaken.

NOW THEREFORE:

For and in consideration of the mutual promises and covenants the DEPARTMENT hereby grants to the SUBLESSEE a sublease to the property indicated

on Exhibit A and described as Lease Area "B" in Exhibit B, attached hereto and made a part hereof by reference.

The term of this Sublease Agreement shall be for a period of twenty-five (25) years commencing July 2, 1986 and ending June 30, 2011, said term to run with the term of the Master Lease, unless sooner terminated or revoked as provided for herein.

The SUBLESSEE, for the use and occupancy of said lands, does hereby covenant and agree to and with the DEPARTMENT to pay the sum of One Dollar ($1.00) per year. Said sum shall be payable to "Illinois Department of Conservation" and remitted to the State of Illinois, Department of Conservation, Division of Special Services, 405 East Washington Street, Springfield, IL 62706.

IT IS FURTHER COVENANTED AND AGREED BETWEEN THE PARTIES HERETO AS FOLLOWS:

1. This Agreement and the permission and rights herein granted shall not be assigned or transferred by SUBLESSEE in any manner, by operation of law or otherwise, without the written consent of the DEPARTMENT and CIPS.

2. The SUBLESSEE shall use and occupy said premises for operation of public recreational facilities to be available at no charge to the public at large, without favor or discrimination of any kind, and for no other purposes or business whatsoever; it being specifically understood that the premises shall not be used for a junk yard, the burning of refuse, deposition of debris, waste or material, or for any unsanitary or unhealthful purposes of any kind or nature, by the SUBLESSEE in the use or occupancy of the premises.

All plans and specifications for facilities or improvements in connection herewith shall be subject to the prior written approval of the DEPARTMENT and CIPS, and no construction activities shall be initiated by the SUBLESSEE without said written approval.

3. The SUBLESSEE shall not cut any trees or shrubs without the approval of the DEPARTMENT. Species selection and location of all plantings shall be subject to DEPARTMENT approval. The SUBLESSEE shall not use chemical herbicides or pesticides without prior approval of the DEPARTMENT.

4. The SUBLESSEE will be responsible for restoration, after any disturbances of the terrain, to the satisfaction of the DEPARTMENT.

5. Should any use of the premises by the SUBLESSEE be hazardous to the public, in the opinion of the DEPARTMENT, the SUBLESSEE at it's sole expense, upon demand by the DEPARTMENT, shall install such safety devices or make such modifications to render said premises compatible with the interests of the public.

6. In the event the SUBLESSEE fails to conform to the terms of any of the provisions of this Agreement within ninety (90) days from the date that demand is received in writing from the DEPARTMENT, the Agreement may be cancelled by written notice from the DEPARTMENT and all rights of the SUBLESSEE shall thereupon be forfeited.

7. The SUBLESSEE has inspected the premises for transmission of oil, gas or products thereof, utilities, etc., by other persons, firms or corporations over, under and across said premises, and the DEPARTMENT and CIPS make no representation or warranty as to prior or existing use or condition of said premises.

8. This Sublease agreement is nonexclusive, and the DEPARTMENT and CIPS reserve the rights of ingress, egress and usage of the premises in the discharge of their duties and responsibilities. Further, the DEPARTMENT and CIPS reserve the right to grant licenses, permits, easements or rights-of-way in and to the subject premises to the extent that they are not incompatible with the Master Lease.

9. The SUBLESSEE, in the use or occupation of the premises, shall comply with all requirements of all laws, orders, ordinances, rules and regulations of Federal, State, county or municipal authorities.

10. The SUBLESSEE shall pay and discharge, when due and payable, its proportionate share of all real estate taxes, assessments, and other charges, governmental or otherwise, which may be levied, assessed or which become liens upon the premises or any part thereof, during the term of this Sublease with respect to any tax year, or any portion thereof; provided, however, that no law, court order, or regulation postponing the date of payment of such taxes, assessments, or charges until after any termination of this Sublease shall relieve the SUBLESSEE of its obligations to make such payment.

The SUBLESSEE shall at any time, upon request of the DEPARTMENT or CIPS, exhibit to the DEPARTMENT or CIPS for examination receipts of payments of all such taxes, assessments and charges.

11. The SUBLESSEE will save and keep the DEPARTMENT and CIPS harmless at all times against any loss, damage, penalty, cost, expense, judgments and decrees including costs of defense by reason of any negligence or any violation of any laws or ordinances or regulations, or by reason of the SUBLESSEE'S usage of the premises.

12. The SUBLESSEE shall obtain, at its own cost and expense, and shall keep in full force and effect during the term of this Sublease, public liability and property damage insurance in an amount not less than $300,000.00 for bodily injury or death to any one person, not less than $300,000.00 for two or more persons, and not less than $300,000.00 property damage in any one occurrence, said insurance to run in favor of the SUBLESSEE and be endorsed to include the DEPARTMENT and CIPS as additional insured. A duplicate copy of such policy or policies of insurance shall be furnished to the DEPARTMENT and CIPS, and nothing in this section shall in any way be construed to limit the liability of the SUBLESSEE hereunder.

13. The DEPARTMENT makes no guarantees or assurances regarding the condition of any improvements situated on the herein described premises and which may be included in this Sublease. The SUBLESSEE shall be responsible for the maintenance of any such improvements which are to be utilized by the SUBLESSEE, and shall be responsible for the prompt payment of any and all utility bills for such services provided to the SUBLESSEE at the subject premises.

14. It is agreed that the needs of the State and CIPS must have priority, and that this Sublease may be terminated upon receipt of 120 days written notice made by the DEPARTMENT in the event that such termination becomes essential to keep the premises devoted to appropriate public or corporate purposes as determined to be suitable by the DEPARTMENT or CIPS. No holding over by the SUBLESSEE shall operate to renew this Sublease.

15. In the event of termination, the party desiring to terminate said Sublease shall give the other party 120 days' notice of such termination. Said notice of termination shall set forth the date upon which termination shall become effective, and said date shall be a minimum of 120 days following the date of the delivery of the notice; said notice is to be given in writing by registered or certified mail.

16. Buildings, improvements, structures or property of any kind obtained or constructed with the funds of the SUBLESSEE, unless subject to prior written agreement with the DEPARTMENT and CIPS to the contrary, shall not become "affixed to the real estate" and may be removed by the SUBLESSEE in the event of Sublease termination or expiration. The SUBLESSEE shall be given a reasonable time as determined by the DEPARTMENT to remove such property.

17. Upon the termination of this Sublease any buildings or improvements not financed solely by the SUBLESSEE shall become the property of CIPS.

18. This Sublease shall be subject to all terms and conditions of the Master Lease granted to the DEPARTMENT by CIPS.

19. All notices required under this Agreement shall be addressed as follows:

DEPARTMENT:

Division of Special Services
Department of Conservation
405 East Washington Street
Springfield, IL 62706
Phone: 217/782-0179

SUBLESSEE:

Joe Sidener
Indian Grove Campground
Rural Route 1
Coffeen, IL 62017

or to such other addresses as the parties may from time to time indicate in writing.

WITNESS the signatures of the parties hereto, the day and year first above written.

SUBLESSEE
INDIAN GROVE CAMPGROUND
APPROVED AND ACCEPTED

BY: Richard Joe Sidener

Title: Owner

Date: 6/17/86

ATTEST:

Deborah Sue Bruce

Date: 6/17/86

DEPARTMENT
STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION

BY: Michael B Wilt
Director

Date July 2, 1986

APPROVED
CIPS
CENTRAL ILLINOIS PUBLIC SERVICE CO.

BY:

Date: July 2, 1986

APPROVED AS TO FORM AND EXECUTION
STATE OF ILLINOIS

BY: James Thompson
James Thompson, Governor
State of Illinois

Date: 7/15/86

EXHIBIT A

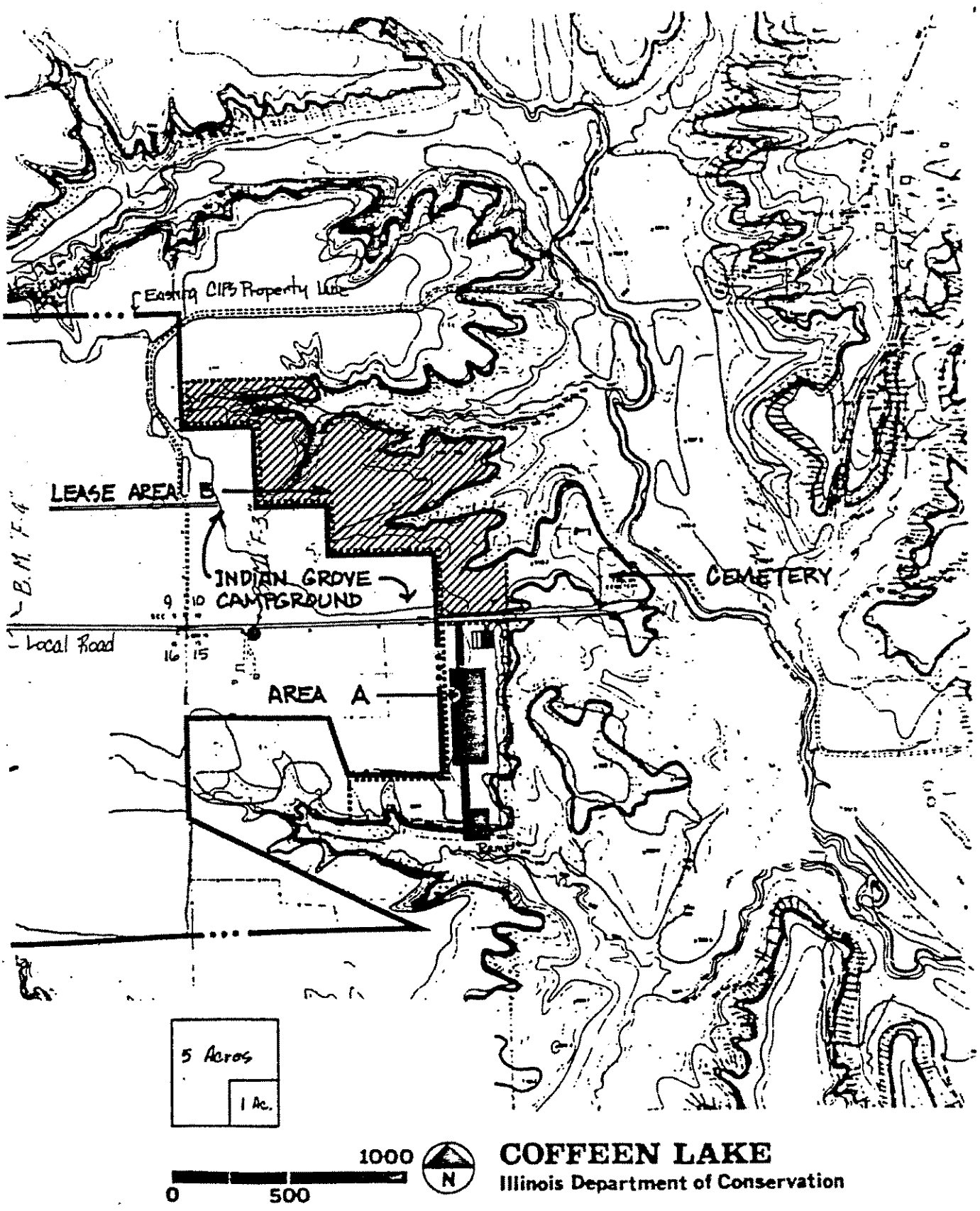

Existing CIPS Property Line
LEASE AREA B
INDIAN GROVE CAMPGROUND
CEMETERY
B.M. F.4
F-3
Local Road
9
10
16
15
AREA A
5 Acres
1 Ac.
1000
0
500
N
COFFEEN LAKE
Illinois Department of Conservation

EXHIBIT B

LEASE AREA "B"

All that part of the Southwest Quarter of the Southwest Quarter of Section 10, Township 7 North, Range 3 West of the Third Principal Meridian, in Montgomery County, Illinois, more particularly described as follows:

Commencing at the Southeast Corner of the Southwest Quarter of the Southwest Quarter of Section 10, Township 7 North, Range 3 West of the Third Principal Meridian, being the Point of Beginning.

From said Point of Beginning thence North 0°44'40" West, approximately 270 feet to the south shoreline of Coffeen Lake at elevation 590 feet above mean sea level; thence westwardly and northwardly along the shoreline of Coffeen Lake at elevation 590 feet above mean sea level to a point approximately 730 feet east of the west line of Section 10 and approximately 1,022 feet north of the Southwest Corner of Section 10; thence South 89°15'20" West, 730 feet to the west line of Section 10; thence South 0°16'32" East, 150 feet; thence North 89°15'20" East, 286.73 feet; thence South 0°44'40" East, 360.00 feet; thence North 89°15'20" East, 300.00 feet; thence South 0°44'40" East, 180.00 feet; thence North 89°15'20" East, 460.00 feet; thence South 0°44'40" East, 330.00 feet; thence North 89°00'29" East, 249.93 feet to the Point of Beginning, containing 11.8 acres, more or less.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

NSa
in Gen & Working Files ?

August 22, 1989

Mr. Ronald E. Chezem, Manager
Division of Special Services
Illinois Department of Conservation
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Chezem:

For the convenience of all parties involved, Central Illinois Public Service Company approves extending the time period of the Indian Grove Campground Concession Lease from one year to five years with all other provisions of the lease remaining the same. It is our understanding that a five-year Concession Lease would still be subject to an annual evaluation, including a site inspection, by the Department of Conservation. If during an annual evaluation any of the covenants of the agreement are violated, then the lease may be terminated before the end of the five years. The five-year Concession Lease may also be canceled at any time as provided for in Section 33 of the current Concession Lease.

Sincerely,

G. W. Moorman

G. W. Moorman
Vice President-Power Supply

DSB/bjs/DOCLEASE
cc: R. J. Grant
D. L. Richardson
D. S. Bruce
Al Hurrelbrink
Joe Sidener

P-555

Amendment One

AMENDMENT TO SUBLEASE WITH
STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION

Lease No. 417A is hereby amended as follows:

Lease premises are expanded to include the following described tract of land indicated on the attached Exhibit C:

> That portion of the following described tract lying above the surface of Coffeen Lake:
>
> The Southwest Quarter of the Southeast Quarter, of the Southwest Quarter, except Taylor Cemetery, all located in Section 10, Township 7 North, Range 3 West of the 3rd P.M., Montgomery County, Illinois.

The area added under this Amendment is intended to provide for expansion of public recreation. All other conditions within Sublease No. 417A will remain the same.

Accepted and agreed to this 12TH day of September, 1991.

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

BY: Glen Moore

Date: 7/30/91

STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION

BY: Brent Manning

Date: 4 Sept 91

SUBLESSEE
INDIAN GROVE CAMPGROUND
APPROVED AND ACCEPTED

BY: Richard Lee Stalmeer

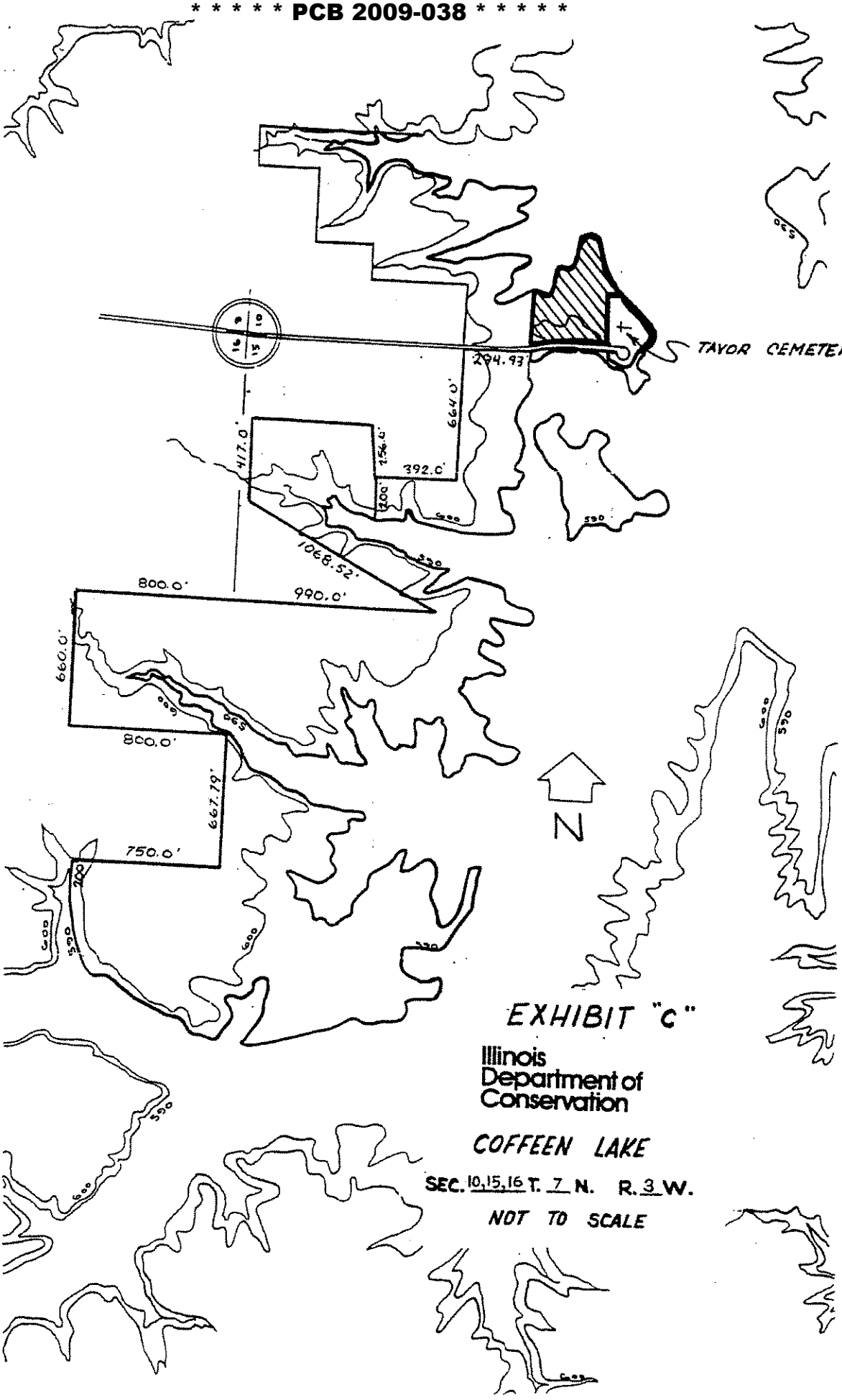
Title: Owner

Date: 6-30-91

APPROVED:

BY: Jim Edgar
Governor, State of Illinois

P-555


TAYOR CEMETERY
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664.0'
417.0'
156.4'
392.6'
200'
1068.52'
800.0'
990.0'
660.0'
800.0'
667.79'
750.0'
100'
N
EXHIBIT "C"
Illinois
Department of
Conservation
COFFEEN LAKE
SEC. 10,15,16 T. 7 N. R. 3 W.
NOT TO SCALE

EXHIBIT 9

IEPA Biological Stream Characterization

Illinois
Environmental
Protection Agency

Bureau of Water
2200 Churchill Road
Springfield, Illinois 62794–9276

November 1996

IEPA/BOW/96-058

Biological Stream Characterization (BSC):

Biological Assessment of Illinois Stream Quality through 1993.

A report by
The Biological Streams Characterization Work Group

Printed by
Illinois Environmental
Protection Agency

Table C-2 (cont). Highly Valued Aquatic Resource (Class B) streams in Illinois.

STREAM	SAMPLING DATE	COUNTY	REACH DESCRIPTION	LOWER R. M.	UPPER R. M.	TOTAL MILES	IEPA CODE	SAMPLE IBI/AIBI
Kaskaskia River Basin								
Asa Creek	08/19/90	Moultrie	Entire stream	0	8.7	8.7	OZZT-	
Beck Creek	07/25/83	Fayette	Entire stream	0	22	22	OQ-02	47
Beck Creek	07/25/83	Fayette	Entire stream	0	22	22	OQ-01	43
Big Creek	07/27/83	Fayette	Entire stream	0	10.7	10.7	OP-01	43
E. Fk. Shoal Creek	07/16/82	Bond	Entire stream	0	60.3	60.3	OID-05	43
E. Fk. Shoal Creek	07/01/82	Montgomery	Entire stream	0	60.3	60.3	OID-04	40
E. Fk. Shoal Creek	07/06/82	Bond	Entire stream	0	60.3	60.3	OID-01	43
Jonathon Branch	-0-	Moultrie	Entire stream	0	8	8	OTD-	
Jonathon Creek	08/03/83	Moultrie	Entire stream	0	18	18	OU-01	43
Jordan Creek	07/13/83	Shelby	Entire stream	0	9.9	9.9	OZZJ-01	43
Kaskaskia River	06/23/83	Champaign	Upstream of TwoMile Slough	271.6	295.1	23.5	O-35	49
Kaskaskia River	06/27/83	Champaign	Upstream of TwoMile Slough	271.6	295.1	23.5	O-36	47
Kaskaskia River	06/27/83	Champaign	Upstream of TwoMile Slough	271.6	295.1	23.5	O-37	40
Lake Fork	06/22/83	Piatt	Mouth to L tributary T16N,R6E,S11SW	0	13.3	13.3	OW-02	45
Lake Fork	08/01/83	Douglas	Mouth to L tributary T16N,R6E,S11SW	0	13.3	13.3	OW-01	43
Mitchell Creek	07/20/83	Shelby	Entire stream	0	14.4	14.4	OQA-01	45
Mitchell Creek	07/20/83	Shelby	Entire stream	0	14.4	14.4	OQA-02	43
Nine Mile Creek	07/27/82	Randolph	Entire stream	0	18.3	18.3	OA-01	49
Richland Creek-North	07/13/83	Shelby	Entire stream	0	25.8	25.8	OR-03	43
Richland Creek-North	06/29/83	Shelby	Entire stream	0	25.8	25.8	OR-01	43
Robinson Creek	07/11/83	Shelby	Entire stream	0	31.3	31.3	OS-01	45
Robinson Creek	07/11/83	Shelby	Entire stream	0	31.3	31.3	OS-02	43
Shoal Creek	08/25/82	Clinton	Beaver Creek up to East Fork	13.3	49.5	36.2	OI-08	40
Shoal Creek	08/11/82	Bond	Beaver Creek up to East Fork	13.3	49.5	36.2	OI-15	47
Shoal Creek	09/13/82	Clinton	Beaver Creek up to East Fork	13.3	49.5	36.2	OI-13	43
Shoal Creek	08/12/82	Bond	Dorris Creek up to Bearcat Creek	58.4	74.2	15.8	OI-14	43
Stringtown Branch	-0-	Moultrie	Entire stream	0	9.4	9.4	OTE-	
Two Mile Slough	06/23/83	Champaign	Entire stream	0	13.8	13.8	OZZX-01	45
W. Okaw River	08/02/83	Moultrie	Upstream of Stringtown Branch	23.1	29.9	6.8	OT-04	49
Whitley Creek	08/03/83	Moultrie	Entire stream	0	13.5	13.5	OZZS-01	49
LaMoine River Basin								
E. Fk. LaMoine River	09/20/88	McDonough	Mouth to Spring Creek	0	16.8	16.8	DGL-06	40
E. Fk. LaMoine River	07/23/85	McDonough	Mouth to Spring Creek	0	16.8	16.8	DGL-	47
E. Fk. LaMoine River	09/21/88	Hancock	Mouth to Spring Creek	0	16.8	16.8	DGL-02	48
E. Fk. LaMoine River	09/21/88	McDonough	Mouth to Spring Creek	0	16.8	16.8	DGL-03	50
Grindstone Creek	07/27/88	McDonough	Entire stream	0	20.5	20.5	DGIA-03	42
Grove Creek	07/13/76	Hancock	Entire stream	0	14.4	14.4	DGQ-	47
Killjordan Creek	07/26/88	McDonough	Entire stream	0	10.4	10.4	DGJA-01	42
LaMoine River	07/27/88	Brown	Mouth up to Cedar Creek	0	35	35	DG-01	45
LaMoine River	07/27/88	Schuyler	Mouth up to Cedar Creek	0	35	35	DG-06	46
LaMoine River	08/15/91	Brown	Mouth up to Cedar Creek	0	35	35	DG-05	42
LaMoine River	07/26/88	Hancock	Flour Creek up to Cedar Creek	50.5	83.5	33	DG-07	48
LaMoine River	07/27/88	Hancock	Flour Creek up to Cedar Creek	50.5	83.5	33	DG-08	44
Little Missouri Creek	10/02/87	Brown	Entire stream	0	14	14	DGDA-	46
Rock Creek	07/13/76	Hancock	Entire stream	0	13.5	13.5	DG0-01	41
Spring Creek	06/27/84	McDonough	Entire stream	0	13.8	13.8	DGLA-	40
Lake Michigan Basin								
None								
Little Wabash River Basin								
Green Creek	07/25/89	Effingham	Entire stream	0	12.6	12.6	CS-12	45
Little Wabash River	07/25/89	Shelby	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-17	47
Little Wabash River	07/24/89	Effingham	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-16	47
Little Wabash River	07/24/89	Effingham	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-25	43
Little Wabash River	07/26/89	Effingham	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-26	43
Little Wabash River	07/24/89	Effingham	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-21	43
Little Wabash River	07/24/89	Shelby	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-18	39
Little Wabash River	07/25/89	Effingham	Salt Creek up to Lake Mattoon Dam	186	223.2	37.2	C-12	43
Skillet Fork	08/08/89	Wayne	Horse Creek up to Dums Creek	44.7	83.5	38.8	CA-07	45
Skillet Fork	08/09/89	Marion	Horse Creek up to Dums Creek	44.7	83.5	38.8	CA-08	40

EXHIBIT 10

Affidavit of Michael L. Menne

AFFIDAVIT OF MICHAEL L. MENNE

1. My name is Michael L. Menne. If sworn as a witness, I can testify competently that the following information is true and accurate to the best of my knowledge.

2. Since 2003, I have been employed as the Vice President of the Environmental Services Department for Ameren Services Company, a subsidiary of Ameren Corporation. I joined the newly formed Environmental Services Department of Union Electric Company, now doing business as AmerenUE in 1976.

3. I became employed as a Manager of Environmental Affairs for Ameren Services Company in 1998 and served as a Manager of the Environmental Safety and Health Department, now the Environmental Services Department, for Ameren Services Company from 2000 to 2003.

4. I am responsible for developing policies and procedures relating to environmental compliance for Ameren Corporation and its operating subsidiaries. I also am responsible for ensuring that Ameren's operating stations, including the Coffeen Station, comply with state and federal permitting conditions and regulatory requirements.

5. In its Petition to Modify Specific Thermal Standard, Ameren is seeking to modify the standard that applies to Coffeen Lake so that the new limits for May and October would not permit thermal discharge exceeding 96 degrees Fahrenheit as a monthly average, in each of the months of May and October, and 102 degrees Fahrenheit as a maximum for more than two percent of the hours in each of those same months.

6. Since the establishment of specific thermal limits applicable to Coffeen Lake, Ameren has sought a variance from the specific thermal standard that applies to Coffeen Lake in 1997 (PCB 97-131) and again in 2007 (IEPA 08-14). The 1997 variance contained a condition requiring CIPS to submit a monitoring plan to Illinois EPA for a study of the thermal effects of the Coffeen Station discharge on the lake's fishery. The plan was approved by the Illinois EPA, and the studies were conducted for CIPS (now Ameren) from 1997 through 2006 by Southern Illinois University- Carbondale.

7. Coffeen Station operated under the 1997 variance until the summer of 1999. In July 1999, water temperatures reached atypically high levels and dissolved oxygen concentrations were depressed during a prolonged stretch of calm, cloudy weather. A fish kill occurred that July, resulting in the termination of the variance based on a condition in the permit allowing termination if a fish kill occurred during the term of the variance. However, no determination was ever made that the variance limits for May or October had impacted conditions in July 1999, or were otherwise related to the July fish kill.

8. While these enhancements improved cooling system performance, Ameren continues to experience potential non-compliance with its thermal limit during the transitional months

of May and October, when energy consumption remains high and temperatures in Southern Illinois are either transitioning to or from summer temperature regimes.

9. Until earlier this year, lake levels have sharply declined in recent years at Coffeen Lake. In the past three years, lake levels at Coffeen Lake fell more than 8 feet from approximately 590 feet in January 2005 to under 582 feet in December 2007. Extraordinary precipitation events in the first half of 2008 has refilled the lake. Prior to an overflow on April 11, 2008, Coffeen Lake has not discharged to Shoal Creek since May 2005.

10. Ameren will ensure that the effluent from Coffeen Station into Coffeen Lake complies with all other applicable provisions of the Illinois water quality regulations by relying on the requirements set forth in Ameren's NPDES Permit for Coffeen Lake.

FURTHER, Affiant sayeth not.

DATED: 12/10/08

Michael L. Menne

CH2\ 2242040.8

STATE OF MISSOURI)
) SS
CITY OF ST LOUIS)

Subscribed and sworn to before me, a Notary Public, this 10th day of December 2008.

Debra K. Patterson

My Commission Expires:

Debra K. Patterson - Notary Public
Notary Seal, State of
Missouri - St. Louis County
Commission #08462293
My Commission Expires 10/31/2012

EXHIBIT 11

ASA Report: Evaluation of Potential Adverse Impacts From Revised Site-Specific Thermal Standards In May and October For Coffeen Lake

EVALUATION OF POTENTIAL ADVERSE IMPACTS FROM REVISED SITE-SPECIFIC THERMAL STANDARDS IN MAY AND OCTOBER FOR COFFEEN LAKE

Prepared for:

Ameren Corporation
One Ameren Plaza
1901 Chouteau Avenue
St. Louis, MO 63166-6149

Prepared by:

ASA Analysis & Communication, Inc.
5 Fairlawn Drive, Suite 205
Washingtonville, NY 10992

March 2008

EXECUTIVE SUMMARY

This report provides an evaluation of the potential for adverse ecological impacts from proposed modifications to current site-specific thermal standards in Coffeen Lake for the months of May and October. Coffeen Lake is the source for cooling water for the 945-MW Coffeen Power Station in Montgomery County, Illinois. Under current thermal standards for May and October, thermal discharges from Coffeen Power Station may not result in water temperatures that exceed:

- 89 ^{o}F as a monthly average, or
- 94 ^{o}F as a maximum for greater than 2 percent of the hours during that period,

as measured at the boundary of a 26-acre mixing zone. In recent years, the station has reduced electric generation in May and October to comply with the above thermal standards. The results of extensive research conducted on the aquatic community of Coffeen Lake, particularly the sport fish populations, indicate that the existing thermal standards for these months are unnecessarily strict. Proposed revised standards for the months of May and October are as follows:

- 96 ^{o}F as a monthly average, and
- 102 ^{o}F as a maximum for more than 2 percent of the hours during that period.

In this report, the potential effects of raising the May and October thermal standards are evaluated by (1) a retrospective assessment, which applies the results of studies on the status of the lake's fish populations to determine whether or how they have adapted to the recent thermal environment in the lake; and (2) a prospective assessment, which predicts how the lake's thermal environment during May and October might be altered under the proposed revised standards.

Conclusions derived from these assessments are:

1. The revised standards realistically reflect a natural thermal environment, where temperature increases or decreases occur more gradually than the abrupt change inherent in the existing site-specific standards.
2. If raised thermal standards resulted in higher water temperatures in the mixing zone in May, warmer temperatures would not be expected to carry over throughout the remainder of the summer season.
3. Stable, higher water temperatures in late winter and spring promote earlier spawning and improved survival and growth or development of early life stages of fish, particularly largemouth bass.
4. Warmer temperatures result in a prolonged growing season, faster growth and earlier attainment of a size permitting a fish diet, and improved overwinter survival for young largemouth bass.

5. At any time, there are areas in the eastern and western arms of Coffeen Lake that can provide water temperatures approaching optimal levels or that can serve as either a nursery for young fish or a thermal refuge for older fish.

6. No significant relationship was found between the thermal regime in the lake (in terms of degree-days accumulated from May through August) and annual recruitment of largemouth bass year classes, or the growth and condition of largemouth bass, bluegill, or channel catfish.

7. Recent monitoring of the fish populations in Coffeen Lake indicates that they have adapted, and in the case of largemouth bass even prospered, in terms of growth rates, condition, and standing crop levels compared to other regional and national populations, at water temperatures that annually exceed the proposed limits for May and October.

8. Fish kills are unlikely to result from revised thermal standards for May and October, since water temperatures and dissolved oxygen levels that have been associated with past fish kills would not occur during these two months.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Report Purpose

This report provides an evaluation of the potential for adverse ecological impacts from proposed modifications to current site-specific thermal standards in Coffeen Lake for the months of May and October. Coffeen Lake is a 1,100-acre reservoir constructed as the source for steam condenser cooling water for the 945-MW Coffeen Power Station (Coffeen or the "Station"), located in Montgomery County in central Illinois, approximately 1 mile south of the city of Coffeen, Illinois and 50 miles northeast of St. Louis, Missouri (Figure 1-1).

Current thermal standards for Coffeen Lake specify that the months of May and October fall within an 8-month "winter" period extending from October through May. During this 8-month period, thermal discharges from Coffeen Power Station may not result in water temperatures that exceed:

- 89^{o}F as a monthly average, or
- 94^{o}F as a maximum for greater than 2 percent of the hours during that period,

as measured at the boundary of a 26-acre mixing zone.

Abnormally warm temperatures and low precipitation in recent years have resulted in instances, particularly during late May and early October, when Coffeen Power Station has had to reduce electric generation (derate) in order to comply with the above thermal standards. The existing limits of 89^{o}F and 94^{o}F were not established on the basis of definitive thermal requirements for the aquatic community and fish populations of Coffeen Lake during these two months. Rather, they were set as assurance that thermal limits set for the "summer" months of June through September (105^{o}F mean or 112^{o}F maximum for greater than 3 percent of the hours) were not applied year-round.

This report shows that the existing thermal standards for the months of May and October are unnecessarily strict, as demonstrated by the results of extensive research conducted on the aquatic community, particularly the sport fish populations, of Coffeen Lake. The petitioner, Ameren Energy Generating Company (Ameren), proposes relief in the form of the following revised standards for the months of May and October:

- 96^{o}F as a monthly average, and
- 102^{o}F as a maximum for more than 2 percent of the hours during that period.

This report presents an overview of the evidence supporting the conclusion that raising the thermal limits for the months of May and October presents minimal additional risk to fish populations in the lake.

1.2 Regulatory Background

On 21 February 1997 Central Illinois Public Service Company (CIPS) petitioned the Illinois Pollution Control Board (Board) for a five-year variance from existing site-specific thermal standards for Coffeen Lake. The petition requested that the months of May and October be placed under the existing summer standards of 105^{o}F monthly mean and 112^{o}F maximum, while leaving June-September under the summer standards and November-April under the winter standards of 89^{o}F monthly mean and 94^{o}F maximum. The need for a variance became apparent when Coffeen converted from a 12-month maintenance schedule to an 18-month schedule in order to reduce ratepayers' costs. Under the previous 12-month schedule, maintenance for Units 1 and 2 occurred during unit outages in May and October (one unit per month), resulting in a much reduced heat loading to Coffeen Lake during these two months. Under the 18-month maintenance schedule, such reductions in heat loading are no longer realized for May and October.

The variance was granted by the Board on 5 June 1997 for the five-year period from that date to 5 June 2002. As a condition of the variance, CIPS (now Ameren) was required to submit a monitoring plan to the Illinois Environmental Protection Agency (IEPA) to study, along with the Illinois Department of Natural Resources (IDNR), the thermal effects of the Coffeen discharge on the fishery of Coffeen Lake. Another condition of the variance was that the thermal standards could revert to their original levels if IEPA or IDNR determined that the variance resulted in adverse impact to the lake, such as a fish kill. This plan was accepted and the studies were conducted for Ameren during 1997-2005 by Southern Illinois University-Carbondale (SIUC).

Coffeen was operated under the five-year variance granted in June 1997 until a fish kill occurred during July 1999, when water temperatures reached atypically high levels and dissolved oxygen (DO) concentrations were minimal over a period of prolonged calm, cloudy weather. As the result of this fish kill, the variance was suspended and the thermal standards for May and October reverted to the previous winter limits (89 ^{o}F and 94 ^{o}F). The variance was suspended without evidence of a relationship between May and October water temperatures and the conditions experienced during July 1999. Coffeen continues to operate under these site-specific standards. In addition to relying on operational constraints in order to comply with the thermal standards, in recent years Coffeen has installed and employed a 70-acre cooling basin and a 48-cell helper cooling tower structure to reduce effluent temperatures prior to discharge to Coffeen Lake.

1.3 Report Organization

In this report, the effects of May and October water temperatures on the fish populations of Coffeen Lake are evaluated using two types of assessments: (1) a “retrospective” assessment that examines biological data collected during the 1997-2004 SIUC studies to evaluate whether the thermal environment of Coffeen Lake is adversely affecting populations of three key recreational fish species—largemouth bass, bluegill, and channel catfish; and (2) a “prospective” assessment that predicts how the lake’s thermal environment during May and October might be altered under the proposed revised standards and how fish might adapt to these changes..

A brief description of the design and operation of the Coffeen Power Station is provided in Section 2, along with a general description of the thermal environment in the lake, with emphasis

on conditions during the months of May and October. The potential for higher water temperatures during May to affect subsequent summer temperatures is evaluated using data from 1997 to 2007. The relationship between summer temperatures and subsequent October temperatures also is examined.

The retrospective assessment presented in Section 3 applies the results of the SIUC studies on the status of the lake's largemouth bass, bluegill, and channel catfish populations to evaluate how the populations have adapted to the recent thermal environment in the lake. In many respects, a retrospective assessment provides the strongest evidence of the effects of existing and proposed thermal standards in that it integrates all aspects of the thermal environment on the life cycle for the fish species and the various trophic levels in the lake, expressed at the uppermost consumer levels. Section 3 also assesses the risk of a fish kill resulting from higher water temperatures during May and October. Temperature and DO conditions during previous fish kills on Coffeen Lake are examined and related to conditions likely to occur under the proposed May and October thermal limits.

The prospective assessment presented in Section 4 predicts how the lake's thermal environment during May and October might be altered under the proposed revised standards under conditions of warmer than average ambient temperatures, and maximum station generation and heat loading. Thermal tolerances and requirements of the three key recreational species in Coffeen Lake (largemouth bass, bluegill, and channel catfish) are presented for the life stages likely to occur during these two months.

Finally, Section 5 summarizes and integrates the multiple lines of investigation presented in the previous sections in order to characterize the actual risk for adverse impact occurring from revisions to the thermal standards for May and October.

Figure 1-1. Map of Location of Coffeen Power Station

2 STATION OPERATIONS AND THERMAL HISTORY

2.1 Station and Lake Descriptions

Coffeen Power Station consists of two coal generating units. Unit 1 has a generating capacity of 350 MW (gross) and began commercial operation in 1965. Unit 2 has a generating capacity of 595 MW (gross) and began commercial operation in 1972. Both units use once-through condenser cooling and draw cooling water from Coffeen Lake. At the total design capacity of 945 MW, a maximum of 4,357 million BTU/h of waste heat is generated by the station. After passing through steam condensers, the cooling water is discharged to the eastern arm of Coffeen Lake (Figure 2-1) through a 17-ft diameter pipe which empties into an open 0.6-mile long flume.

A 70-acre supplemental cooling basin was installed in the spring of 2000, and a 48-cell industrial helper tower structure was installed in the spring of 2002 (Figure 2-2). The cooling basin and helper towers are located downstream of a "drop structure" (modified during Spring 2000) at the terminus of the discharge canal and upstream of a permitted 26-acre mixing zone in Coffeen Lake. Together, the cooling basin and helpers towers condition the cooling water discharge temperature, as necessary, to meet the permitted mixing zone temperatures. When operating simultaneously, the cooling basin and helper towers can draw up to 90 percent of the maximum plant discharge flow.

Coffeen Lake was created in 1963 by impounding the flow of McDavid Branch of the East Fork Shoal Creek and by pumping water from East Fork Shoal Creek downstream of the dam spillway. The spillway crest elevation is at 590 ft elevation. The gross surface area and volume of Coffeen Lake are 1,100 acres and 16,650 acre-ft, respectively. Currently the effective surface area and volume are 560 acres and 12,200 acre-ft. The drainage area is approximately 17.2 square miles. When it was created, the maximum depth was 52 to 58 ft and the average depth was 18.3 ft. The lake was originally designed to provide cooling capacity sufficient for a 1000-MW facility with a 70 percent capacity factor.

The station's cooling water intake structure is located at the end of a cove near the midpoint of the western arm of Coffeen Lake (Figure 2-1). Water depth at the intake originally was 40 ft. The configuration of the intake and discharge on the lake's two arms causes water to flow in a clockwise direction from the eastern arm to the western arm of the lake over a distance of approximately 4.1 miles.

2.2 Station Operations and Monitoring

During 2002 through 2006, the average annual net generation from the Station was 66 percent of its design capacity (Table 2-1). Since 1997, annual mean hourly generation rates have increased from 460 gross MW/h to 709 MW/h in 2006 and 689 gross MW/h in January-October 2007 (Figure 2-3). Hourly generation rates specifically for the 6-month interval from May through October followed a similar pattern of increase, from 388 gross MW/h in 1997 to 772 gross MW/h in 2007. The biggest increase for both the annual and May-October rates occurred between 2001 and 2002 (Figure 2-3). After 2001, the annual mean generation has fluctuated between 56 percent and 74 percent of maximum design capacity (Table 2-1).

Water temperatures are routinely monitored at seven locations in the cooling loop: the downstream end of the discharge flume; the cooling pond inlet, midpoint, and outlet; the outer edge of the mixing zone (includes a primary temperature probe and a back-up probe); the dam; and the intake. The temperature probe at the edge of the mixing zone, where compliance with thermal standards is determined, is on an anchored buoy at a depth approximately 28 in. below the water surface. Temperature is recorded every 5 minutes.

From 1997 through 2006, Southern Illinois University-Carbondale (SIUC) monitored water temperatures and dissolved oxygen (DO) concentrations at various depths in Coffeen Lake (Heidinger et al. 2000, 2001, 2002; Brooks 2004, 2005; Brooks and Heidinger 2006, 2007). Temperature and DO measurements were made at weekly intervals from May or June through September or October annually during this period. Measurements were taken at four locations and at 0.5-m intervals from water surface to within 0.5 m of the lake bottom. The sampling locations and sampling time interval (afternoon) were repeated every year for consistency and to facilitate yearly comparisons. The four locations consisted of a station near the midpoint of each of four segments of the lake (Figure 2-4). Data from these surveys provided information on the thermal and DO stratification of the lake.

SIUC also used temperature loggers programmed to measure water temperatures every 2 minutes at 1.5-m depth intervals (surface, 1.5 m, 3.0 m, and 4.5 m) in the mixing zone, near the dam, near the intake, and recently on an IDNR buoy near the railroad bridge in the upper portion of the western arm of the lake (Figure 2-4).

2.3 Temperature and Dissolved Oxygen in Coffeen Lake

Mean daily water temperature during 1997 to 2007, as measured near the surface (28-inch depth) at the edge of the thermal mixing zone in the eastern arm of Coffeen Lake, has followed a regular seasonal pattern, occasionally exceeding 100^{o}F during July or August and reaching lows of approximately 44-55^{o}F in January (Figure 2-5). Temperatures at the mixing zone boundary represent the warmest temperatures to which fish and other organisms would be exposed, other than within the mixing zone itself. For example, mean monthly surface temperatures recorded at the intake in the western arm of the lake during May through October 2004-2007 were consistently 10^{o}F to 15^{o}F lower than at the mixing zone boundary, as shown by Figure 2-6. This relationship between the discharge and intake temperatures was statistically significant ($P<0.001$).

There can be considerable year-to-year variation in water temperatures in Coffeen Lake. In Figure 2-7, the maximum, mean, and minimum values for average daily temperatures recorded during 2004-2007 near the surface at the intake are plotted for each calendar date. Winter temperatures (December-March) show the greatest variation, with a single date's temperature ranging as much as 25^{o}F among the four years. From 2004 through mid-November 2007, the warmest daily mean temperature recorded at the intake surface was 97^{o}F and the coldest was 41^{o}F (Figure 2-7).

Since 1997, daily average water temperatures at the edge of the mixing zone in May and October rarely have exceeded 96^{o}F (Figure 2-8), and maximum temperatures have not exceeded 102^{o}F (Figure 2-9). Typically, daily average temperatures in these months have been 80-90^{o}F and maximum temperatures have been in the 90s.

2.3.1. Diel Cycles

Often a diel cycle is apparent in the water temperatures recorded in the mixing zone and at the intake. Data from May, July, and October 2007 are used as an example. Near-surface water temperatures recorded hourly at the edge of the mixing zone were in the mid to upper 80s (^{o}F) during 12-15 May and a diel cycle was evident, with lowest temperatures occurring just before noon and the warmest temperatures (up to 3-4^{o}F higher) occurring in late afternoon to early evening (Figure 2-10). During this time, a similar diel cycle was observed at the intake where water temperatures were in the lower 80s, but the difference between the maximum and minimum hourly records during each day was less (1-3^{o}F). The diel cycle at both locations was masked somewhat as water temperatures declined during 16-17 May and increased during 22-25 May. After 22 May, temperatures increased more rapidly in the mixing zone than at the intake, resulting in temperatures at the intake being 7 to 14^{o}F less than at the mixing zone boundary.

In July 2007, when water temperatures were near the warmest for the year, diel cycles were strongly expressed at both the mixing zone and the intake (Figure 2-11). For example, hourly temperatures in the mixing zone on 16 July and 25 July increased approximately 9^{o}F during the 24-hour period, and diel temperature increases of approximately 4^{o}F were typical on other dates. Intake temperatures cycled daily in a similar pattern but with temperatures ranging only 2-3^{o}F during the day. Intake temperatures were approximately 9^{o}F to 14^{o}F less at the intake than at the mixing zone.

In October 2007 water temperatures declined steadily at the intake from the upper 80s to the lower 70s, while temperatures at the mixing zone boundary declined from the mid and upper 90s to the lower 80s (Figure 2-12). As temperatures declined, diel cycles became less pronounced, especially at the intake.

2.3.2. Vertical Stratification

Recent vertical profiles of water temperature and DO concentrations are available from the weekly surveys conducted by SIUC during 2006 for the four segments of Coffeen Lake shown in Figure 2-4. Of greatest interest is the vertical distribution of temperatures and DO during the months of May and October. In 2006, Coffeen Lake had become thermally stratified by 4 May (Figure 2-13). On this date, epilimnetic temperatures were in the mid 80s (^{o}F) in Segment 1 (the eastern arm near the thermal discharge) and the upper 70s in Segment 2 (the lower half of the western arm of the lake), with a difference in surface temperatures of approximately 8^{o}F. Below the thermocline depth (approximately 9 ft in Segment 1 and 16 ft in Segment 2), temperatures declined to 68^{o}F in Segment 1 and 60^{o}F in Segment 2 at the lake bottom (Figure 2-13). As the month progressed, temperatures gradually rose and the thermocline dropped to lower depths but remained most pronounced in Segment 1 (see 25 May in Figure 2-13). Near-bottom depths in Segments 1 and 2 were anaerobic or nearly so, but DO concentrations remained 4 mg/L or higher at other depths within the hypolimnion and in Segments 3 and 4 (Figure 2-14).

This pattern of stratification in the deeper lake segments (1 and 2) and less pronounced thermal stratification in the shallower segments (3 and 4) continued throughout the summer months, while hypolimnetic depths became progressively depleted of DO (Brooks and Heidinger 2007). By 28 September 2006, the thermal stratification had broken down as temperatures cooled and vertical mixing occurred (Figure 2-13). DO concentrations throughout the water column were 4

mg/L or higher. SIUC did not conduct a survey in October 2006. However, during some years the water column may remain stratified during October, especially in Segment 1, as shown by survey results from 17 October 2000 (Figures 2-13 and 2-14).

2.3.3. Cumulative Water Temperatures

Changing meterological conditions and variable heat loadings from the station's thermal discharge result in year-to-year differences in the thermal environment of Coffeen Lake. These annual differences can have biological significance. The concept of degree-days is commonly used to reflect longer term, cumulative effects of temperatures. Daily mean near-surface water temperature recorded at the mixing zone boundary were used as an index of the thermal environment of the lake. Monthly and seasonal degree-days were determined by computing the difference between mean daily temperatures and 60^{o}F (15.6^{o}C) and summing these differences over the desired period of time, i.e., individual month or season (e.g., May-October). A threshold temperature of 60^{o}F was chosen because it represents the minimum temperature for largemouth bass spawning (Heidinger 1975) and a reasonable, if not conservative, lower limit for growth. Degree-days accumulated at the mixing zone boundary should be a reliable index of the thermal environment of much of the lake, as shown by a significant correlation (r^2=0.9464, P<0.001) with degree-days accumulated at the intake during May-October 2004-2007 (Figure 2-15).

Total degree-days are plotted by month (May-October) and year (1997-2007) in Figure 2-16. As expected, accumulated degree-days were greatest in July and August and least during May and October. However, there was greater annual variability in total degree-days during the months of May, June, and September than during July and August.

Based on degree-days, May and June in 1997 and 2001 were especially cool, and May and June 2007 were especially warm. During these three years, the lower or higher temperatures in the spring tended to carry over throughout the entire 6-month season. In other years, warm May or June temperatures were followed by relatively cooler July-September temperatures, as in 1998 and 2000. May 1998 was ranked the warmest and May 1997 was ranked the coolest (Table 2-2). These were two of the three years (1997-1999) when the 1997 thermal variance for May was in effect.

Using the 1997-2007 data, there are indications that raising water temperatures in the mixing zone during May via higher thermal standards will not necessarily result in warmer temperatures throughout the remainder of the season. Simple linear regression analysis indicated there was not a statistically significant relationship (r^2=0.1634; P=0.21) between May temperatures (degree-days) and the degree-days accumulated over the subsequent five months, June-October (Figure 2-17). Warmer temperatures during May-September, on the other hand, tend to influence October temperatures, as indicated by a significant positive relationship between degree-days accumulated during May-September and October degree-days (r^2=0.8607, P<0.001; Figure 2-18). This relationship might be expected if it takes longer in October to dissipate heat loadings from earlier months during the warmest years, e.g., 2004-2007.

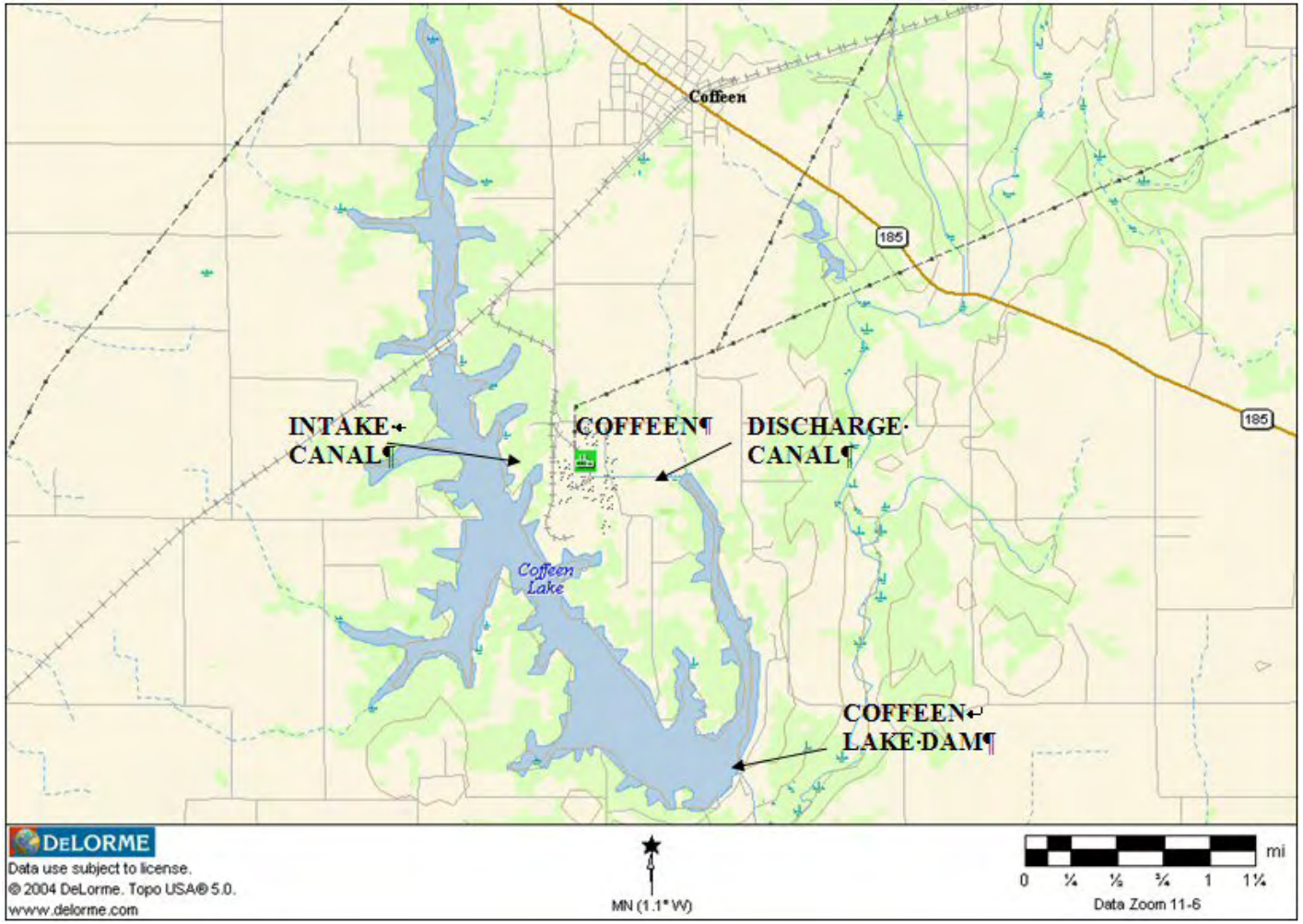

Figure 2-1. Map of Coffeen Lake

Figure 2-2. Coffeen Power Station Thermal Discharge Area Showing the 70-acre Cooling Basin (Upper Left) and 48-Cell Helper Tower (Right)

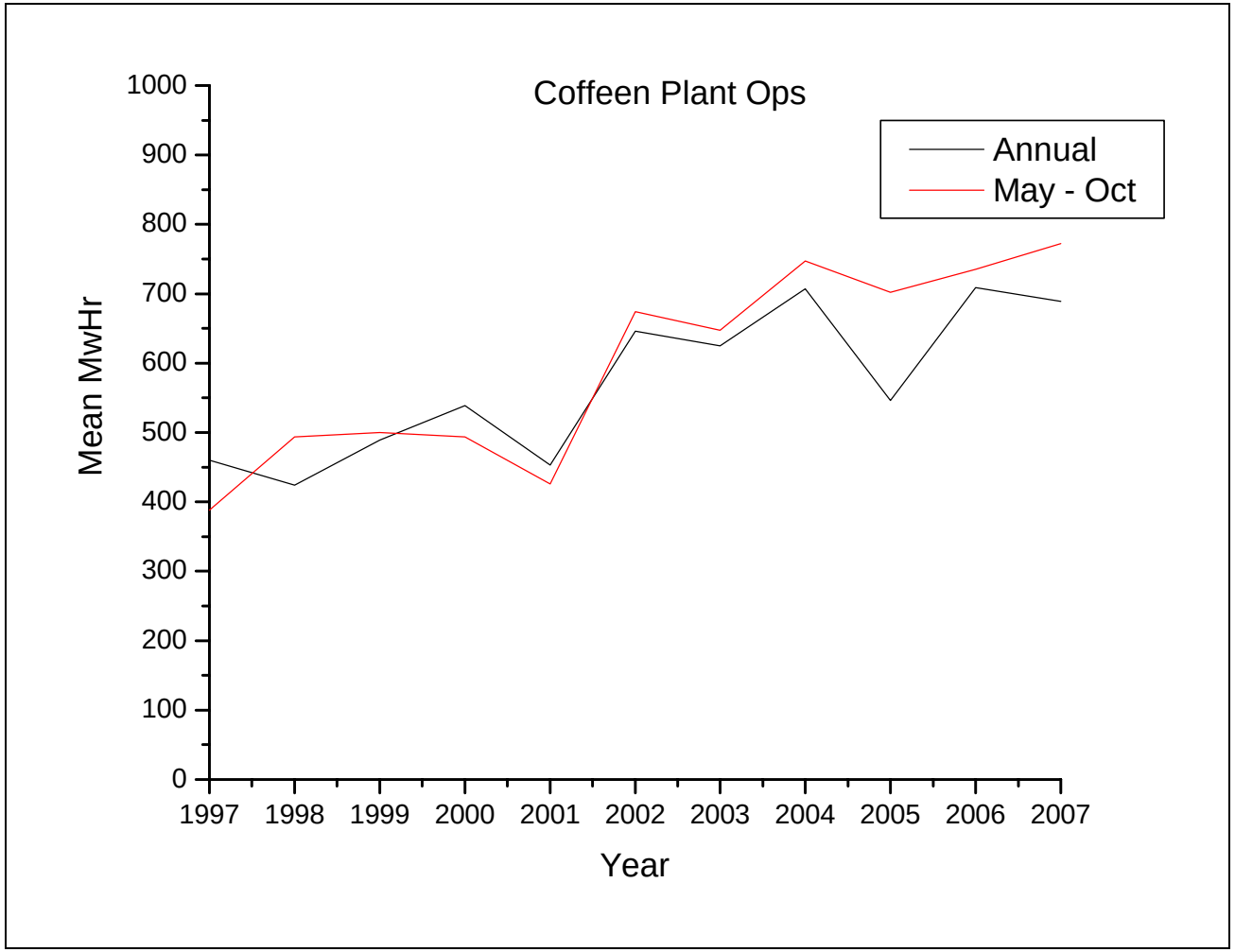

Figure 2-3. Mean Hourly Generation Rates (MW/h) for Coffeen Power Station during 1997 through October 2007

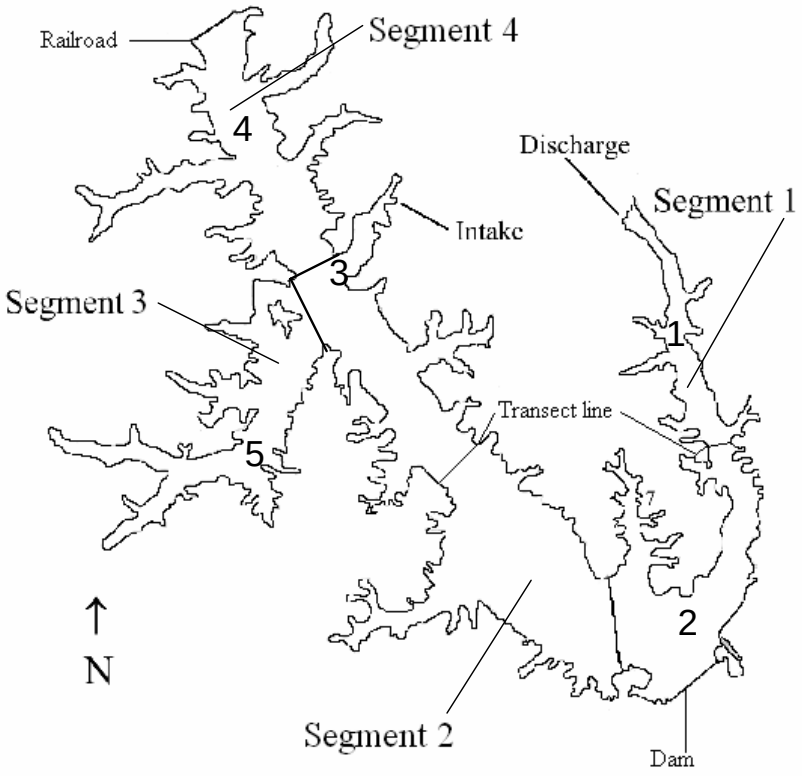

Figure 2-4. Map of Four Lake Segments Used by SIUC for Sampling Water Temperature and Dissolved Oxygen Concentrations (from Brooks and Heidinger 2006). Sampling Station Locations Depicted by Numerals 1-5.

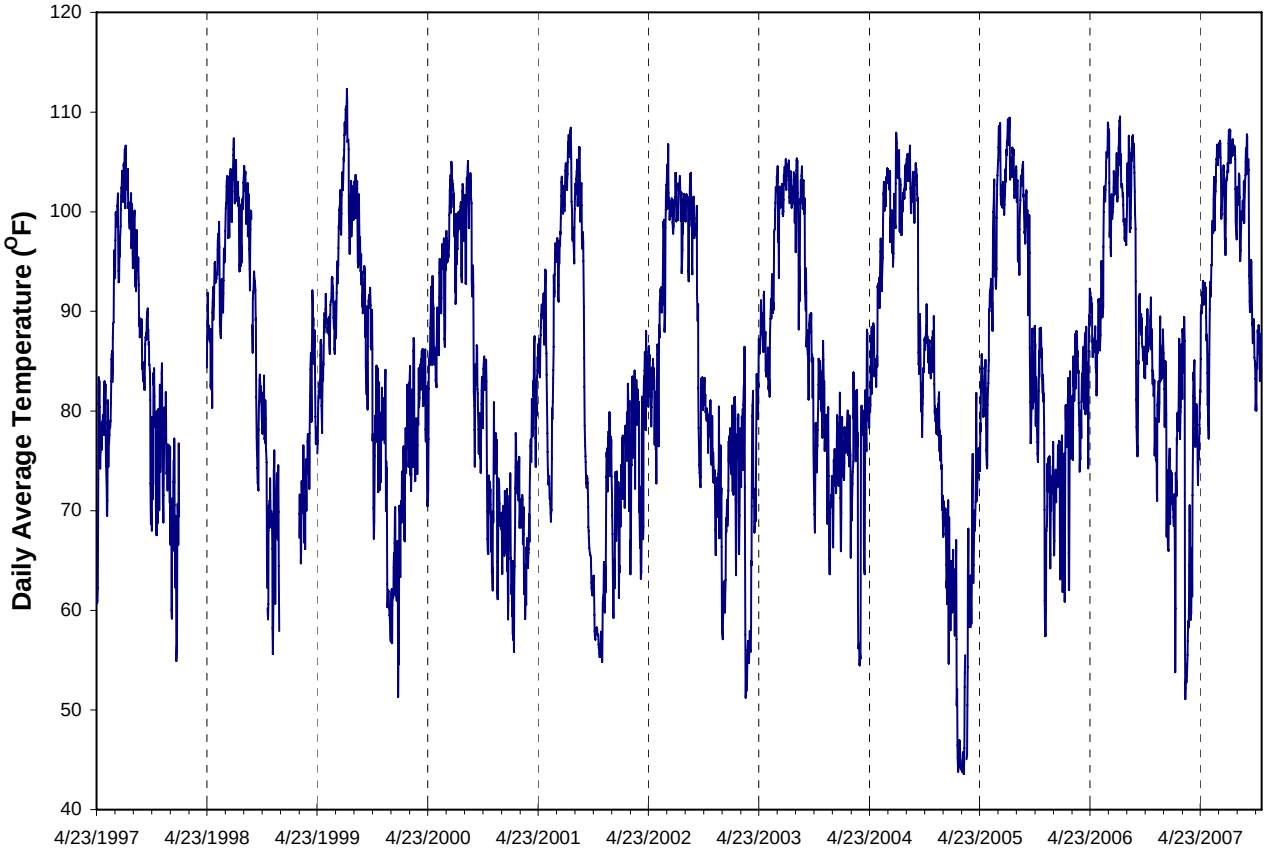

Figure 2-5. Daily Average Water Temperatures Measured Near-Surface at the Mixing Zone Boundary, April 1997 through 11 November 2007

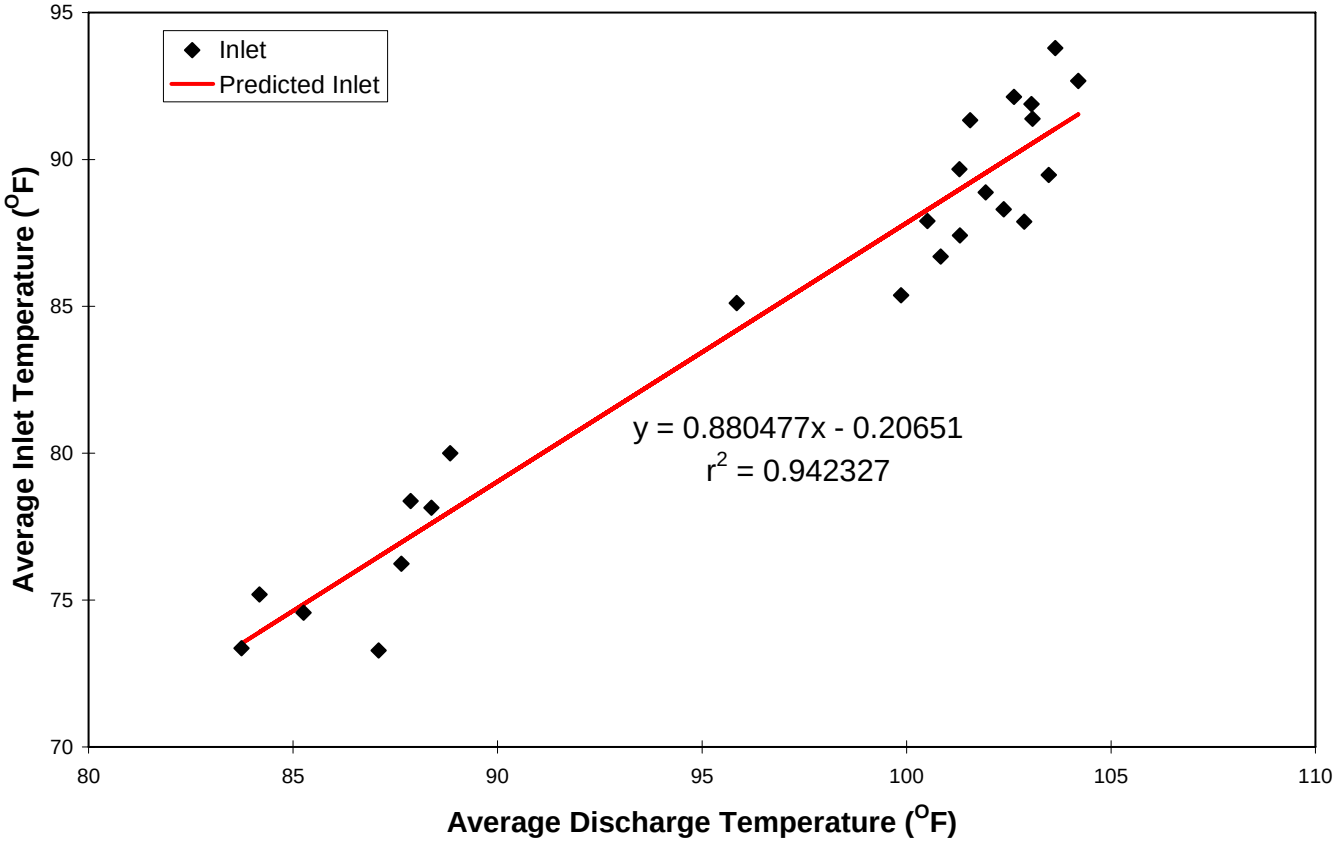

Figure 2-6. Mean Monthly Intake Surface Water Temperature as a Function of Mean Monthly Discharge Temperature Measured Near-Surface at the Boundary of the Mixing Zone, Based on May-October, 2004-2007

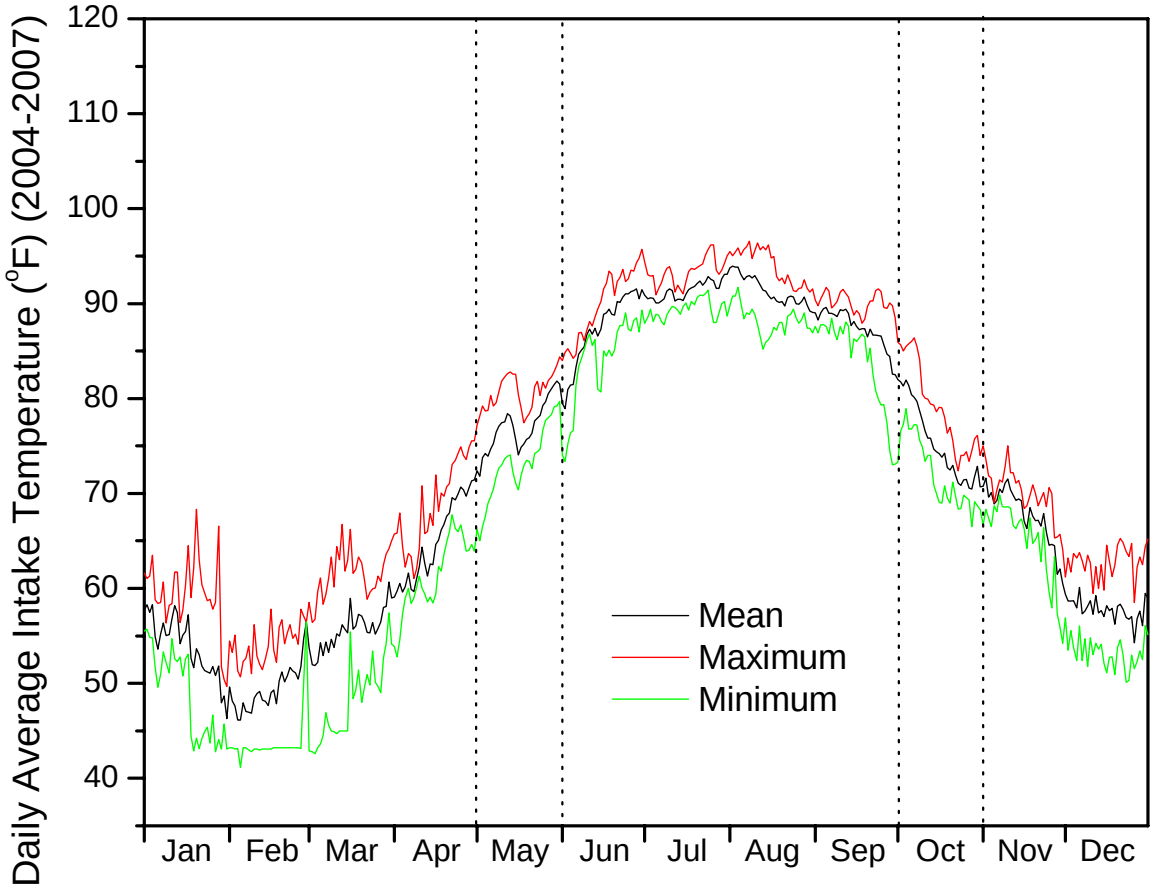

Figure 2-7. Range of Daily Average Surface Water Temperatures at the Coffeen Power Station Intake, 2004-2007

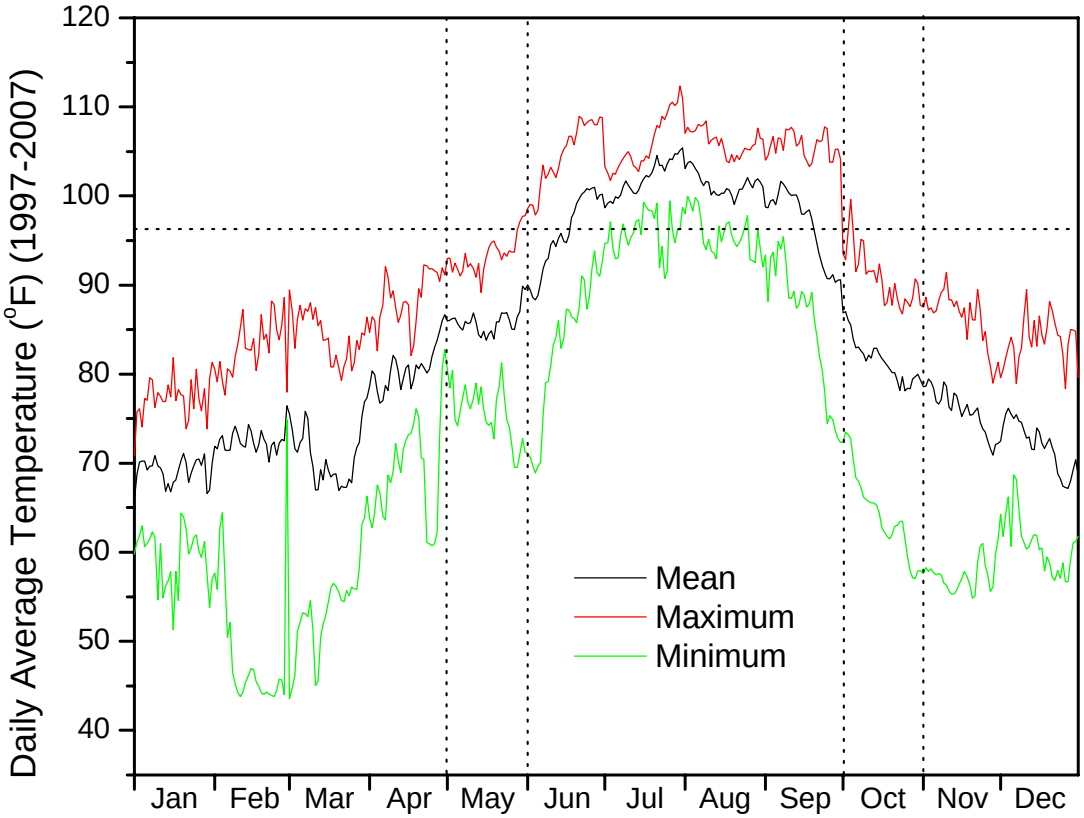

Figure 2-8. Range of Daily Average Near-Surface Water Temperatures at the Mixing Zone Boundary during 1997-2007 Relative to 96°F

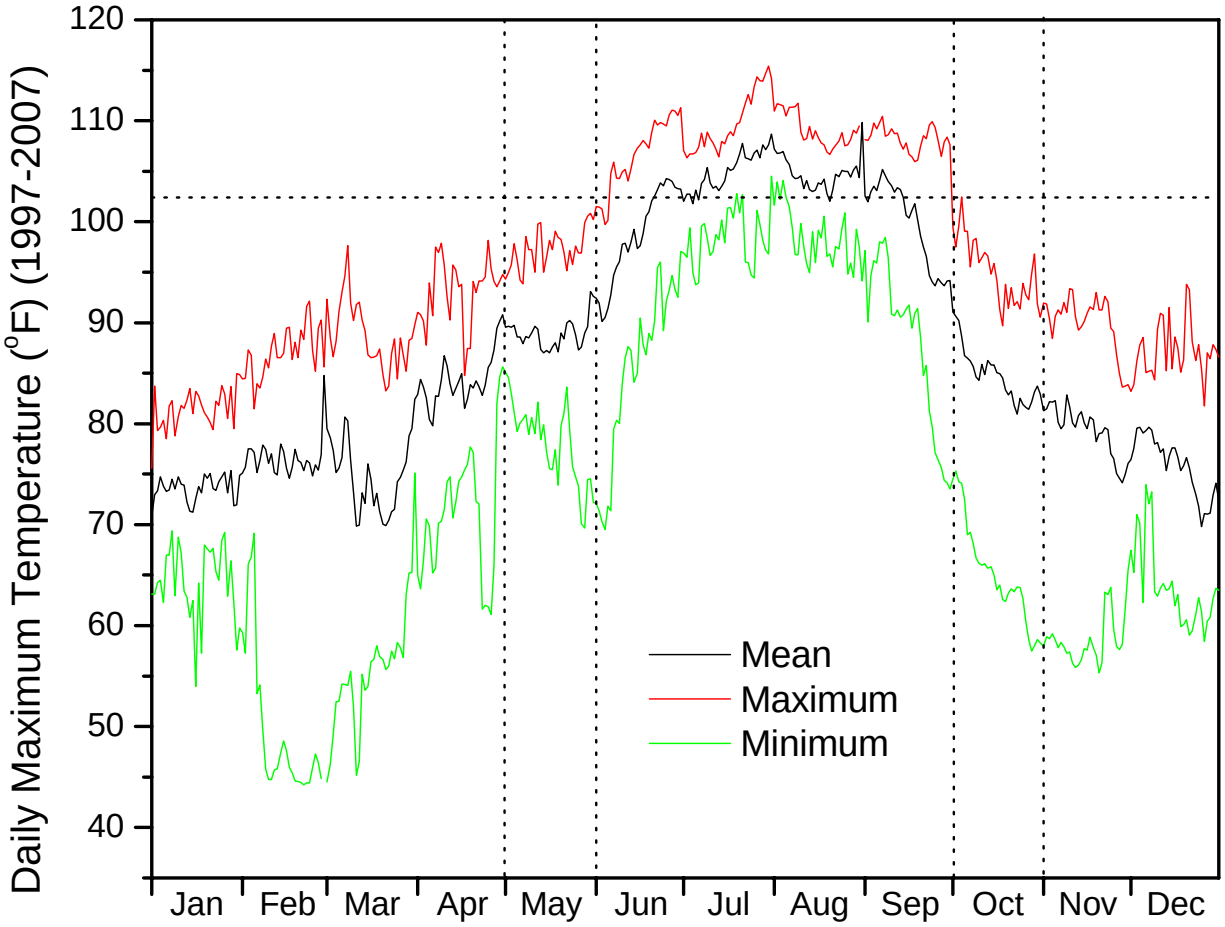

Figure 2-9. Range of Daily Maximum Near-Surface Water Temperatures at the Mixing Zone Boundary during 1997-2007 Relative to 102°F

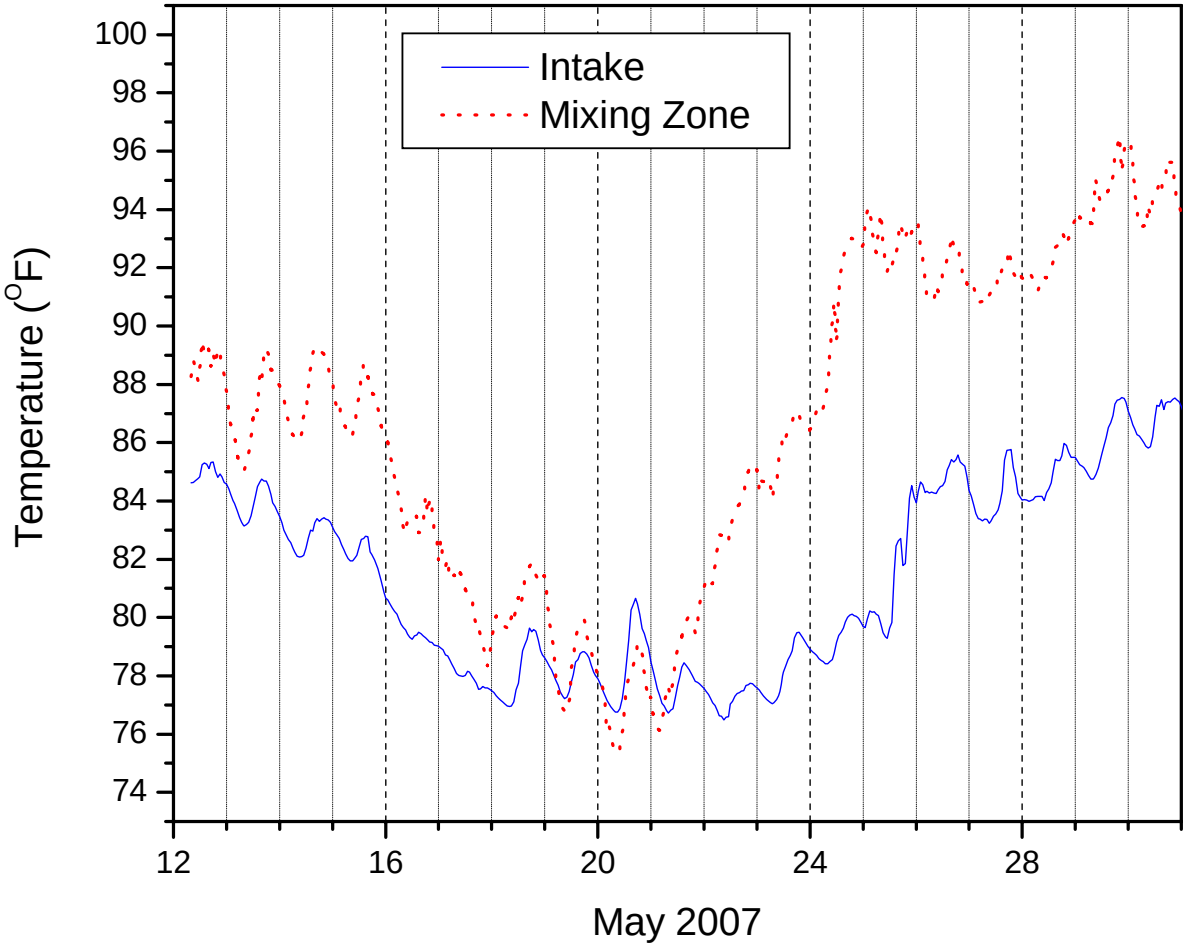

Figure 2-10. Hourly Near-Surface Water Temperatures at the Intake and Mixing Zone Boundary, 12-31 May 2007

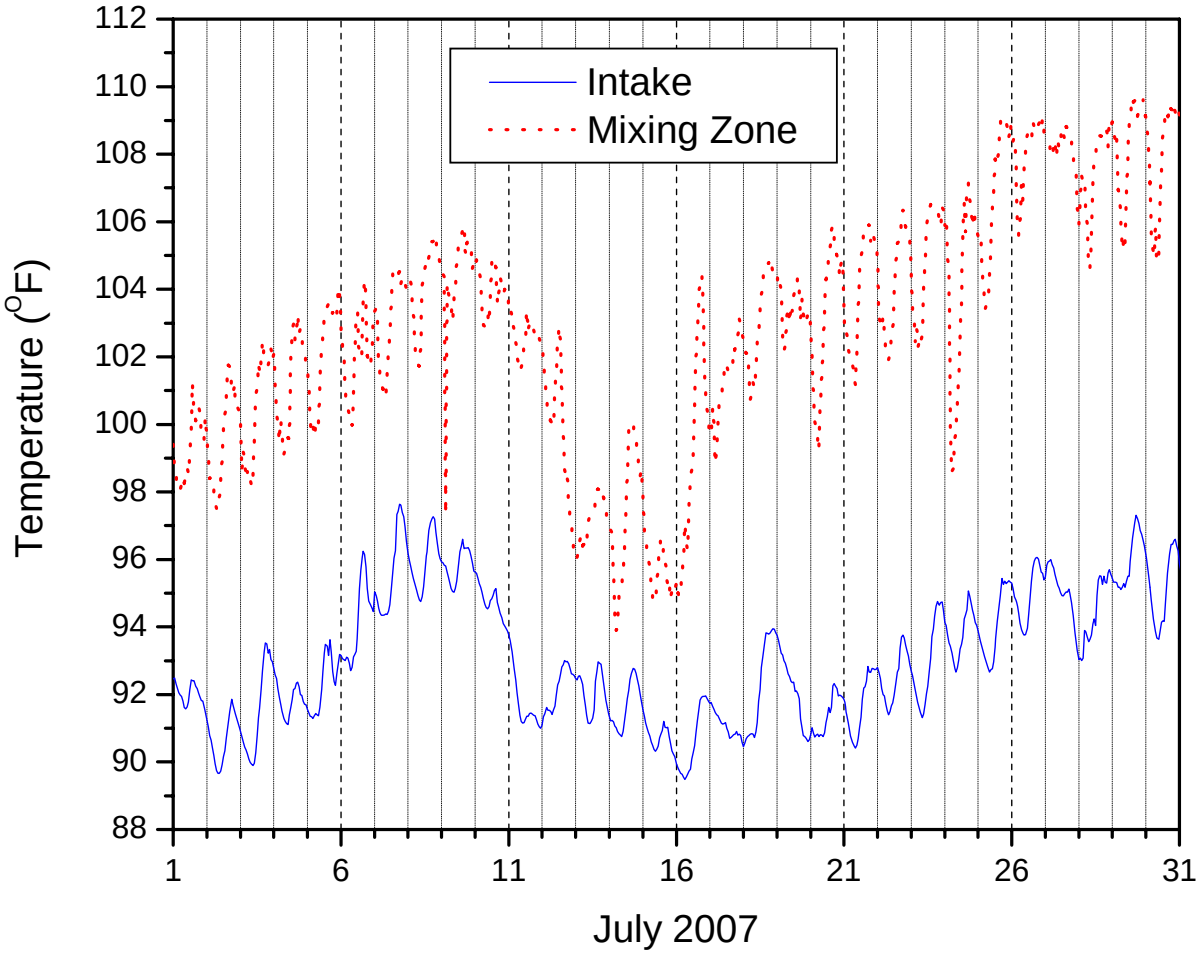

Figure 2-11. Hourly Near-Surface Water Temperatures at the Intake and Mixing Zone Boundary, 1-31 July 2007

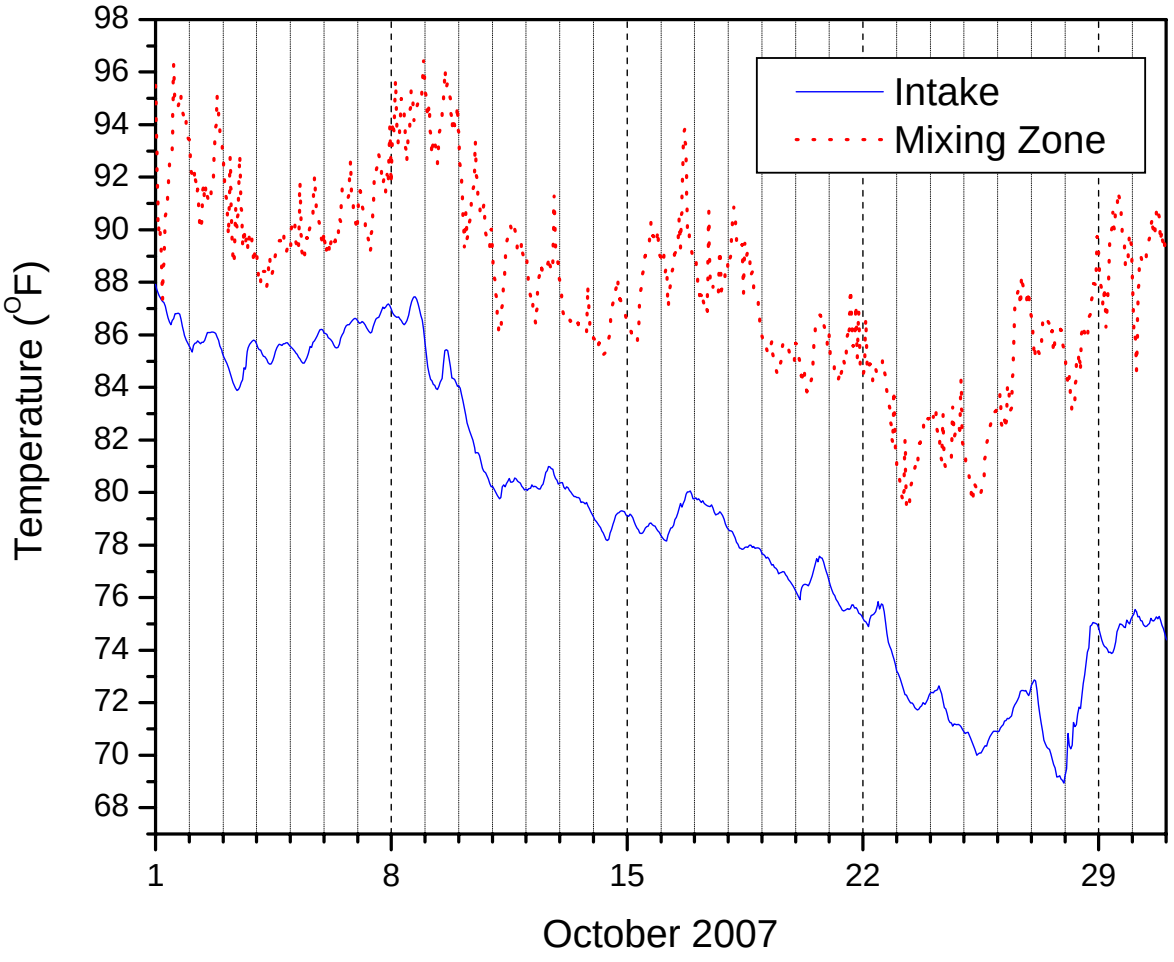

Figure 2-12. Hourly Near-Surface Water Temperatures at the Intake and Mixing Zone Boundary, 1-31 October 2007

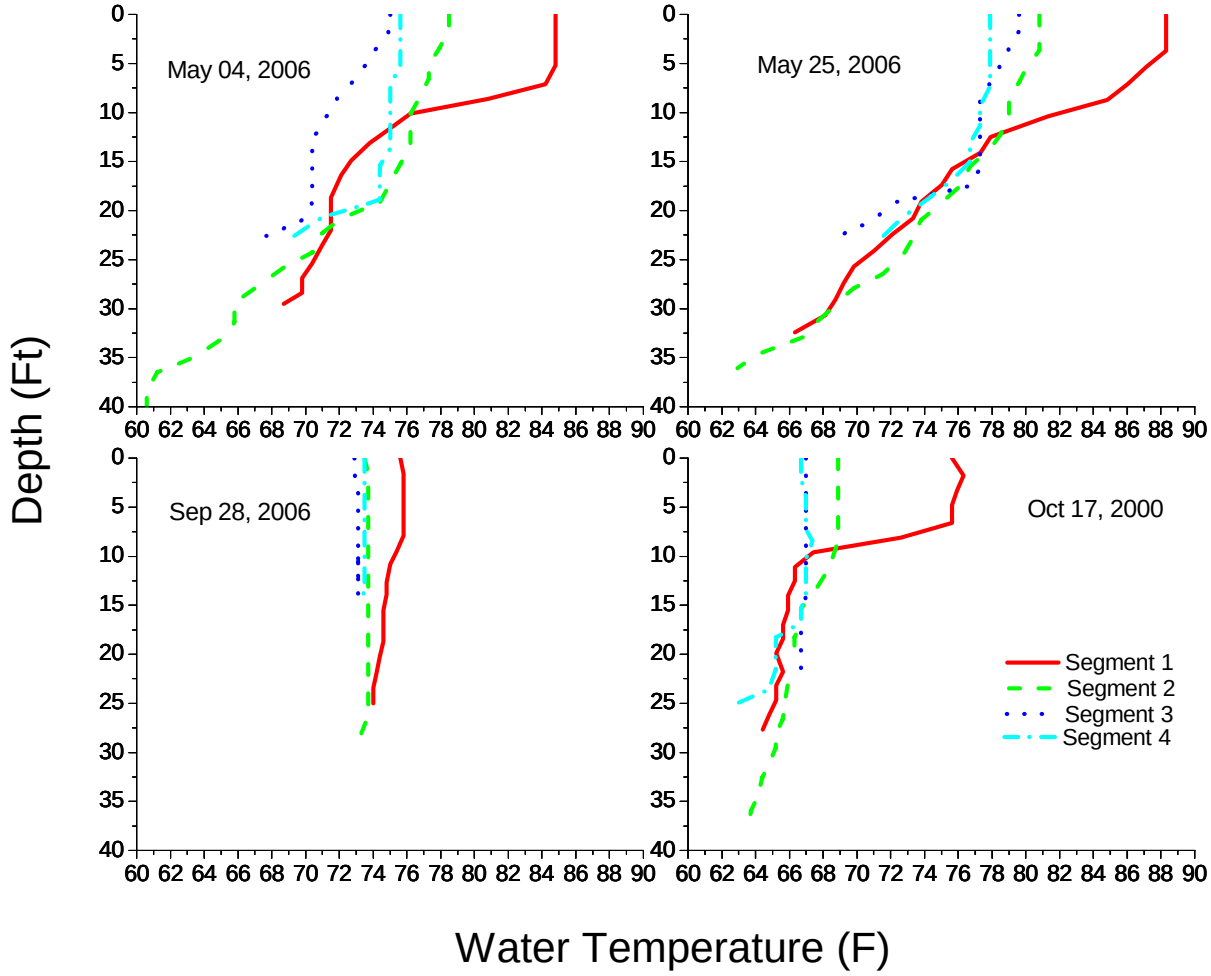

Figure 2-13. Vertical Profiles of Water Temperature on 4 May,25 May, and 28 September 2006 and 17 October 2000

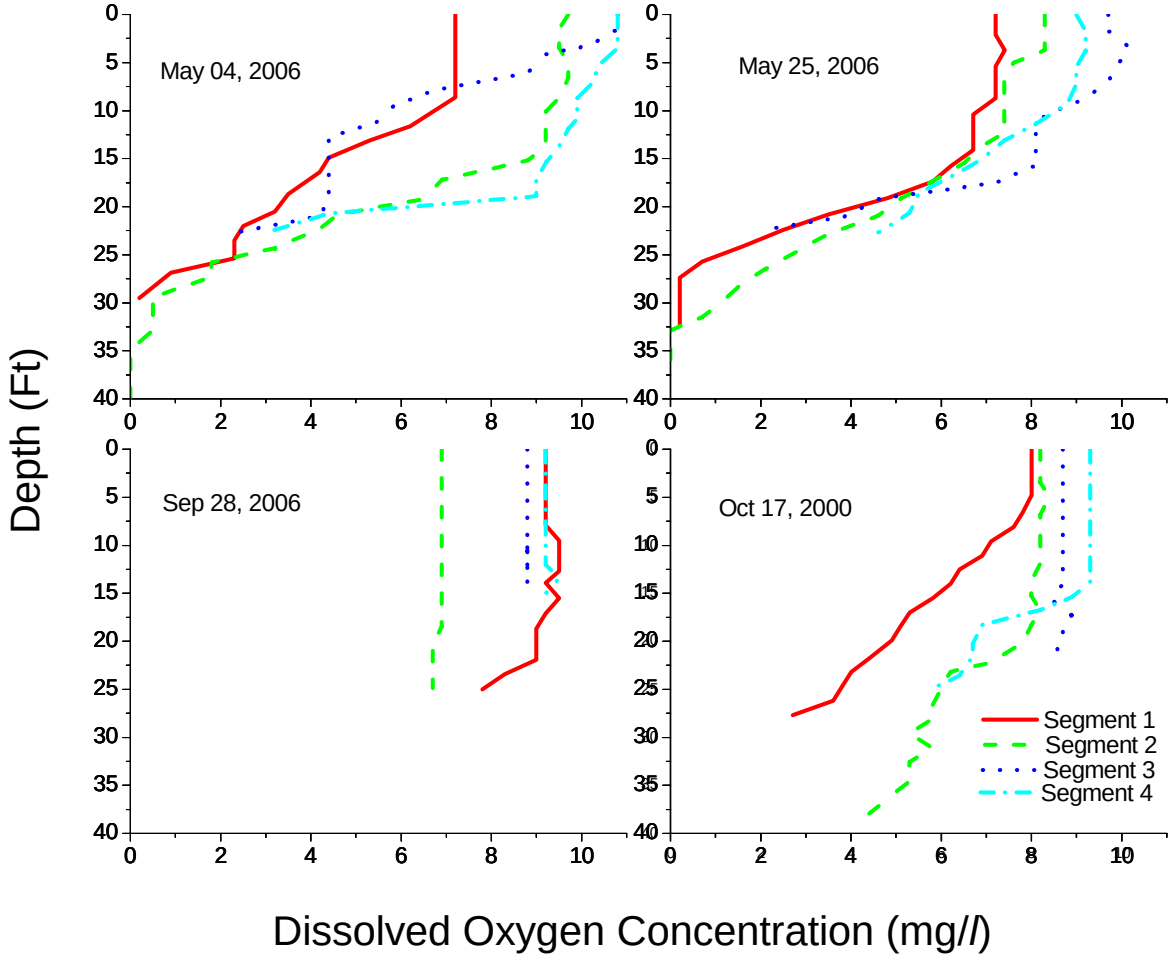

Figure 2-14. Vertical Profiles of Dissolved Oxygen (DO) on 2 May, 25 May, and 28 September 2006 and 17 October 2000

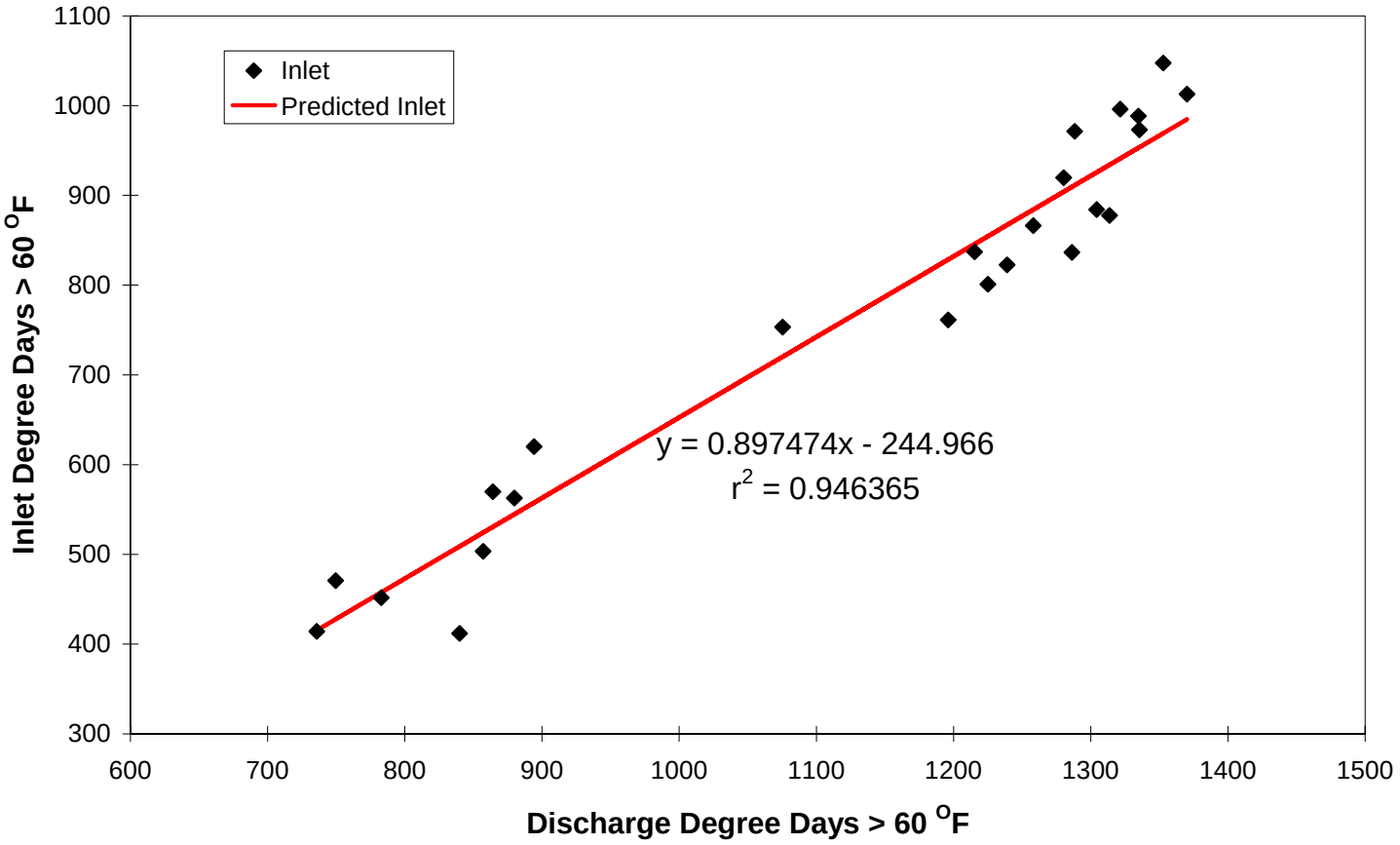

Figure 2-15. Regression of Accumulated Degree-Days at the Mixing Zone Boundary (Discharge) vs. at the Coffeen Intake (Inlet) for May-October of 2004-2007

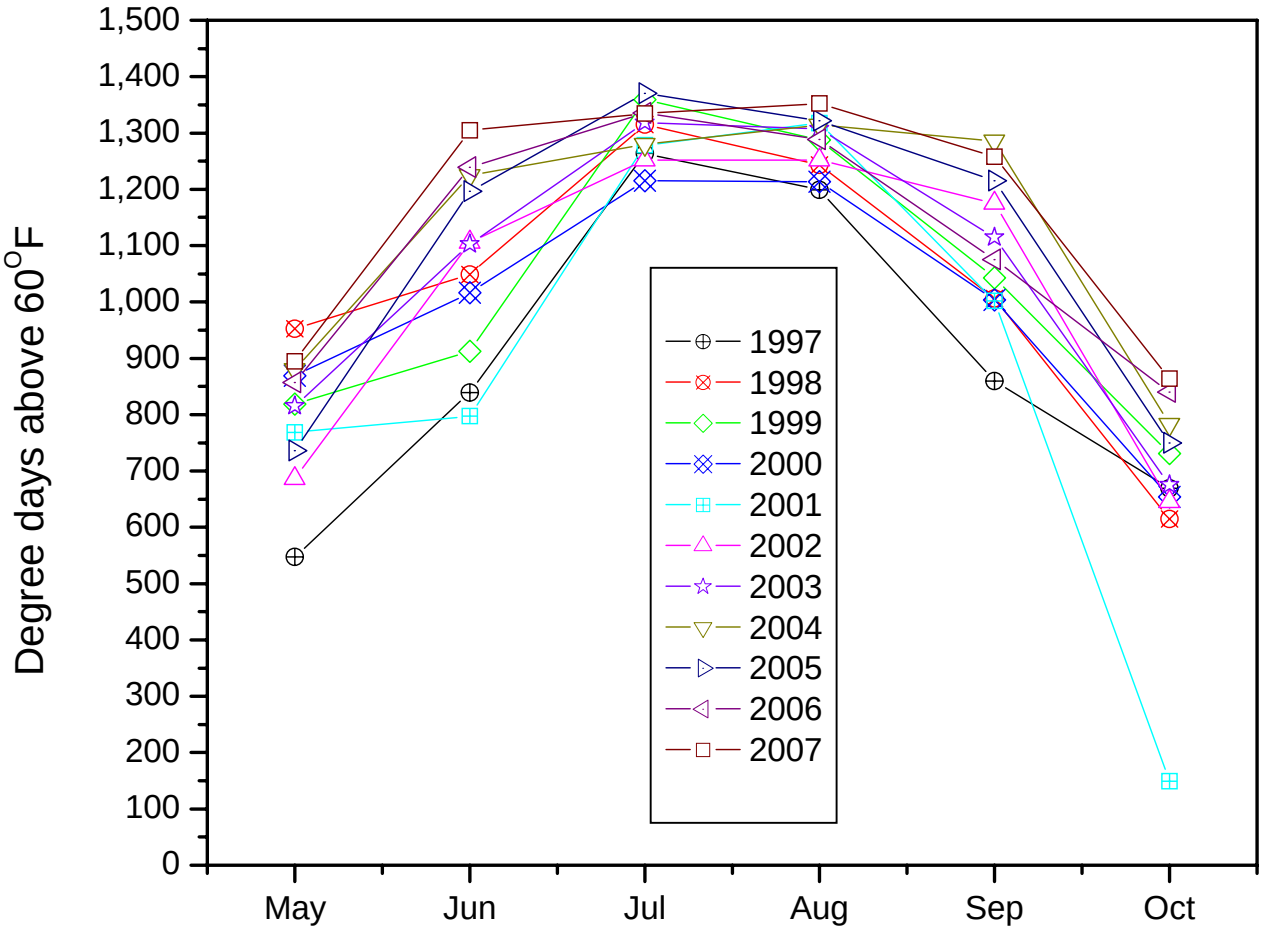

Figure 2-16. Degree-Days Accumulated Monthly at the Mixing Zone Boundary during May-October, 1997-2007

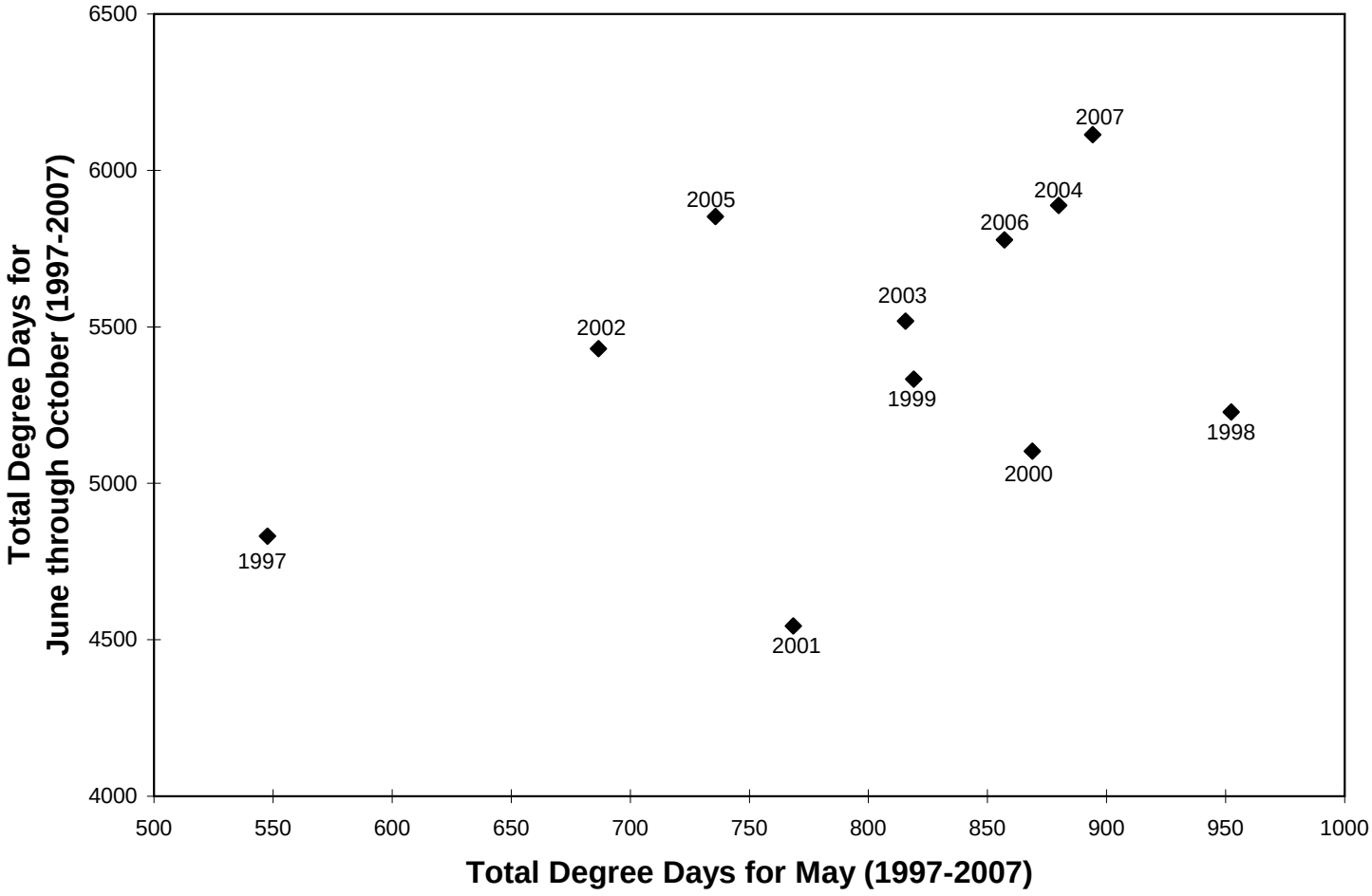

Figure 2-17. Plot of Total Degree-Days Accumulated during May and during the Subsequent June-October, 1997-2007

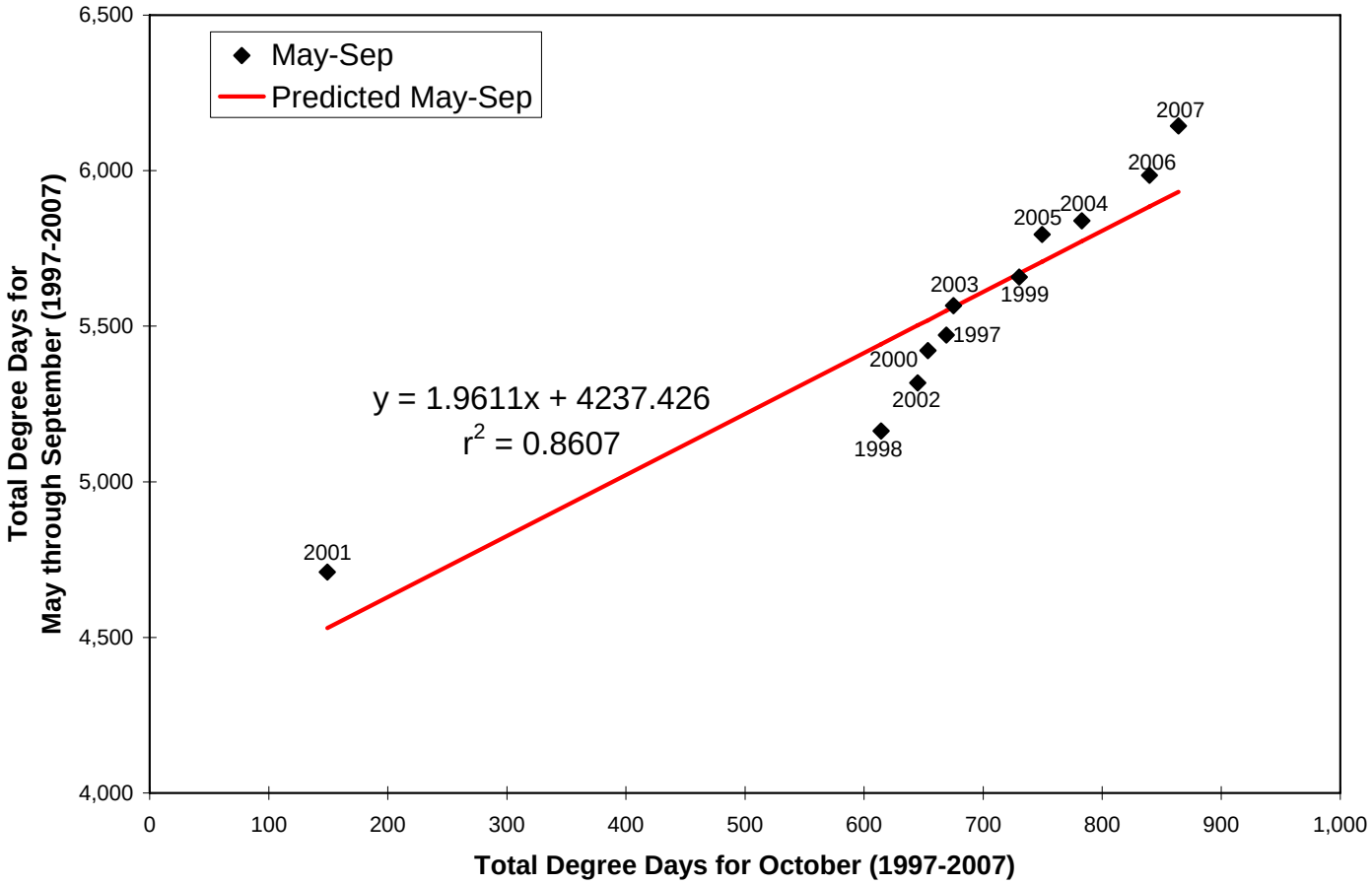

Figure 2-18. Regression of Accumulated Degree-Days at the Mixing Zone Boundary in October vs. during the Previous May-September, 1997-2007

Table 2-1. Monthly Mean Cooling Water Flow Rate and Percentage of Maximum Design Generation and Flow Rate at Coffeen, 2002-2006

Percentage of Maximum Generation (900 MW)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2002	67%	73%	67%	70%	68%	78%	87%	79%	74%	34%	54%	53%	67%
2003	86%	78%	24%	60%	63%	70%	88%	77%	61%	9%	66%	62%	62%
2004	83%	84%	37%	52%	69%	84%	82%	86%	85%	59%	78%	85%	74%
2005	30%	4%	23%	37%	52%	70%	89%	82%	85%	57%	63%	77%	56%
2006	49%	80%	67%	64%	77%	67%	82%	73%	63%	93%	76%	88%	73%
Average	63%	64%	43%	57%	66%	74%	86%	80%	74%	50%	68%	73%	66%
Actual Plant Flow Rate (MGD)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2002	540	495	540	568	646	659	659	659	659	467	432	406	561
2003	405	329	210	446	574	579	628	611	531	410	422	405	463
2004	329	373	197	381	581	602	616	616	616	560	514	605	499
2005	179	58	255	335	497	529	629	611	618	528	529	487	438
2006	326	333	291	325	575	553	623	614	555	616	561	431	484
Average	356	318	299	411	574	584	631	622	596	516	492	467	489
Percentage of Maximum Flow Rate (890 CFS or 575 MGD)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2002	94%	86%	94%	99%	112%	115%	115%	115%	115%	81%	75%	71%	97%
2003	70%	57%	36%	78%	100%	101%	109%	106%	92%	71%	73%	70%	80%
2004	57%	65%	34%	66%	101%	105%	107%	107%	107%	97%	89%	105%	87%
2005	31%	10%	44%	58%	86%	92%	109%	106%	107%	92%	92%	85%	76%
2006	57%	58%	51%	56%	100%	96%	108%	107%	97%	107%	98%	75%	84%
Average	62%	55%	52%	71%	100%	102%	110%	108%	104%	90%	85%	81%	85%

Table 2-2. Total Degree-Days Accumulated at the Mixing Zone Boundary during May and June-October 1997-2007 and Their Annual Rankings

Year	*May*	*Rank*	*Jun-Oct*	*Rank*
1997	548	11	4,831	10
1998	952	1	5,228	8
1999	819	6	5,333	7
2000	869	4	5,103	9
2001	769	8	4,544	11
2002	687	10	5,431	6
2003	816	7	5,518	5
2004	880	3	5,888	2
2005	736	9	5,853	3
2006	857	5	5,778	4
2007	894	2	6,114	1

3 RETROSPECTIVE ASSESSMENT

3.1 Evidence of Thermal Adaptations

The Coffeen Power Station has been operating for over 40 years, and water temperatures at or above the proposed site-specific thermal standards (96^{o}F and 102^{o}F) have occurred repeatedly. A retrospective assessment provides the strongest evidence of the long-term effects of periodically higher water temperatures in that it integrates all aspects of the thermal environment on the life cycle for the fish species and the lower trophic levels in the lake, such as phytoplankton, epiphyton, macrophytes, zooplankton, and benthos.

In an assessment of the potential influence of elevated water temperatures on the biota of a cooling lake such as Coffeen Lake, it is general practice to select species for detailed analysis which (1) are important because of their societal or ecological value, and (2) can adequately represent other species not studied to the same extent. These selected species are usually referred to as "representative important species" or RIS. Following extensive studies on the thermal impacts of Coffeen Power Station on the biota of Coffeen Lake conducted during 1978-1981 (Tranquilli and Larimore 1981) and 1997-1999 (Heidinger et al. 2000), three fish species were selected to be monitored on an annual basis thereafter to comply with the requirements of the thermal standard variance issued by the Illinois Pollution Control Board on 5 July 1997 (see Section 1.2). These three species— largemouth bass, bluegill, and channel catfish — are primary components of the recreational fishery of Coffeen Lake.

The RIS populations in Coffeen Lake were studied annually from 1997 to 2004, including the period (June 1997-July 1999) when the June 1997 variance was in effect, and for the more than seven years that followed (Heidinger et al. 2000, 2001, 2002; Brooks 2004, 2005). Data collected by the SIUC field studies were supplemented by data collected during the same years by the Illinois Department of Natural Resources (IDNR). Among other things, the SIUC studies tracked the recruitment of individual year classes of largemouth bass; and the growth, condition, and mortality of all three RIS. The results from these annual studies provide information on the welfare of the populations, the response of population parameters to annual variations in water temperatures, and possible adaptations to the artificially heated thermal environment.

The Coffeen Lake populations for all three species are maintained by natural reproduction. Therefore, all life stages from eggs to adults can be influenced by the effects of the thermal discharge from Coffeen Power Station. However, not all life stages may be present during May and October, the months for which thermal standard revisions are being considered. The presence or absence of the early life stages, especially eggs, larvae and juveniles (i.e., young-of-the-year or YOY), during May is dependent on the spawning dates for each species. Spawning dates are influenced by water temperature which along with photoperiod, controls gonad maturation of spawning adults and serves as an external cue for spawning.

Fish spawning dates and ichthyoplankton have been investigated in the past on Coffeen Lake (Perry 1981; Tranquilli and Perry 1981; Newman 1981a, 1981b; Ackerson 2000). Data from these previous studies and from other sources can be used to estimate the monthly occurrence of each life stage for the three RIS with respect to exposure to water temperatures during May and

October. Monthly water temperatures that prevailed at the time of these studies may have since been modified, e.g., warmer temperatures now may occur earlier in the spring, possibly accelerating the time of spawning and early life stage development.

The occurrence of each life stage (spawning, egg or embryo, larva, juvenile, and adult) for each of the three RIS was estimated for each month from March through October in the eastern (discharge) arm and in the western arm (intake) in Figures 3-1 and 3-2. These charts were derived using either documented monthly occurrence of each life stage or, in cases where life-stages were not collected, by inference based on water temperatures and life stage duration values derived from published scientific literature. In the case of largemouth bass and bluegill, information from the two sources (documented and inference) is superimposed for some life stages to test their validity.

3.2 Largemouth Bass (*Micropterus salmoides*)

The largemouth bass is the most important sport fish in Coffeen Lake, where the fishery for it is considered to be exceptional. During the 2001 creel survey by the Illinois Natural History Survey (INHS), it was among the three most frequently caught and harvested fish species in Coffeen Lake, along with channel catfish and white crappie. Largemouth bass was the species targeted by 41 percent of all interviewed anglers during the 2001 creel survey.

There is evidence that largemouth bass spawning occurs earlier in Coffeen Lake than in other regional lakes not receiving thermal effluents. Optimal spawning temperatures for largemouth bass range from 60 to 75^{o}F (Heidinger 1975). Normally, these temperatures regionally might occur in May and June (Smith 2002). However, during 2004-2007 this temperature range has occurred during March and April in the eastern arm of Coffeen Lake (Figure 3-1) and during March-May in the western arm (Figure 3-2).

In 1979, Tanquilli and Perry (1981) used the maturation stage of the gonads of female largemouth bass, as well as their gonadosomatic index or GSI (gonad weight relative to total body weight), to estimate spawning dates in Coffeen Lake. They found that largemouth bass in the heated, eastern arm of the lake began spawning in mid or late March, but did not begin spawning in the western arm until late April or May. Water temperatures in the western arm may be warmer now than in 1979, possibly causing spawning to occur even earlier than observed in 1979.

Early spawning by largemouth bass has been documented in other regional lakes that receive thermal effluents. Lake Sangchris, also located in central Illinois, receives thermal effluent from the Kincaid Generating Station (Tranquilli et al. 1981). During 1975-1977, spawning in Lake Sangchris occurred at 15-21^{o}C (59-70^{o}F) in early April to mid-May in the heated area of the lake and late April to mid-May in other areas. Tanquilli and Perry (1981) concluded that largemouth bass spawned earlier in Coffeen Lake than in Lake Sangchris because of the warmer temperatures in Coffeen Lake.

At Thomas Hill Reservoir in Missouri, Witt et al. (1970, in Tranquilli et al. 1981) also found gonad development and the timing of spawning for largemouth bass to be accelerated by a thermal discharge. While not detecting a difference in the GSI of largemouth bass in heated and unheated areas of Par Pond, South Carolina, Bennett and Gibbons (1975) speculated that thermal

effluent from the Savannah River Plant accelerated gonad development of largemouth bass, where spawning started in March and continued through April. Largemouth bass in two other power plant cooling reservoirs in Illinois, Newton Lake and Lake of Egypt, apparently spawn from late March to mid-May based on estimated hatching dates (Ackerson 2000).

At 60-67^{o}F, largemouth bass eggs hatch in 3 to 4 days (Kramer and Smith 1960). Life stage duration for the larval stage (6-16 mm length; Tin 1982) at 66.7^{o}F is 19 days (http://www.fishbase.com). Therefore, juvenile largemouth bass 16 mm total length (TL) or larger should be found within approximately 3-4 weeks of the date of spawning. The months when largemouth bass life stages are predicted to be present in the eastern and western arms of Coffeen Lake, as shown in Figures 3-1 and 3-2, are derived from this information. Largemouth bass larvae, juveniles, and adults should be the dominant life stages present in the eastern, discharge arm during May, whereas spawning and largemouth bass embryos may still be present in the cooler, western arm in May. In October, only juveniles (YOY) and adults are present throughout the lake.

3.2.1. Largemouth Bass Recruitment

Stroud and Clepper (1975) made the generalization that power plant effluents favor largemouth bass. Several studies prior to and after their statement appear to support this view, especially in terms of first-year survival and growth and subsequent establishment of the strength of individual year classes. Elevated water temperatures have been shown to improve the production of largemouth bass year classes through various mechanisms, such as earlier spawning; improved survival and growth of embryos, fry,and juveniles; earlier attainment of sizes allowing piscivory; and improved overwinter survival. Although each of these mechanisms can be influenced by factors other than water temperature (e.g., wind-driven currents, fluctuating water levels, and availability of prey), temperature appears to be a dominant factor.

Several researchers have concluded that recruitment of YOY largemouth bass and year class strength are determined by the influence of water temperatures during the earliest life stages, i.e., timing of spawning, embryo development, and growth of fry or larvae. Kramer and Smith (1960, 1962) determined that year class strength for largemouth bass in Lake George, Minnesota was set during the period from egg deposition to 2-week old fingerlings. They found that egg survival and nest success was directly and positively related to mean daily water temperatures. The length that YOY attained by early August was directly related to the total temperature experience to that date, expressed as degree-days over 50^{o}F. Jackson and Noble (2000) found year class abundance of 50-mm largemouth bass in Jordon Lake, North Carolina to be significantly correlated with air temperatures in late winter and early spring. They hypothesized that year class strength is determined by the success of early spawners under the conditions of stable, warm temperatures and shorter egg incubation times.

Earlier spawning can impart benefits that last throughout the first year of life. In Lake Sangchris, areas heated by the effluent from the Kincaid Generating Station resulted in earlier spawning. Early spawning provided a head start on growth of YOY largemouth bass, which was maintained throughout the growing season and resulted in a prolonged growing season (Tranquilli et al. 1981, Sule 1981). Young produced by earlier spawning had a competitive advantage over young produced later, and their development was not out of phase with their prey base as the result of the warmer temperatures. Tranquilli et al. (1981) also proposed that the thermal effluent

stabilized temperatures, thus avoiding potential temperature declines that could retard or terminate egg incubation. The differing thermal regimes (heated vs. unheated) in Lake Sangchris provided a diversity of spawning conditions and timing, thus helping to maintain a consistent production of year classes over time (Tranquilli et al. 1981). Jackson and Noble (2000) also found variations in year class strength in Jordan Lake, North Carolina to be determined largely by early spring water temperatures which controlled egg survival.

Miller and Storck (1984) observed that young largemouth bass reaching the swim-up fry stage earlier (late May) in Lake Shelbyville, Illinois maintained a faster subsequent growth rate than those reaching swim-up later (mid-June). The faster growth rate allowed them an earlier transition to a fish diet, which ultimately created a bimodal length distribution (piscivorous vs. non-piscivorous individuals). Earlier transition to piscivory decreases competition with other species that are planktivorous or insectivorous, and decreases predation on the young largemouth bass due to their increased growth rates and size (Garvey et al. 2002). Sule (1981) found piscivory in Lake Sangchris to begin at approximately 90 mm length.

Early spawning and faster growth rates may increase year class production by increasing survival, particularly over the winter in temperate regions. Earlier spawning resulting in faster growth and earlier transition to piscivory will lead to larger individuals, which survive the winter months better than smaller individuals (Miller and Storck 1984, Jackson and Noble 2000). Overwinter survival is promoted by less depletion of energy stores, greater resistance to disease, and reduced predation (Gutreuter and Anderson 1985, Fullerton et al. 2000, Garvey et al. 2002). Miranda and Hubbard (1994) found that largemouth bass >126 mm in length had greater overwinter survival rates than smaller individuals. Furthermore, the relatively warm temperatures in Coffeen Lake during the winter may permit young largemouth bass to continue feeding and assimilating energy for growth as long as prey are available. Age-0 largemouth bass will continue to feed at 6^{o}F and warmer, which can offset loss of fat reserves during winter months (Fullerton et al. 2000, Garvey et al. 2002).

From these historical studies, it is apparent that elevated water temperatures in Coffeen Lake should benefit the largemouth bass population overall in terms of reproduction, growth, and survival. Whether annual variations in the thermal environment of Coffeen Lake have influenced recruitment of individual year classes can be investigated using the results of the SIUC and IDNR studies in 1997-2004. Recruitment of YOY and yearling bass was monitored by electrofishing surveys conducted in the fall (Brooks 2005). SIUC and IDNR produced independent indices of annual abundance expressed in terms of catch-per-hour (CPUE). These annual index values were regressed against the total degree-days[1] accumulated during May-August in the same year.

The IDNR CPUE indices for YOY (age-0) largemouth bass in 1997-2004 were consistently higher than the SIUC indices (Figure 3-3), but there was not a significant relationship (α=0.05) with total May-August degree-days for either set of indices (Table 3-1). The highest abundance of YOY according to the IDNR index occurred during 1997 and 2004, which represented both the warmest (2004) and the coolest (1997) growing seasons. The SIUC index showed five years

[1] see Section 2.3.3 for the derivation of degree-days

(1997, 1999, 2001, 2002, and 2004) to be nearly equal and higher than the other three years (1998, 2000, and 2003).

The results of this analysis suggest that annual variation in recruitment of YOY largemouth bass was influenced by factors other than accumulated water temperatures within the temperature range existing during the eight years of data collection. However, the range of index values was relatively small from year to year, particularly for the SIU index, suggesting fairly consistent recruitment annually.

3.2.2. Largemouth Bass Growth and Condition

The growth advantage of YOY largemouth bass in Coffeen Lake is readily demonstrated by comparison of mean total lengths reached over the summer and early fall growing seasons compared to other lakes and reservoirs in Illinois. Mean total length in Coffeen Lake by late October or mid-November has ranged from 140 to 206 mm (Table 3-2). These lengths are approximately 50-90 mm greater than the lengths reached in nine other locations, which include both unheated waters and heated waters (Lake Sangchris). First year growth in Newton Lake, another power plant cooling reservoir, was similar but slightly less than in Coffeen Lake (Table 3-2).

The first year growth advantage in Coffeen Lake is maintained in subsequent years of life. This is illustrated by a comparison of mean total length at the age of annulus formation, as determined by backcalculation methods, for Coffeen Lake and the state-wide means of sampled populations from 24 states (Table 3-3). Through age-4, Coffeen Lake largemouth bass are larger than from any other location except Newton Lake. Typically, freshwater fish species grow faster at lower latitudes because of a prolonged growing season. This phenomenon is evident in that most of the states ranked near the top in Table 3-3 are southern states such as Florida, Louisiana, Alabama, Tennessee, North Carolina, and Arkansas. However, bass in Coffeen Lake are even larger than in these southern states.

The mean total length reached by YOY largemouth bass in Coffeen Lake by late-October or mid-November did not appear to be significantly (α=0.05; Table 3-1) related to their thermal history, expressed as accumulated degree-days from May through August. However, there was an apparent trend of increasing size with increasing temperatures (Figure 3-4) in that the largest mean lengths occurred in recent years (2000, 2002-2004) when the total degree-days were average or higher. The year 1998, which was among the warmest, was an obvious exception to this trend. When the months of accumulated degree-days were changed from May-August to April-June, a significant (P=0.036) positive relationship with mean total length of YOY bass was found (Figure 3-5). From these results, it appears that the thermal history during the earliest period of growth (i.e., April through June) had the greatest influence on annual growth rates for YOY largemouth bass.

A positive relationship between temperatures and growth also was found when mean lengths of age-1 fish were estimated by backcalculation for the time of the first annulus formation (Figure 3-6). However, this relationship was not statistically significant at α=0.05 (Table 3-1).

Relative weight (W_r) is an index that is commonly used by fisheries scientists to evaluate the physical condition or plumpness of fish. Relative weight is the ratio of the observed weight of a

fish to a length-specific standard weight determined by length-weight regression for the species as a whole, including multiple populations from regions throughout the species' range (Murphy et al. 1991). The ratio is multiplied by 100 to express it as a percentage, where 100 represents a better than average condition, equivalent to a management goal.

Mean relative weight values were available for largemouth bass juveniles and adults caught by SIUC and IDNR in Coffeen Lake during 1997-2004 (Brooks 2005). These values were regressed on total accumulated degree-days for May-August to determine whether there was a relationship between fish condition and annual temperatures as measured near the surface at the mixing zone boundary. Separate analyses were conducted from SIUC and IDNR data. Neither data set showed a significant relationship at α=0.05 (Table 3-1), but annual rankings did appear consistent between the two data sets (Figure 3-7). Annual differences in relative weight appeared to be influenced by factors other than the thermal environment of each year. Overall, mean W_r was 100 or greater, indicating a very healthy, robust largemouth bass population throughout the eight-year period.

3.3 Bluegill (*Lepomis macrochirus*)

The bluegill is a panfish species that is highly prized by anglers and is also ecologically important as a forage species. Bluegills serve as prey to many game species such as largemouth bass, and occur in all habitats but most frequently are found near vegetation and woody debris.

Bluegill are reported to spawn from late May through August in the region, at water temperatures of 67 to 80°F (Cornish and Welke 2004). A prolonged spawning season is also evident in Coffeen Lake. Based on the timing of capture and size of larval fish belonging to the genus *Lepomis*, Ackerman (2000) concluded that hatching occurred from late April to mid-October in 1998 and from early May to mid September in 1999 in the eastern arm of Coffeen Lake. In the cooler western arm, hatching occurred from mid-May to early October in 1998 and early May to mid-September in 1999. Peak hatching, based on relative abundance of larvae, occurred in mid- to late June in the eastern arm and mid-July to mid-August in the western arm.

Bluegill eggs hatch in approximately 48 h at 77°F (Merriner 1971). The larval stage lasts 30 days at 74.3°F (http://www.fishbase.com). In 1980, larval *Lepomis*[2] were caught as early as late April in the eastern arm and late May in the western arm, and were present when sampling concluded in late August (Newman 1981a). In the late 1990s, larval and early juvenile *Lepomis* 4-20 mm in length were captured by tow nets and light traps from mid-April to mid-October in 1998, and mid-May to mid-September in 1999 (Ackerson 2000). Sampling ended in mid-October in 1998 and mid-September in 1999.

Based solely on water temperatures and literature information that spawning can begin at 67°F, bluegill spawning could begin in Coffeen Lake as early as March in the eastern, discharge arm (Figure 3-1). However, the 1998-1999 studies did not indicate spawning or the presence of larval *Lepomis* prior to late April (Ackerman 2000). Therefore, spawning and eggs (embryos) most likely occur from April to October in the eastern arm (Figure 3-1) and May to October in

[2] No distinction was made between larval and early juvenile fish based on morphometrics or length.

the western arm (Figure 3-2). Juveniles would follow in approximately 1 month. Adults are present year-round.

3.3.1. Bluegill Growth and Condition

Although bluegill growth is influenced by temperature, growth differences among populations typically originate from intraspecific and interspecific competition for food resources (Spotte 2007). Predation rates on bluegills and competing species in turn influence the degree of food competition. The abundance of food resources usually is correlated with the amount of vegetation and the size of the littoral area within a lake or reservoir. Growth rates can vary greatly among lakes in the same vicinity and experiencing the same climatic conditions.

There is evidence that competition for food is limiting growth of bluegills in Coffeen Lake, resulting in a stunted population. Heidinger et al. (2000) and Brooks (2005) observed that the bluegill population in Coffeen Lake consisted of very few individuals of quality sportfish size (e.g., $\geq$160 mm TL), but instead were forage-size fish that would be available to largemouth bass and other piscivores. A similar stunted population was found in Lake Sangchris, another power plant cooling reservoir (Joy and Tranquilli 1979, in Tranquilli et al. 1981). Coffeen Lake has an abundance of submerged macrophytes, as well as other sunfish species (especially redear sunfish, *Lepomis microlophus*), gizzard shad (*Dorosoma cepedianum*), and now threadfin shad (*Dorosoma petense*). The availability of macrophytes as refuge from predation may be increasing the survival of small fish. In addition, the presence of several competitors such as other sunfish and shad species likely has increased intraspecific and interspecific competition for food resources.

The degree to which bluegill growth has been stunted in Coffeen Lake is shown by a comparison of mean total length at age with other regional bluegill populations (Table 3-4). At age-1, the mean length of Coffeen Lake bluegills (64 mm) is well within the range of age-1 lengths in other regional lake, reservoir, and river populations (56-76 mm). By age-2, Coffeen Lake bluegills are beginning to be slightly smaller, and by ages 3 and 4 are 17 to 108 mm smaller, with the exception of some Indiana lake populations (Table 3-4).

The influence of water temperatures on bluegill growth in Coffeen Lake is unclear. Optimal temperatures for growth are 27.2-32.3^{o}C (81-90^{o}F) (Coutant 1977). This temperature range exists throughout the summer in many locations in Coffeen Lake (Section 2). There was no significant relationship (α=0.05; Table 3-1) between total accumulated degree-days during May-August in 1999-2003 (i.e., initial year of growth for the 1999-2003 year classes) and the mean total length of each corresponding year class as determined by backcalculation at the formation of the first annulus (Figure 3-8). Therefore, within the range of temperatures experienced in Coffeen Lake during this five-year period, the thermal environment appeared to have no effect on first year growth rates.

The mean relative weight (W_r) of juvenile and adult bluegill in Coffeen Lake has been less than 100 (ranging 80-89 in IDNR annual surveys and 76-96 in SIUC annual surveys). These relatively low values are consistent with the hypothesis of competition for food resources stunting growth in the lake. A plot of mean annual W_r values for the two data sources vs. degree-days clearly shows a lack of correlation for either data set (Figure 3-9 and Table 3-1), suggesting

food competition or some other factor, rather than temperature, influences the condition of bluegills.

3.4 Channel Catfish (*Ictalurus punctatus*)

The channel catfish is a very important recreational fish species in Illinois and in Coffeen Lake. During the 2001 creel survey by INHS, it was the most frequently harvested fish species in Coffeen Lake. Adults may be found in many habitats, but prefer habitat with woody debris, bank cavities and moderate currents. In daylight they seek depths with cover and current. At night they feed in shallower depths.

Channel catfish have been found to spawn at water temperatures ranging from 21 to 28^{o}C (69.8-82.4^{o}F) in the spring (Hubert 1999). Eggs take 6-10 days to hatch at temperatures of 16-26^{o}C (60.8-78.8^{o}F) (Hubert 1999) and 3-8 days at 27-28^{o}C (80.6-82.4^{o}F). The larval stage lasts 12-16 days (http://www.fishbase.com).

Surveys conducted on Coffeen Lake have not collected channel catfish eggs or larvae except for entrainment studies at the Coffeen intake in 1980, when larvae appeared in collections from 9 June to 30 June (Newman 1981b). Eggs and larvae would be expected to be uncommon in ichthyoplankton collections because channel catfish build and tend nests, thus protecting young from being dislodged or lost. Therefore, predicting the monthly occurrence of early life stages for channel catfish depends heavily on the relationship of spawning to water temperatures.

Stable water temperatures in the range of 70-82^{o}F occur in April and May in the eastern, discharge arm of Coffeen Lake (Figure 3-1) and in May and June in the western arm (Figure 3-2), and that is likely when channel catfish spawn. The occurrence of larval channel catfish in June 1980 entrainment collections from the western arm appears to corroborate this prediction. Allowing for approximately 1 week for hatching and 2 weeks for larval development (life stage duration), larvae would be present during the same months and shortly thereafter, i.e., April-June in the eastern arm and May-July in the western arm (Figures 3-1 and 3-2). Regarding the two months of interest, juveniles would occur in May in the eastern arm but not in the western arm, and would occur throughout the lake in October.

3.4.1. Channel Catfish Growth and Condition

Available data do not show a clear effect of water temperatures on the growth and condition of channel catfish in Coffeen Lake. The length at age for channel catfish in Coffeen Lake falls within the range of values for other channel catfish populations studied in rivers, lakes, and other reservoirs in the Midwest or South (Table 3-5). The mean relative weight of juveniles and adults in Coffeen Lake during 1997-2004 has approached 100 in some years (84-93 in IDNR annual surveys and 80-98 in SIUC annual surveys). There was no significant (α=0.05) relationship annually between mean relative weights and degree-days accumulated from May through August for either the IDNR or SIUC data sets (Figure 3-10 and Table 3-1), indicating that annual changes in the thermal environment had no effect on the condition of channel catfish in Coffeen Lake.

3.5 Fish Standing Crops

Perry and Tranquilli (1981) sampled Coffeen Lake using cove-rotenone techniques to estimate the standing crops of fish species in the lake at that time, and to compare the estimates to other heated and unheated reservoirs in Illinois and elsewhere. They concluded that largemouth bass standing crops in Coffeen Lake during 1979-1980 were intermediate among the mean values for standing crops for Lake Sangchris, a heated reservoir in Illinois; Lake Shelbyville, an unheated flood control reservoir in Illinois; Midwestern lakes, and lakes in the mid-south (Table 3-6). Channel catfish and bluegill standing crops were considerably higher than in the other lakes and reservoirs, as were all species combined except for Lake Shelbyville.

While fish abundance data for Coffeen Lake in the intervening years between 1980 and 1997 are not available, fall electrofishing catch per hour data are available from both the IDNR and SIUC surveys for the three RIS for the eight years from 1997 to 2004 as a measure of relative abundance (Table 3-7). The relative abundance indices from both data sources were variable but showed no sustained trend.

Available data are not definitive concerning the abundance of fish through the years. However, they do indicate that midway during the existence of Coffeen Lake (1979-1980) the fish population sizes for the three RIS compared favorably with other midwestern and southern populations. Recent data suggest the populations are relatively stable with no consistent trend, suggesting that Coffeen populations still compare favorably to those in the other locations.

When mean catch-per-hour values from the IDNR surveys of 1997-2004 were regressed on degree-days for May-August, a significant negative relationship (r^2=0.5271, P=0.0414; Figure 3-11) was found for juveniles and adult bluegills, but not for largemouth bass or channel catfish or for SIUC indices for bluegill (Table 3-1). This relationship was greatly influenced by the data point for 1997, when catch rates were high and degree-days were lowest (Figure 3-11). Since there is no other evidence of a declining trend in abundance, these results might reflect a direct or indirect relationship between temperatures and the susceptibility of bluegills to capture by electrofishing.

3.6 Recent IDNR Survey Results

IDNR periodically produces reports on the status of its lake management plan for Coffeen Lake. The most recent report (Pontnack 2007) summarizes the current status of game species in Coffeen Lake based on results from annual fall electrofishing programs over the period from 2000 to 2006.

With regard to largemouth bass, the population is described as being “solid”, although fish ranging from 15 to 19 inches in length appeared to be declining in abundance, while the numbers of fish >20 inches remained stable. Relative weight (W_r) declined from 102 in 2004 to 95 in 2006, raising a concern that additional forage fish might be needed. However, W_r remained within the plan’s objective range of 90 to 110. Proportional stock density (PSD or the percentage of stock fish equal to or exceeding quality length) values of 78-89 were consistently higher than the objective of 50-70, signifying a high quality fishery for large bass.

The bluegill population was characterized as being dominated by young, small fish. While mean catch rates have increased since 2004, they were near the overall mean for the period but below the targeted value. Mean relative weights (82-89) were below the target range of 90-110.

The abundance of channel catfish has increased approximately three-fold since 2003 as indicated by catch-per-effort, but relative weight decreased since 2003 from 90 to 85. Mean W_r values in 2000 (93) and 2001 (94) were well within the targeted range of 90-110. Based on the electrofishing catch, the PSD for the channel catfish population (7-35) is below the plan's objective of 40-60, indicating a dominance of fish smaller than quality size. However, a size bias may exist if larger fish are not as vulnerable to capture by electrofishing because of their preference for the deepest portions of the lake.

White crappie (*Pomoxis annularis*), while not one of the three RIS, is an important and popular game species in Coffeen Lake. Catch rates declined in 2006 from values that previously were consistently near the plan objective. Relative weights declined from targeted values >90 to 87 in 2004 and 85 in 2006. PSD (73-100) remained well above the objective of 40-60, indicating an abundance of large crappie. The abundance of white crappie was noted to be cyclical throughout its geographic range, so cycles may be expected to occur in Coffeen Lake as a function of year class production.

3.7 Habitat Conditions During Previous Fish Kills

As is evident from the stated conditions for the variance granted in June 1997 and the subsequent suspension of the variance in 1999 (Section 1.2), thermally-related fish kills are of greatest concern when considering higher thermal limits for Coffeen Lake. Fish kills in Coffeen Lake are infrequent, especially ones that involve more than a few fish. Larger fish kills (up to a few hundred fish) tend to be associated with extraordinary meteorological conditions that, together with maximum summer temperatures, have reduced the amount of available habitat containing adequate dissolved oxygen and temperatures that could be tolerated for an extended period of time (Brooks 2004, 2005; Brooks and Heidinger 2006, 2007). In particular, sudden major increases in temperature or prolonged periods of hot humid weather with extensive cloud cover have been suggested as the causes of these incidents (Brooks 2005). Rapid temperature increases can entrap small pockets of fish leaving no route of passage to more thermally suitable habitat elsewhere in the lake. Extensive cloud cover limits photosynthetic production of oxygen, potentially reducing the habitat containing suitable levels of both temperature and oxygen. Nevertheless even these fish kills have been shown to have had no adverse ecological effect on the fishery (Brooks 2004, 2005; Brooks and Heidinger 2006, 2007). Minor kills involving just a few fish have been attributed to mortalities of angler-released fish or temporary loss of localized cool-water refuges as heated currents circulate in the lake. Kills on a somewhat larger scale (i.e., 179-223 fish found) have occurred in the summers of 1999 and 2001. By investigating the conditions prevailing at the time of these larger kills, the relative risk of fish kills during May and October under revised thermal standards can be evaluated.

Fish kills were more prevalent in Coffeen Lake during the period from 1999 to 2002 (Brooks and Heidinger 2006, 2007). This period was used as a source of information on conditions prevailing during the fish kills. The fish kills were documented as part of the weekly lake surveys conducted by SIUC during these years. The surveys recorded the number of carcasses of each

species found and the locations where they were found. Since the surveys only occurred on one day per week, the actual dates that fish succumbed and the actual localized temperature and dissolved oxygen conditions leading up to their deaths could not be determined definitively. However, some patterns are evident that might be useful for predicting whether fish kills could occur during May and October under revised thermal standards.

The dates on which dead fish were found by SIUC sampling crews during April-October 1999-2002 are indicated by arrows superimposed on daily plots of mean water temperatures recorded near the surface at the mixing zone boundary (Figures 3-12 through 3-15). Water temperatures at this location are indicative of the relative heat loading in the lake on each date (see Section 2.3 and Figure 2-6), but generally are higher than existing elsewhere in the lake.

Most notably, the fish kills during 1999-2002 occurred almost exclusively from late June to early August, at the peak of summer water temperatures. The one exception was a minor fish kill documented on 9 April 1999 (Figure 3-12), involving two channel catfish and one carp. The cause of mortality for these few fish is unknown, but their discovery followed an increase in mean daily mixing zone temperature from 74^{o}F on 24 March to 92^{o}F on 7 April (Figure 3-12). Such a sudden rise in temperatures at this time is highly unusual, and this instance equaled the maximum temperatures recorded in early April during 1997-2007 (Figure 2-8). Whether this temperature rise contributed to the mortality of these fish cannot be substantiated.

The three largest fish kills were recorded on 27-28 July 1999 (179 fish counted), 10 July 2001 (223 fish counted), and 24 June-4 July 2002 (124 fish counted). The 27-28 July 1999 event corresponded in time to the warmest mean daily water temperature recorded during the year (112^{o}F; Figure 3-12). Water temperatures had increased steadily from approximately 88-90^{o}F in the mixing zone in late June to this peak 112^{o}F temperature on 30 July. Brooks (2005) observed that this fish kill coincided with high ambient temperatures, in combination with elevated discharge temperatures and prolonged periods of calm, cloudy weather. The meteorological phenomenon of high ambient temperatures and prolonged calm, cloudy weather that occurred on these dates also resulted in fish kills in other, non-heated lakes in this region such as East Fork Lake near Olney, Illinois.

The 10 July 2001 fish kill also followed a period of increasing temperatures, from approximately 91^{o}F in late June to 103.5^{o}F near the surface at the mixing zone boundary on 10 July (Figure 3-14). Mean daily temperatures at this location continued above 100^{o}F for the remainder of the month without apparently causing another fish kill of this magnitude (Figure 3-14). During the week of 24 June to 4 July 2002, 124 fish carcasses were counted (Figure 3-15). This event also occurred when mean daily water temperatures recorded at the mixing zone boundary rose over a period of time to exceed 100^{o}F. Mean daily water temperatures had risen from approximately 88^{o}F in mid-June to 104.8^{o}F on 26 June, after which remained near or above 100^{o}F until late September but no subsequent kills occurred (Figure 3-15).

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Mix zone mean temperature (2004-2007)	69.5	80.2	87.2	101.4	102.9	102.5	100.3	86.1
Mix zone mean temperature range (^{o}F)	44-89	63-92	74-97	88-108	94-110	95-108	75-108	76-100
Largemouth bass spawning	α	α						
Largemouth bass embryos	α	α						
Largemouth bass larvae		α	α					
Largemouth bass juveniles		α	α	α	α	α	α	α
Largemouth bass adults								
Bluegill spawning		#	#	##	#*	#*	#	#
Bluegill embryos		#	#	##	#*	#*	#	#
Bluegill larvae		#	#	##	#*	#*	#	#
Bluegill juveniles			#	#	##	#	#	#
Bluegill adults								
Channel catfish spawning								
Channel catfish embryos								
Channel catfish larvae								
Channel catfish juveniles								
Channel catfish adults								

α - spawning based on gonadosomatic index in 1979 and subsequent life stage durations (Tranquilli and Perry 1981)
- observed occurrence during 1998-1999 using hatch dates and life stage durations (Ackerman 2000)
- month of peak occurrence in 1998-1999 using hatch dates and life stage durations (Ackerman 2000)
* - temporally absent in warm temperatures of 1999 using hatch dates and life stage durations (Ackerman 2000)
shaded - predicted occurrence based on water temperature and life stage duration

Figure 3-1. Life Stage Presence by Month for Three Fish Species in the Discharge Arm of Coffeen Lake

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Intake mean temperature (2004-2007)	56.7	65.5	77.1	86.1	91.7	91.5	86.7	74.7
Intake mean temperature range (^{o}F)	43-73	53-76	65-84	69-96	86-100	85-98	73-92	63-86
Largemouth bass spawning		α	α					
Largemouth bass embryos		α	α					
Largemouth bass larvae			α	α				
Largemouth bass juveniles			α	α	α	α	α	α
Largemouth bass adults								
Bluegill spawning			#	#	##*	##*	#	#
Bluegill embryos			#	#	##*	##*	#	#
Bluegill larvae			#	#	##*	##*	#	#
Bluegill juveniles								
Bluegill adults								
Channel catfish spawning								
Channel catfish embryos								
Channel catfish larvae				e				
Channel catfish juveniles								
Channel catfish adults								

α - spawning based on gonadosomatic index in 1979 and subsequent life stage durations (Tranquilli and Perry 1981)
- observed occurrence during 1998-1999 using hatch dates and life stage durations (Ackerman 2000)
- month of peak occurrence in 1998-1999 using hatch dates and life stage durations (Ackerman 2000)
* - absent in warm temperatures of 1999 using hatch dates and life stage durations (Ackerman 2000)
shaded - predicted occurrence based on water temperature and life stage duration
e - collected in 1980 entrainment samples (Newman 1981b)

Figure 3-2. Life Stage Presence by Month for Three Fish Species in the Intake Arm of Coffeen Lake

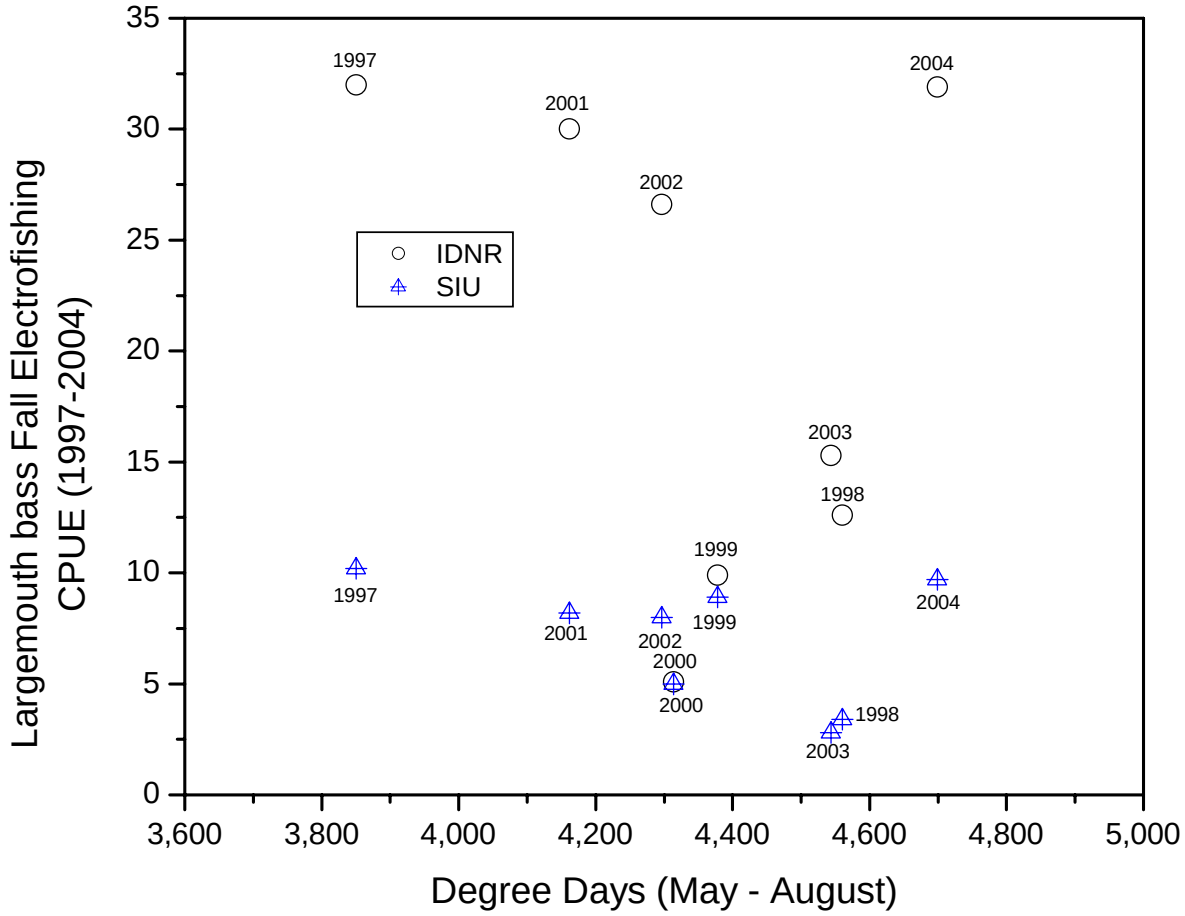

Figure 3-3. Plot of Total Degree-Days during May-August vs. Two Indices (SIUC and IDNR) of Mean Catch-per-Hour of Young-of-Year Largemouth Bass during the Fall, 1997-2004

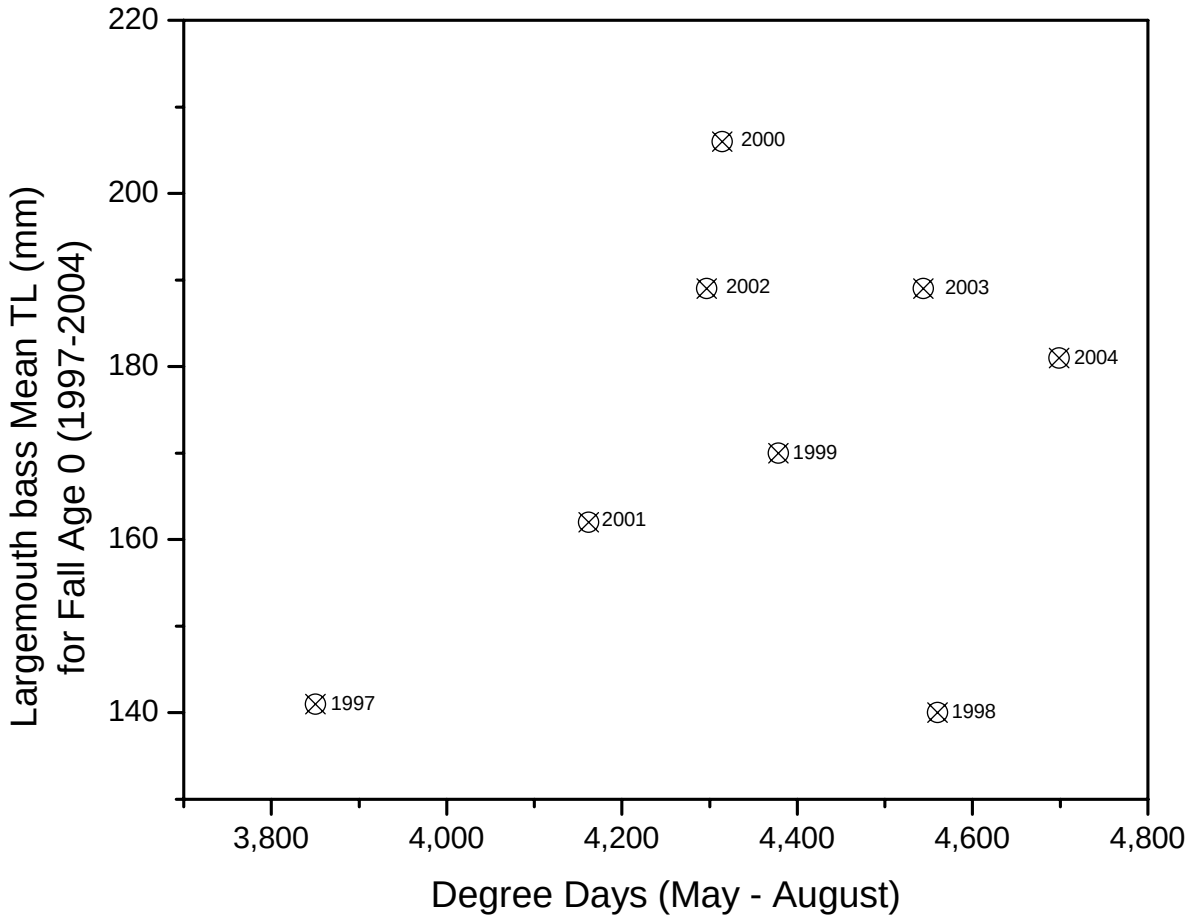

Figure 3-4. Plot of Total Degree-Days during May-August vs. Mean Total Length of Young-of-Year Largemouth Bass during the Fall, 1997-2004

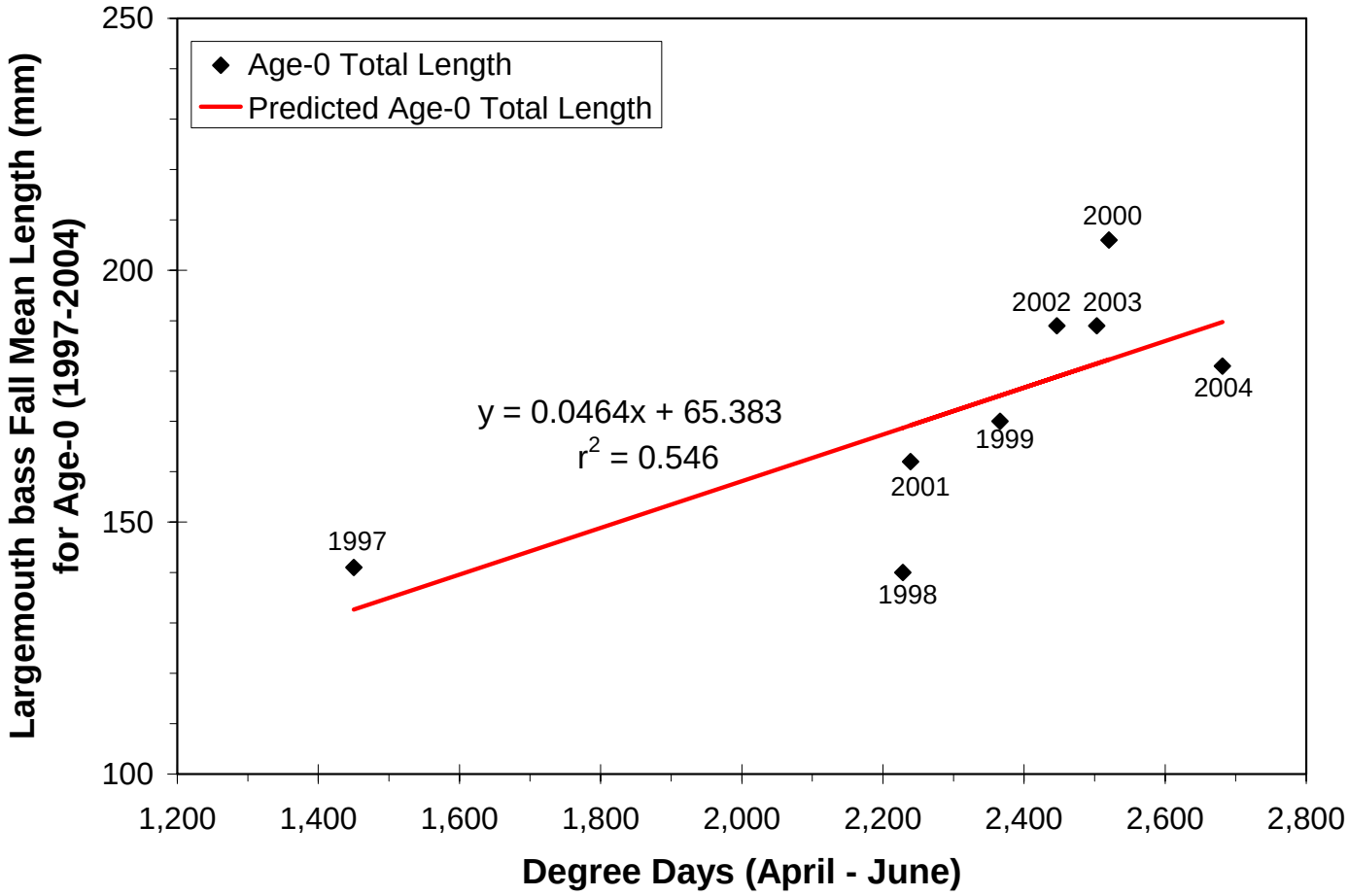

Figure 3-5. Plot of Total Degree-Days during April-June vs. Mean Total Length of Young-of-Year Largemouth Bass during the Fall, 1997-2004

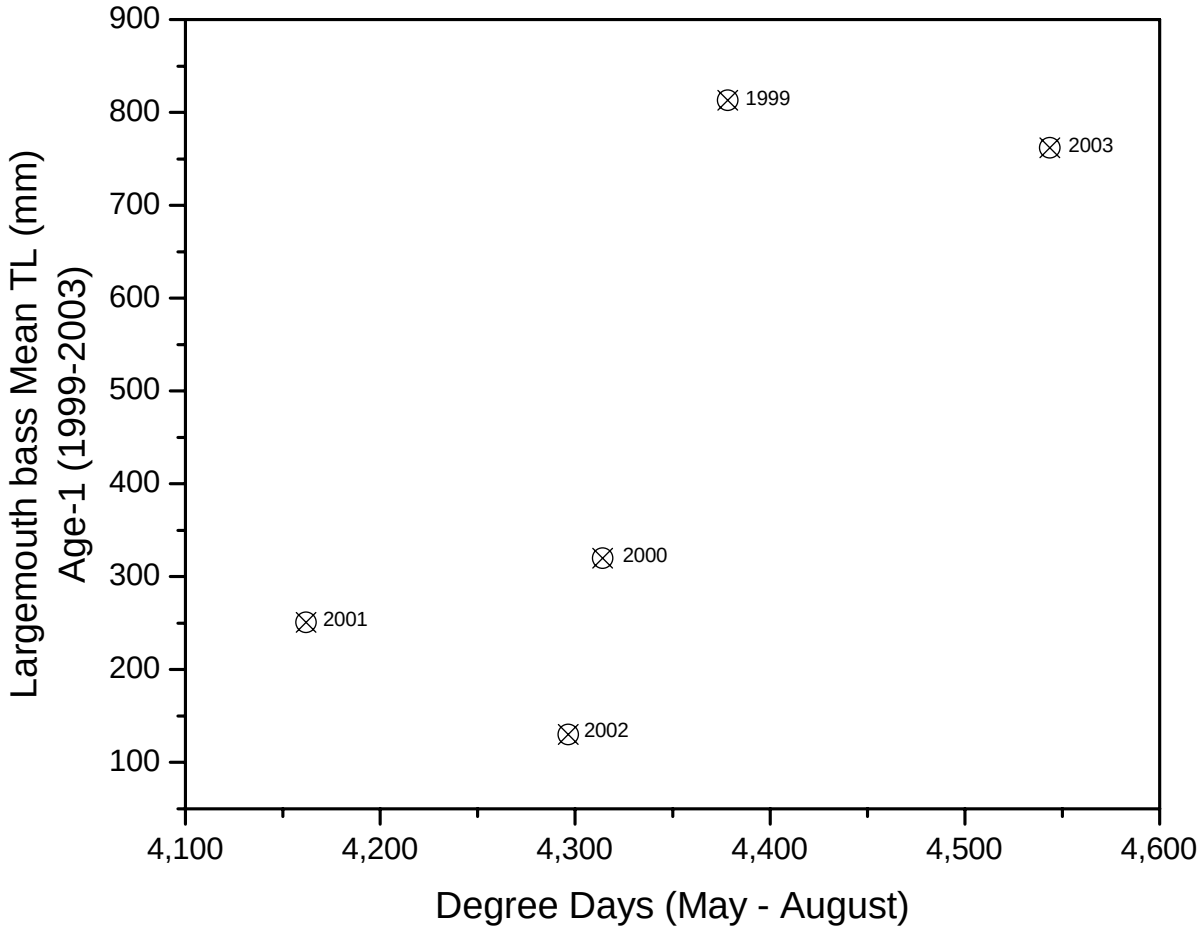

Figure 3-6. Plot of Total Degree-Days during May-August of First Year of Life vs. Mean Total Length of Age-1 Largemouth Bass, 1999-2003

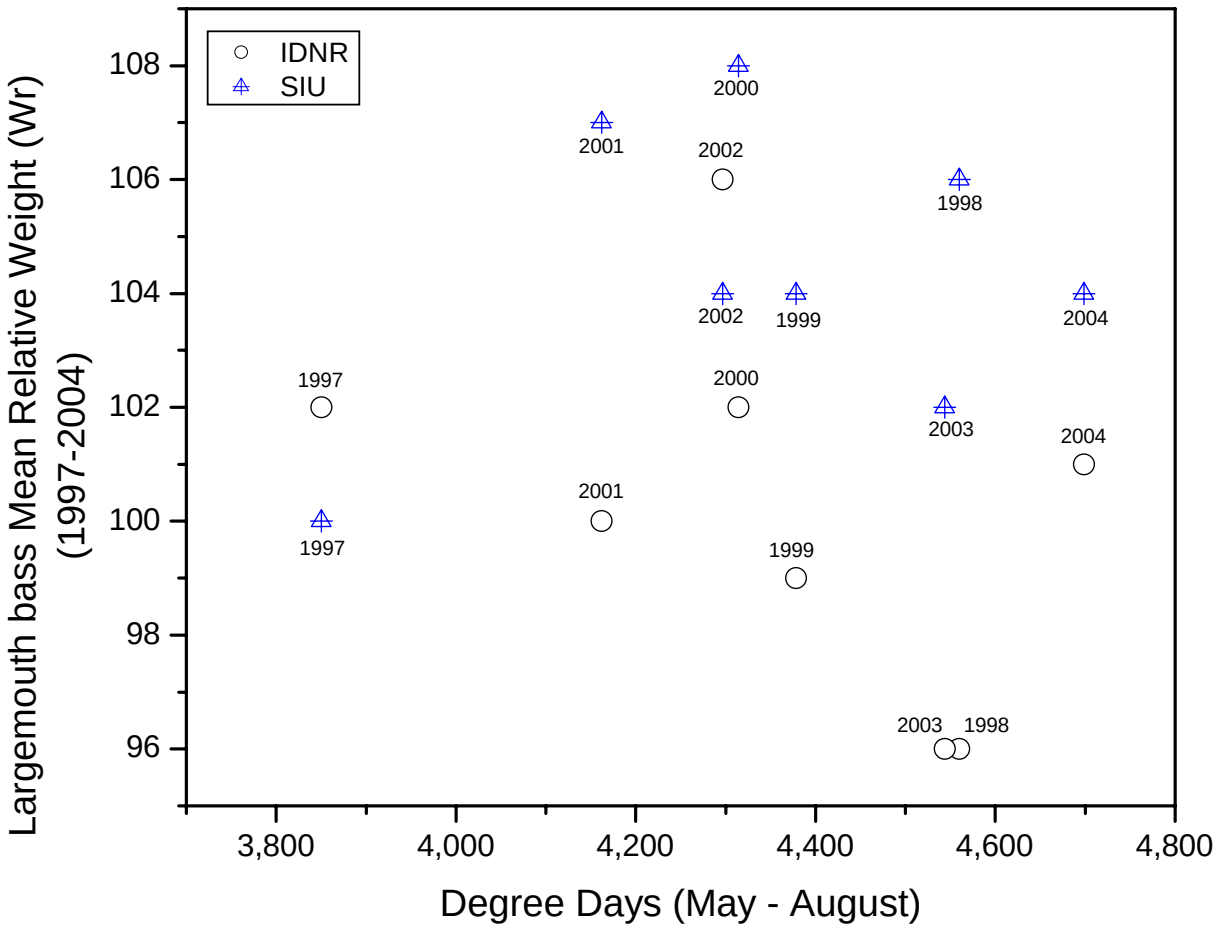

Figure 3-7. Plot of Total Degree-Days during May-August vs. Two Indices (SIUC and IDNR) of Mean Relative Weight for Juvenile and Adult Largemouth Bass during the Fall, 1997-2004

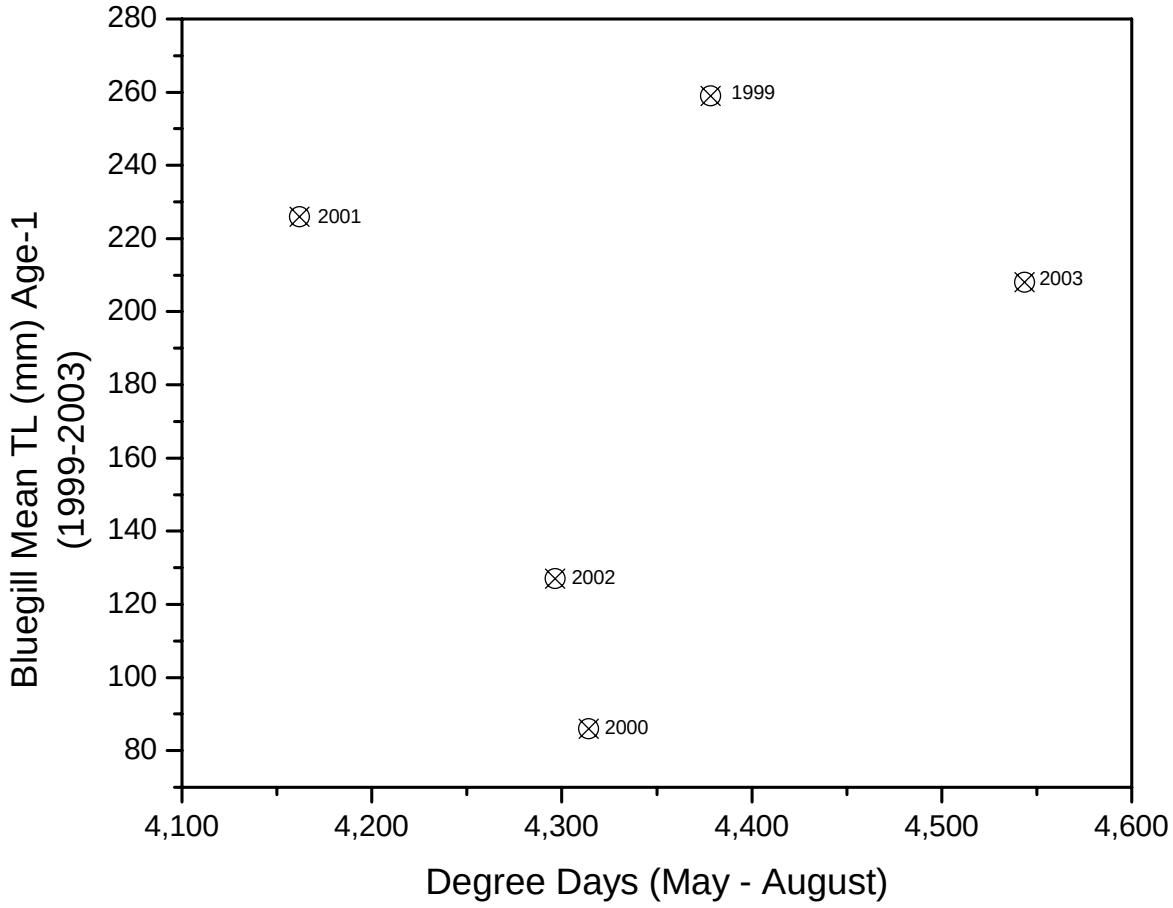

Figure 3-8. Plot of Total Degree-Days during May-August of First Year of Life vs. Mean Total Length of Age-1 Bluegill, 1999-2003

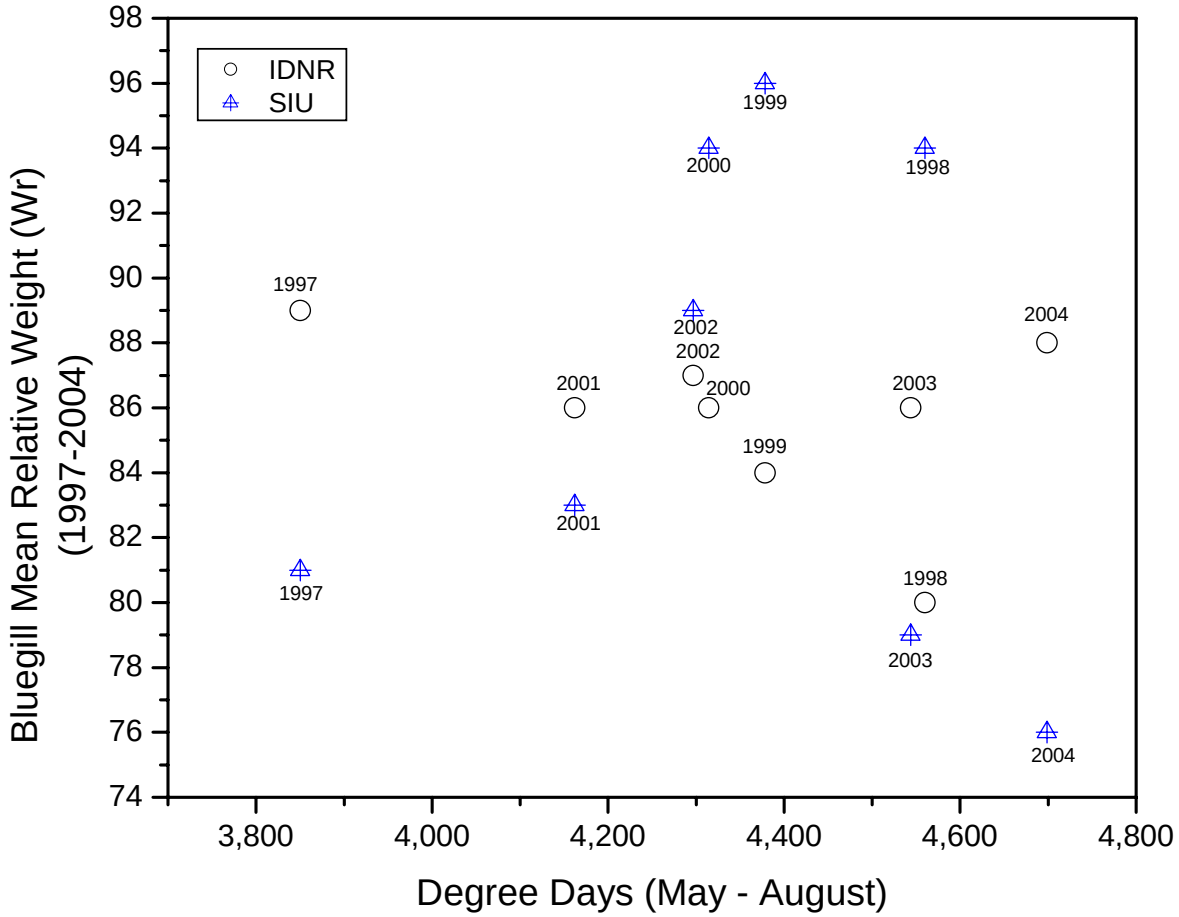

Figure 3-9. Plot of Total Degree-Days during May-August vs. Two Indices (SIUC and IDNR) of Mean Relative Weight for Juvenile and Adult Bluegill during the Fall, 1997-2004

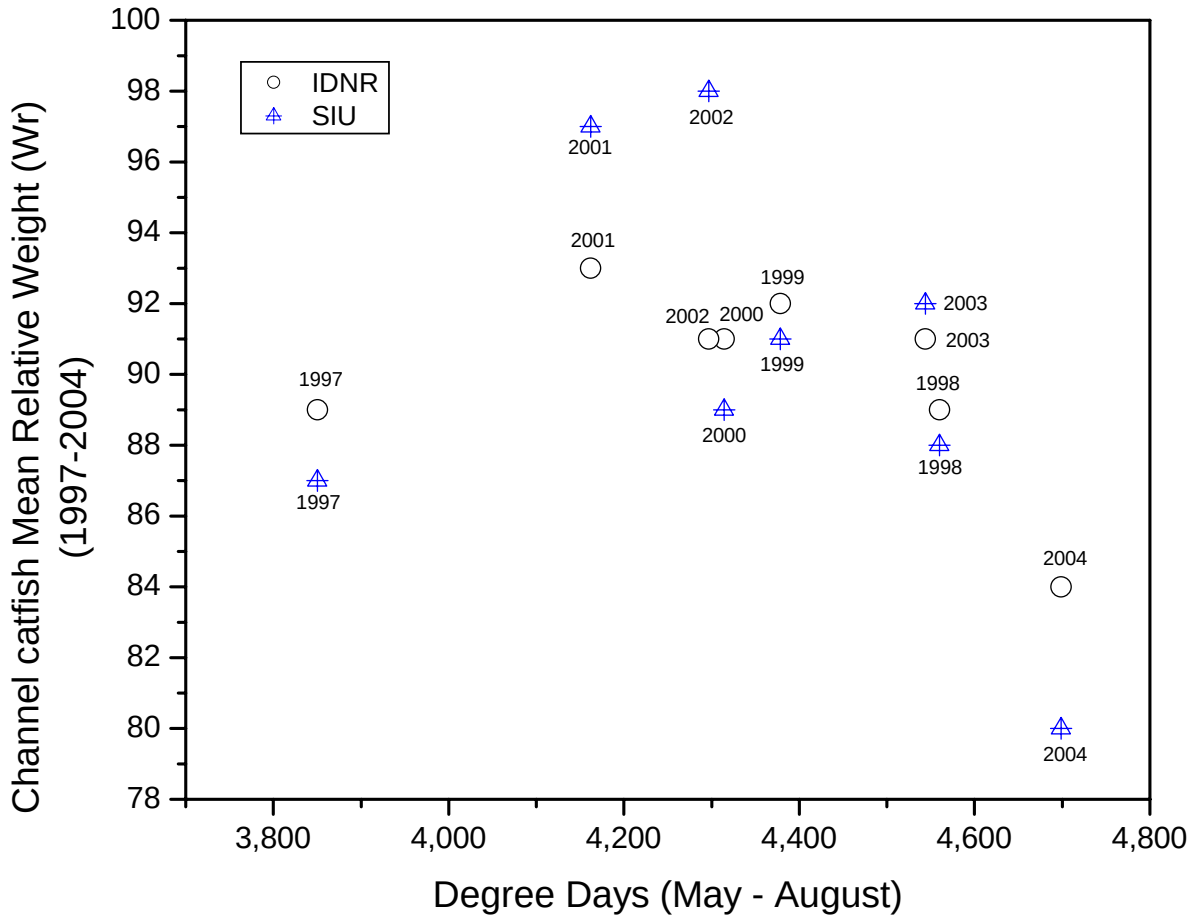

Figure 3-10. Plot of Total Degree-Days during May-August vs. Two Indices (SIUC and IDNR) of Mean Relative Weight for Juvenile and Adult Channel Catfish during the Fall, 1997-2004

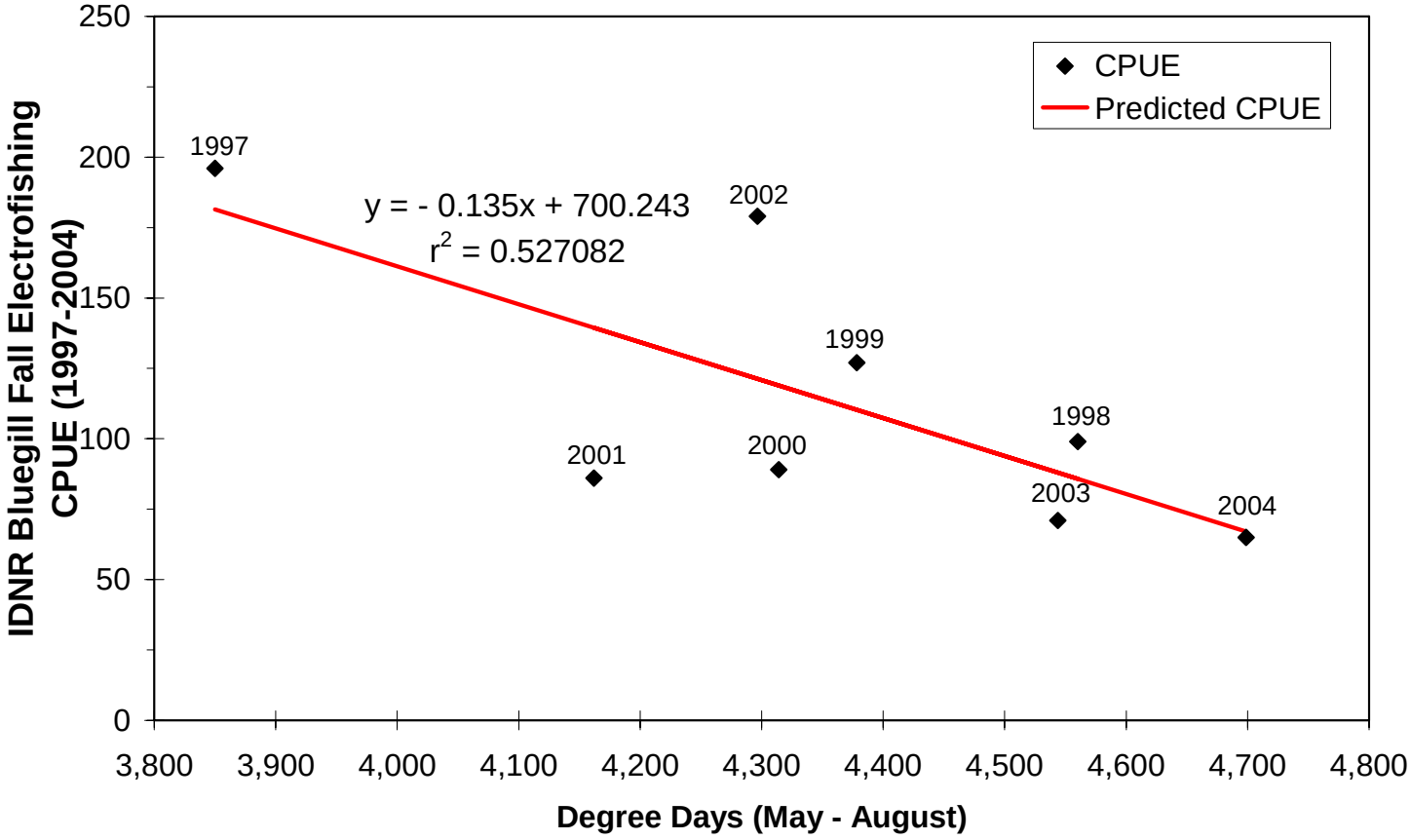

Figure 3-11. Regression of Accumulated Degree-Days at the Mixing Zone Boundary during May-August vs. IDNR Mean Catch-per-Hour of Juvenile and Adult Bluegill, 1997-2004

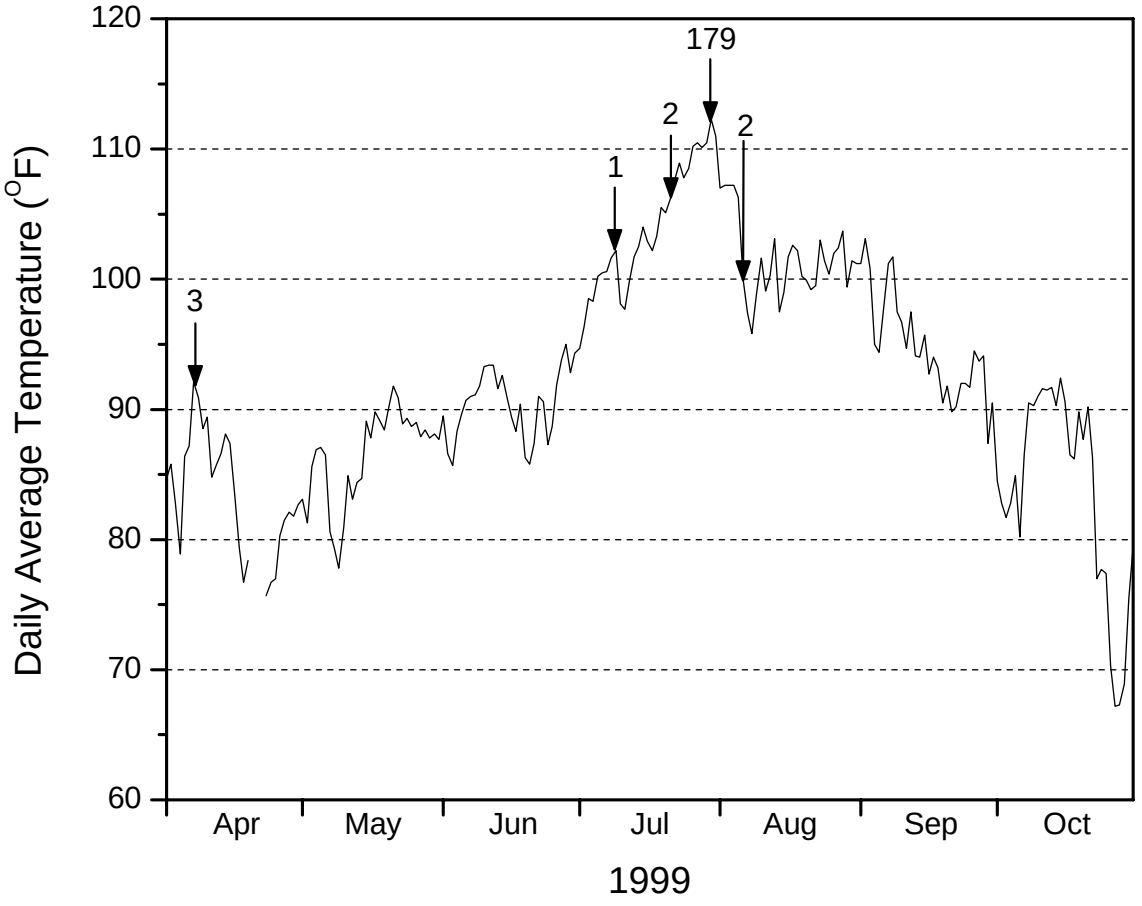

Figure 3-12. Mean Daily Near-Surface Water Temperature at the Mixing Zone Boundary, April-October 1999 and Dates of Observed Fish Kills as Indicated by Arrows (Number of Fish Recovered Shown Above Arrows)

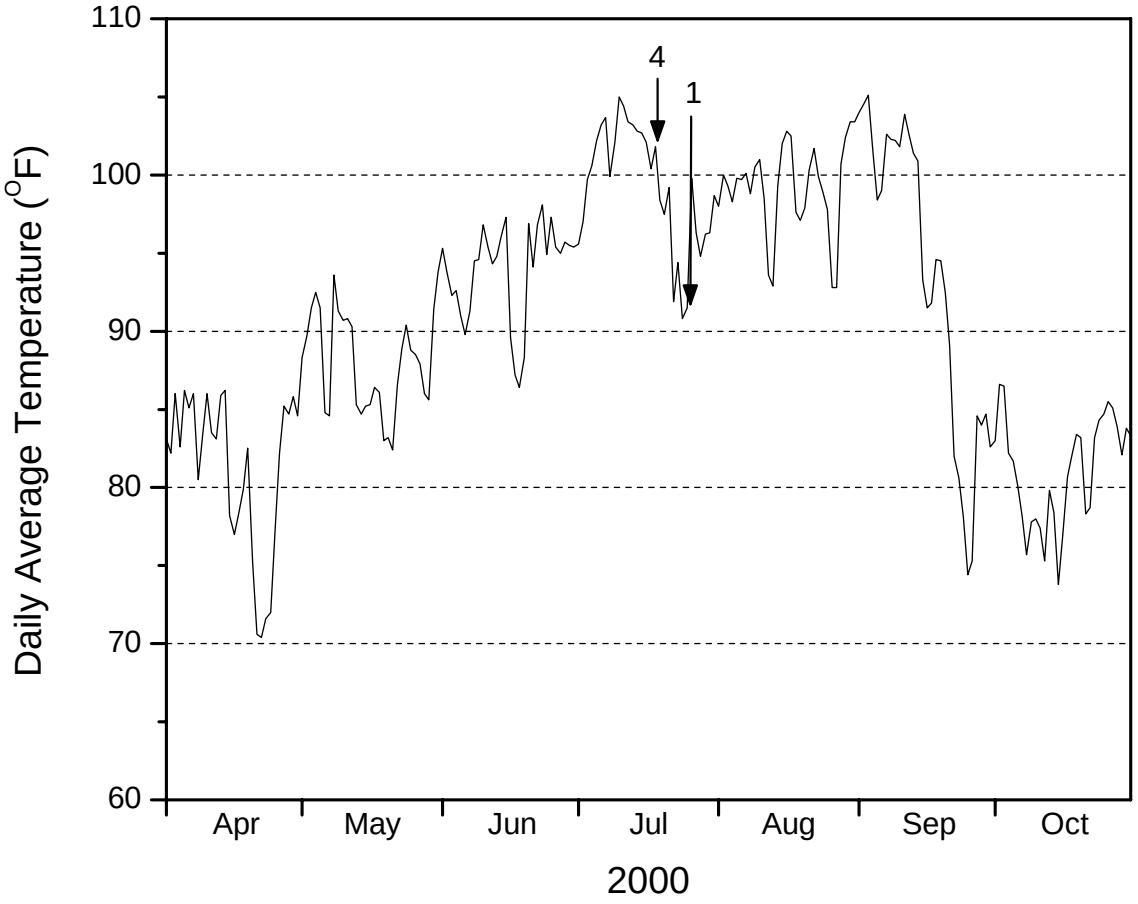

Figure 3-13. Mean Daily Near-Surface Water Temperature at the Mixing Zone Boundary, April-October 2000 and Dates of Observed Fish Kills as Indicated by Arrows (Number of Fish Recovered Shown Above Arrows)

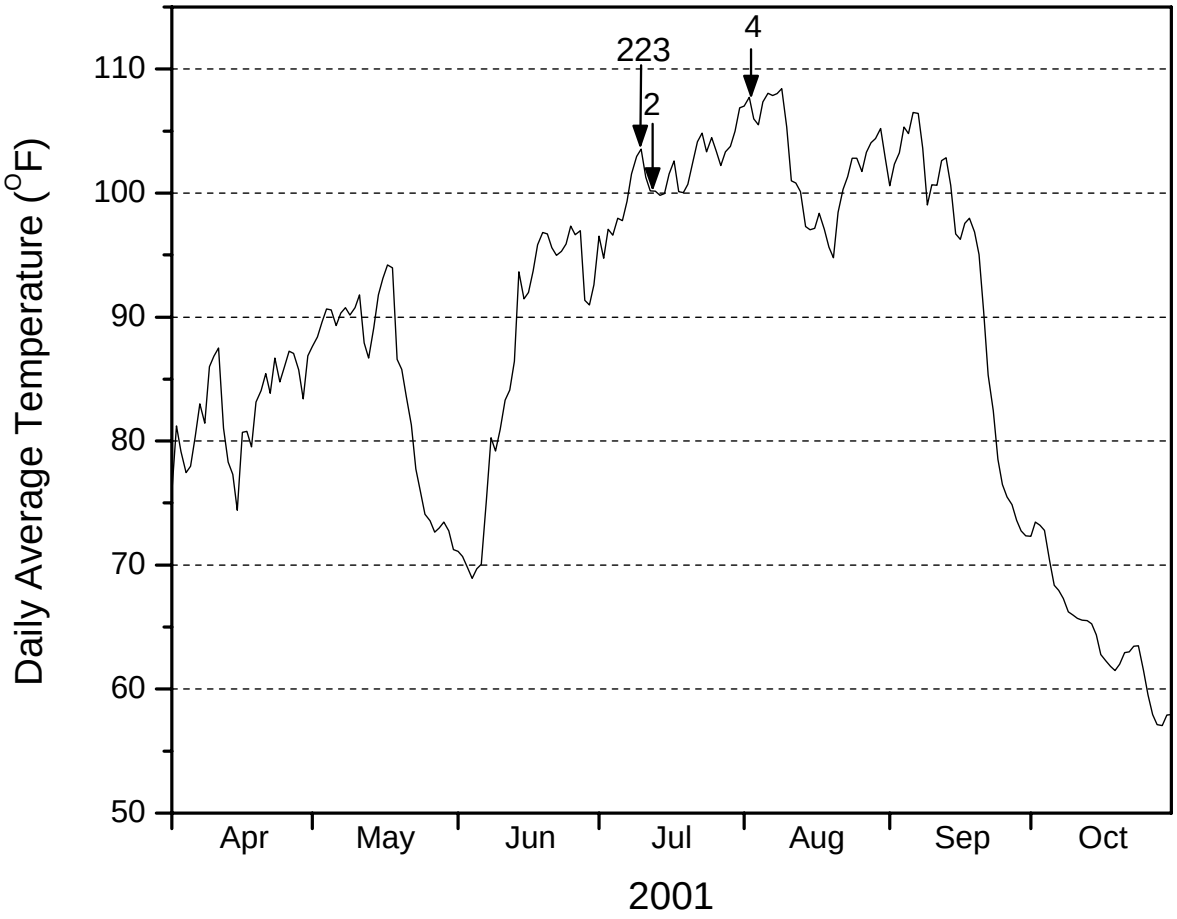

Figure 3-14. Mean Daily Near-Surface Water Temperature at the Mixing Zone Boundary, April-October 2001 and Dates of Observed Fish Kills as Indicated by Arrows (Number of Fish Recovered Shown Above Arrows)

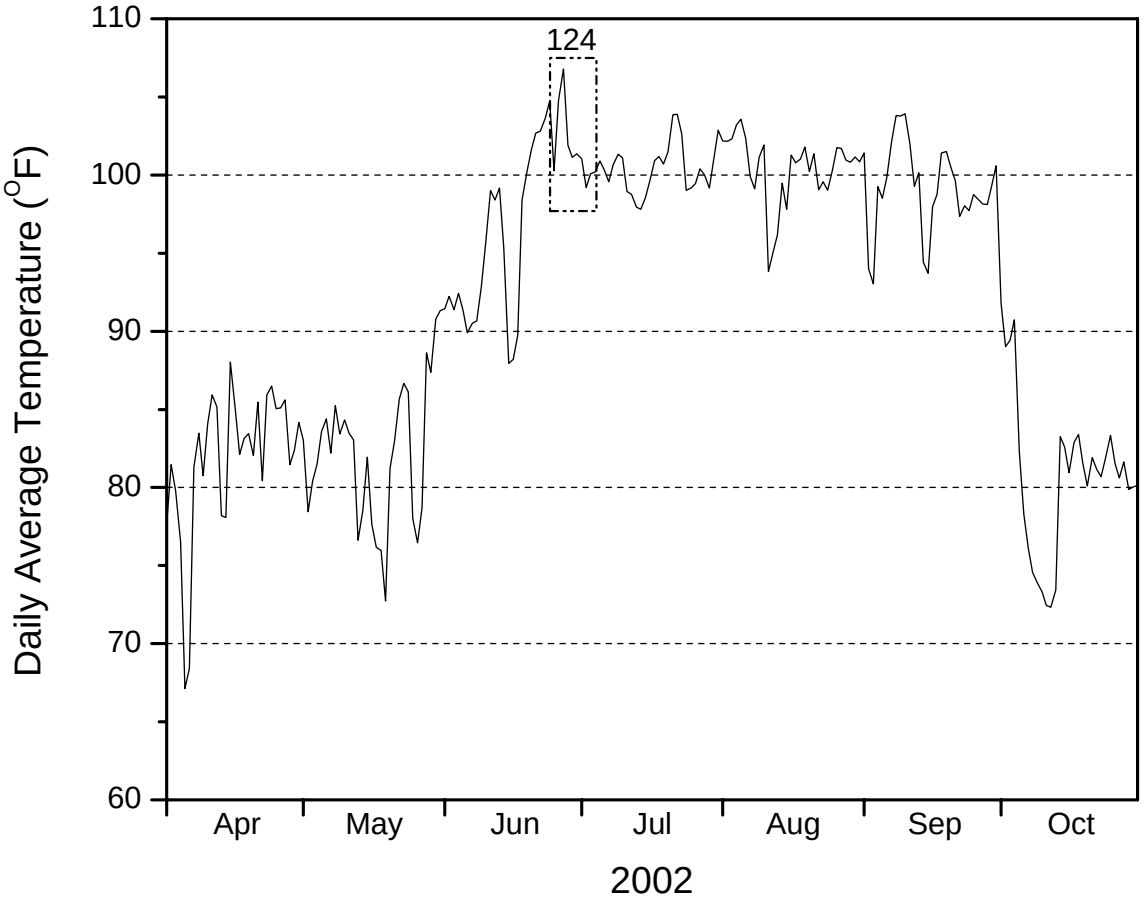

Figure 3-15. Mean Daily Near-Surface Water Temperature at the Mixing Zone Boundary, April-October 2002 and Dates of Observed Fish Kills as Indicated by Box (Number of Fish Recovered Shown Above Box)

Table 3-1. Statistical Results of Regression Analysis of Coffeen Lake Fish Population Parameters on Degree-Days during May-August

			r^2	*Significance F*
Fall Electrofishing CPUE (1997-2004)	**Largemouth bass**	**IDNR Age 0**	0.0971	0.4524
		SIU Age 0	0.1977	0.2697
	Largemouth bass (All Ages)	**IDNR**	0.0108	0.8064
		SIU	0.0248	0.7094
	Bluegill (All Ages)	**IDNR**	0.5271	0.0414
		SIU	0.0001	0.9823
	Channel catfish (All Ages)	**IDNR**	0.0510	0.5907
		SIU	0.0623	0.5511
Fall Mean Total Length (TL) (1997-2004)	**Largemouth bass**	**Age 0**	0.1152	0.4108
Fall Backcalculated TL (mm) Fall (1999-2003)	**Largemouth bass**	**Age 1**	0.5654	0.1427
	Bluegill Age-1	**Age 1**	0.0177	0.8312
Mean Relative Weight (Wr) (1997-2004)	**Largemouth bass (All Ages)**	**IDNR**	0.1890	0.2818
		SIU	0.0741	0.5141
	Bluegill (All Ages)	**IDNR**	0.1788	0.2966
		SIU	0.0003	0.9656
	Channel catfish (All Ages)	**IDNR**	0.1826	0.2910
		SIU	0.1199	0.4008

Table 3-2. Mean Total Length of Young-of-Year Largemouth Bass in Northern and Central Illinois Reservoirs

Lake	Type Reservoir	Month	Years	Mean TL (mm)	Source
Coffeen Lake, IL	cooling	late Oct to mid-Nov	1997-2004	140-206	Brooks 2005
Newton Lake, IL	cooling	late Oct to mid-Nov	1997-2004	127-193	Brooks 2005
Lake Sangris, IL	cooling	mid-Oct to mid-Nov	1975	86-106*	Larimore and Tranquilli 1981
Apple Canyon Lake, IL	non-cooling	late-Sep to early Oct	1988-1991	79-117*	Fuhr et al. 2002
Shabonna Lake, IL	non-cooling	late-Sep to early Oct	1988-1991	58-92*	Fuhr et al. 2002
Lake George, IL	non-cooling	late-Sep to early Oct	1988-1991	83-120*	Fuhr et al. 2002
Lake Carleton, IL	non-cooling	late-Sep to early Oct	1988-1991	71-95*	Fuhr et al. 2002
Pierce Lake, IL	non-cooling	late-Sep to early Oct	1988-1991	92*	Fuhr et al. 2002
Johnson-Sauk Lake, IL	non-cooling	late-Sep to early Oct	1988-1991	82-96*	Fuhr et al. 2002
Le Aqua Na Lake, IL	non-cooling	late-Sep to early Oct	1988-1991	76-133*	Fuhr et al. 2002
Lake Shelbyville, IL	non-cooling	Sep	1980-1981	53-140*	Miller and Storck 1984

*estimated from graphed value

Table 3-3. Mean Backcalculated Length (mm TL) at Age for Largemouth Bass Populations from Coffeen and Newton lakes and from 24 States*

		Age						
Lake or State	**N**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Coffeen Lake**	1	203	341	392	412	413	444	457
Newton Lake**	1	191	330	406	439	465	450	479
Florida	14	175	276	335	384	424	471	502
Louisiana	18	175	279	346	377	405	454	473
Alabama	5	158	258	336	392	438	495	524
Tennessee	22	152	262	327	370	413	456	479
North Carolina	40	148	240	312	368	418	463	495
Maryland	5	147	252	320	363	406	428	463
Arkansas	13	145	243	315	370	413	441	433
California	26	145	256	344	403	458	508	517
Oklahoma	48	143	247	324	384	431	479	515
Kentucky	11	136	250	331	382	424	439	470
Mississippi	9	131	210	265	315	370	426	452
Texas	9	127	225	277	336	387	461	499
Illinois	24	120	234	303	356	414	454	469
Iowa	15	115	204	281	332	388	424	459
Missouri	45	109	199	265	316	352	401	419
New York	13	102	190	258	311	348	377	404
Connecticut	85	98	202	279	334	374	405	433
Michigan	10	98	177	237	294	331	360	388
Ohio	42	93	185	254	310	364	411	441
Idaho	40	87	170	233	286	331	370	409
Wisconsin	49	84	172	240	289	330	366	399
Rhode Island	48	84	195	273	324	360	396	428
Maine	3	82	188	266	326	370	388	418
Pennsylvania	5	63	155	227	284	321	339	378

N = number of sampled populations

* data for individual states from Beamsderfer and North (1995)

** data from Brooks (2005)

Table 3-4. Mean Total Length (mm) at Age for Bluegill at Various Locations

	Age			
	1	**2**	**3**	**4**
Coffeen Lake[a]	64	94	108	112
Newton Lake[a]	70	107	127	129
Lake of Egypt[b]	66	104	137	157
Pools 16 & 17 UMR[c]	56	109	155	178
Mississippi River[d]	76	135	168	185
Ohio River[e]	68	98	131	152
Michigan lakes[f]	62	95	130	150
Indiana lakes[g]	na	50-116	65-175	80-220
Sandhill lakes, NE[h]	na	105	150	170
Mining/borrow pits, NE[h]	na	105	132	160

[a]Brooks 2005
[b]Heidinger et al. 2000
[c]Cornish and Welke 2004 for Upper Mississippi River
[d]Carlander 1977
[e]Heidinger and Waddell 1989
[f]Schneider 1999; statewide average from graph
[g] Ricker 1942 (in Spotte 2007)
[h]from graph in Porath and Hurley 2005
na=not available

Table 3-5. Mean Total Length (mm) at Age for Channel Catfish in Selected Lakes, Rivers, and Reservoirs

	Age						
	1	2	3	4	5	6	7
Coffeen Lake	141	195	259	281	305	337	361
Newton Lake	104	214	257	274	301	297	331
Mississippi R. Pool 18[a]	104	180	234	297	333	356	409
Mississippi R. Pool 24[b]	132	188	224	259	297	368	411
Mississippi R. Pool 16[a]	91	165	226	267	302	328	368
Missouri River[c]			215-282			382-410	
Ohio River[d]			170-282			328-406	
Lake of the Ozarks, MO[e]			157			263	
Pony Express Lake, MO[f]			330			503	
Kentucky Lake, KY[g]			288			475	
Fort Gibson Reservoir, OK[h]			292			531	
Norris Reservoir, TN[i]			272			424	

[a]Heidinger and Brooks 2005
[b]Pitlo et al. 2004
[c]Hesse et al. 1982 (in Hubert 1999)
[d]Schoumacher 1973 (in Hubert 1999)
[e]Marzolf 1955 (in Hubert 1999)
[f]Eder and McDannold 1987 (in Hubert 1999)
[g]Freeze 1977 (in Hubert 1999)
[h]Hancock 1957 (in Hubert 1999)
[i]Carroll and Hall 1964 (in Hubert 1999)

Table 3-6. Mean Standing Crop Estimates (kg/ha) of Fish Species from Three Illinois Reservoirs and Other U.S. Reservoirs (adapted from Perry and Tranquilli 1981)*

Species	Coffeen Lake	Lake Sangchris	Lake Shelbyville	Midwest	Mid-south
largemouth bass	267.5	275.3	294	204 (468)	92 (717)
bluegill	52.1	22.8	22.7	42 (180)	21 (87)
channel catfish	34.6	9.5	2.6	14 (57)	9 (110)
all fish species	437.8	360.9	449.6	398 (134)	202 (1000)

*maximum values shown in parentheses for range of lakes

Table 3-7. IDNR and SIUC Electrofishing Indices of Relative Abundance (Catch-per-Hour) of Juvenile and Adult Largemouth Bass, Bluegill, and Channel Catfish in Coffeen Lake, 1997-2004

largemouth bass			bluegill			channel catfish		
Year	IDNR	SIU	Year	IDNR	SIU	Year	IDNR	SIU
1997	79	23	1997	196	54	1997	9	5
1998	43	14	1998	99	49	1998	12	1
1999	67	25	1999	127	163	1999	16	5
2000	20	16	2000	89	97	2000	3	7
2001	99	23	2001	86	66	2001	6	3
2002	93	39	2002	179	166	2002	11	13
2003	66	26	2003	71	67	2003	4	6
2004	100	22	2004	65	67	2004	13	13

4 PROSPECTIVE ASSESSMENT

4.1 May and October Temperature Tolerance

The impacts of thermal effluents from power plants and other heat sources on fishes have been studied primarily in the laboratory. These laboratory studies occurred primarily during the 1970s and 1980s as a result of Clean Water Act §316(a) assessments or efforts to establish water quality standards with respect to temperature (Bevelheimer and Coutant 2003). Appendix A presents a summary of data thus obtained for the life stages of largemouth bass, bluegill, and channel catfish, which are representative of the fish community in Coffeen Lake. Maximum tolerated temperatures have been determined by a variety of methods, but typically involve holding test fish at a predetermined temperature for acclimation, then testing them at higher temperatures to determine levels that result in acute mortality of 50 percent of test subjects (e.g., LT50 or upper incipient lethal temperature, UILT) over a stated period of time (e.g. 48 or 96 h) or when death is assured (critical thermal maximum or CTM). Typically, a 2^{o}C "safety factor" is applied to the UILT or CTM value to approximate the upper temperature that could be occupied continuously with no lethality.

Predicting responses of individual fish life stages to the proposed thermal standard revisions is difficult because of the complexity of the thermal environment in Coffeen Lake (i.e., area differences and vertical stratification in the lake) and the ability of fish, particularly motile life stages, to adapt to or avoid temperatures that could exceed their optimal or tolerance levels. The proposed thermal limits of 96^{o}F and 102 ^{o}F apply to near-surface water temperatures at the boundary of the 26-acre mixing zone. They represent the warmest temperatures to which fish and other organisms would be exposed, other than within the mixing zone itself.

Water temperatures at other locations in the lake and at greater depths would be considerably less than the proposed limits of 96^{o}F and 102^{o}F for May and October. For example, temperatures recorded near the surface at the intake typically are 10^{o}F to 15^{o}F lower than at the mixing zone boundary (Section 2.3 and Figure 2-6). Even at the mixing zone boundary in Segment 1, near-surface water temperatures can be up to 18^{o}F or more greater than near the bottom, as shown by vertical profiles for May 2006 (Figure 2-13). When the lake is stratified in October, near-bottom temperatures can be 13-14 ^{o}F less than near-surface temperatures, as in 2000 (Figure 2-13). Thus, at times when water temperatures approach the thermal limits of 96^{o}F and 102^{o}F in May and October, temperatures in many areas or depths of the lake would be in the 80s (^{o}F) or lower, well within the range of temperatures tolerated by RIS life stages (Table 4-1).

There is evidence that juvenile and adult fish will avoid the highest temperatures in or near the thermal plume in the eastern arm of the lake. Electrofishing was conducted in August 1995 when surface water temperatures in the eastern, discharge arm were 38-44^{o}C (100.4-111.2^{o}F) (ESE 1995). No fish were caught where surface temperatures were 40^{o}C (104 ^{o}F) or above. Fish began to be caught in areas at 38^{o}C, and catches progressively increased as surface temperatures declined to 36^{o}C (96.8^{o}F) where DO was sufficient. Gill net sampling and sonar indicated that fish were present in the discharge arm at depths of 3-4 m (9.8-13.1 ft) where temperatures were 34-37^{o}C (93.2-98.6^{o}F) and DO concentrations were 2-5 mg/L. Using sonic transmitters, Rush

(2000) found that adult largemouth bass increased their movements in Coffeen Lake during the summer, generally away from the discharge area.

Laboratory studies of temperature tolerance, such as those cited in Appendix A, measure responses to rapid changes in temperature. As a result, their use tends to conservatively underestimate thermal tolerance in the field. In reality, organisms can acclimate and adapt physiologically or genetically to temperature regimes, recover from short-term thermal stress, and utilize lower temperature areas of the waterbody as refuge from stressful temperatures when necessary (Coutant 2003, Reash 2008, Bevelheimer 2008). Moreover, fish can utilize habitat with temperatures exceeding their long-term thermal tolerance limits for feeding and other functions, returning to more thermally suitable areas for recovery from thermal stress (NAE/NAS 1973).

4.2 Thermal Modeling

Potential changes in the thermal regime of Coffeen Lake under the proposed site-specific thermal standards can be explored through the use of thermal modeling. Sargent & Lundy, LLC conducted such a modeling exercise as a means of evaluating alternatives for increasing the cooling capacity of Coffeen Lake (S&L 2008). Their one-dimensional model was used to predict lake temperatures expected to occur as the result of increases in electric power generation and resulting heat loading to the lake. This exercise considered the current and proposed thermal permit limits for May and October. S&L chose 1987 for background meteorological conditions as an example of a year when ambient temperatures during May would be greater than average, then superimposed the operation of the Coffeen Power Station to simulate lake conditions under maximal station operation. Using maximum operation and heat discharge along with warmer than average ambient temperatures allowed an evaluation of near worst-case conditions in terms of temperature increases in the lake during the months of May and October under the revised thermal standards.

The model output provides predicted mean hourly water temperatures along the axis of the cooling loop in the lake from the mixing zone boundary to the station's intake at 1,000-ft intervals. The model first was run using the existing thermal standards for May and October, then was rerun using the proposed thermal standards for those two months while maintaining current standards for the remaining 10 months. Assumptions used in the modeling included continuous operation of the cooling basin and intermittent operation (100 percent on or off) of the cooling towers as discharge temperatures approached the month-specific thermal standards. Cooling tower operation was the means for maintaining temperatures at the mixing zone boundary near or below the thermal standards. While the one-dimensional model used for this assessment is simplistic, the model results provide insight into probable temperature increases and maximum temperatures under near-maximum station operation and warm ambient temperatures.

To illustrate the expected temperatures under these conditions, three locations along the cooling loop were examined: the edge of the mixing zone, the dam (9,000 ft from discharge), and the intake (21,500 ft from discharge). The plots of cumulative frequency for predicted temperatures at each location presented in Figures 4-1 and 4-2 indicate that maximal temperature increases at the edge of the mixing zone under the proposed standards would be greater than at the dam and

intake, i.e., heat would be dissipated as distance from the discharge increases. According to the model, the median temperature (50th percentile) at the edge of the mixing zone during May would be approximately 95^{o}F under the proposed standards compared to approximately 88^{o}F under the existing standards (Figure 4-1). Differences in temperature between existing and proposed standards would be successively smaller at the dam and intake: 88^{o}F vs. 84^{o}F at the dam and 81.5^{o}F vs. 80^{o}F at the intake. In October, the median temperatures would be approximately 90^{o}F and 86^{o}F at the edge of the mixing zone (proposed vs. current), 82^{o}F and 80^{o}F at the dam, and 74^{o}F and 73^{o}F at the intake (Figure 4-2).

An alternative way to evaluate the temperature increases is presented in Figure 4-3 as a plot of the distribution of predicted temperatures longitudinally from the edge of the mixing zone to the intake. Shown in these plots are the predicted "worst case" median temperature increase, minimum and maximum temperature increases, and 25th and 75th percentiles. As in Figures 4-1 and 4-2, the predicted temperature increase declines progressively along the cooling loop.

The S&L model accounts for heat retention through time and therefore provides additional insight as to whether warmer lake temperature during May would carry over into summer months. To illustrate this phenomenon, Figure 4-4 plots predicted mean daily water temperatures at the edge of the mixing zone under maximum station operation from mid-April to mid-June and from mid-September to mid-November under the existing and proposed thermal standards for May and October, while keeping existing standards for adjacent months. As expected, predicted mean daily temperatures increase at the start of May under the proposed standards but quickly begin to converge again with the current temperatures after the end of May and completely converge by mid-June (Figure 4-4). Likewise, at the start of October the predicted mean daily temperatures increase under the proposed standards but converge again with the current temperatures by early November.

Since the S&L model is one-dimensional, it does not account for vertical or horizontal distributions of temperatures within the lake. Therefore, it cannot simulate the entire thermal regime in the lake or the temperatures that individual fish might encounter throughout the lake. However, it does provide additional perspective of potential temperature increases linearly within the lake under near-worst case conditions of maximum operation and warm ambient temperatures. Temperatures in other parts of the lake such as in coves or north of the station intake may be cooler, providing thermal refuges when necessary.

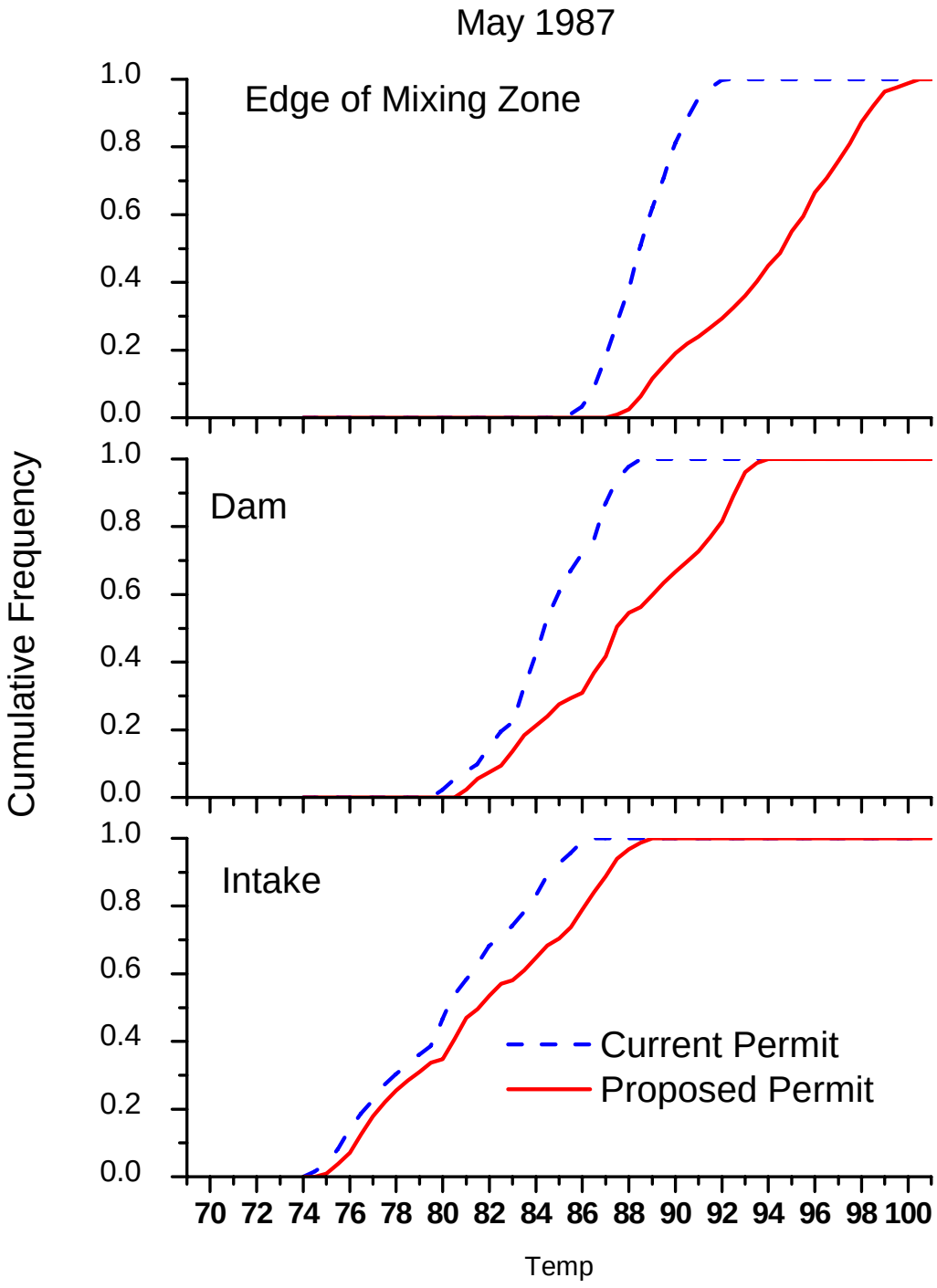

Figure 4-1. Cumulative Frequency of Predicted Water Temperatures at Three Locations in Coffeen Lake under Existing and Proposed Temperature Limits during May using 1987 Meteorological Conditions

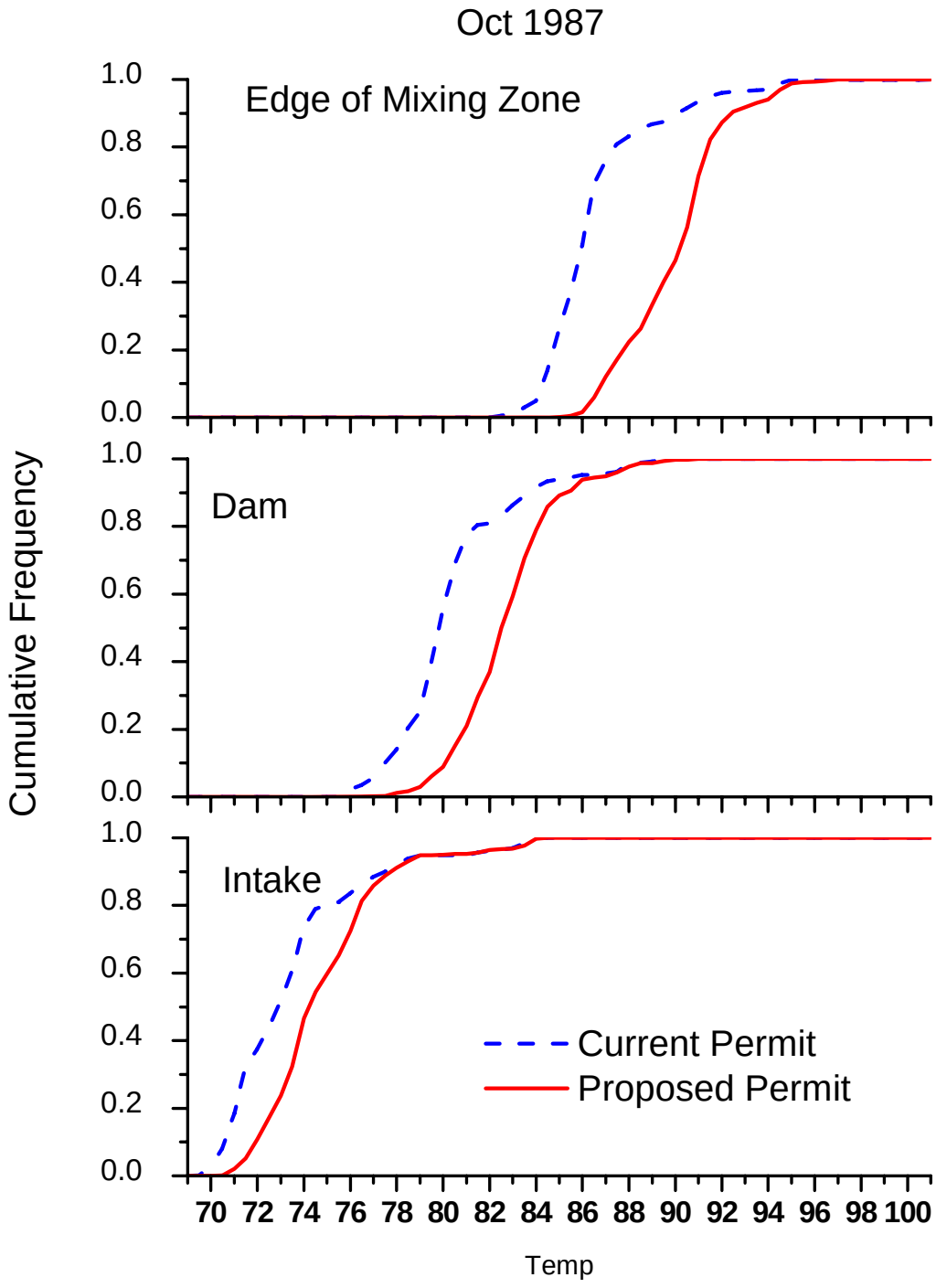

Figure 4-2. Cumulative Frequency of Predicted Water Temperatures at Three Locations in Coffeen Lake under Existing and Proposed Temperature Limits during October using 1987 Meteorological Conditions

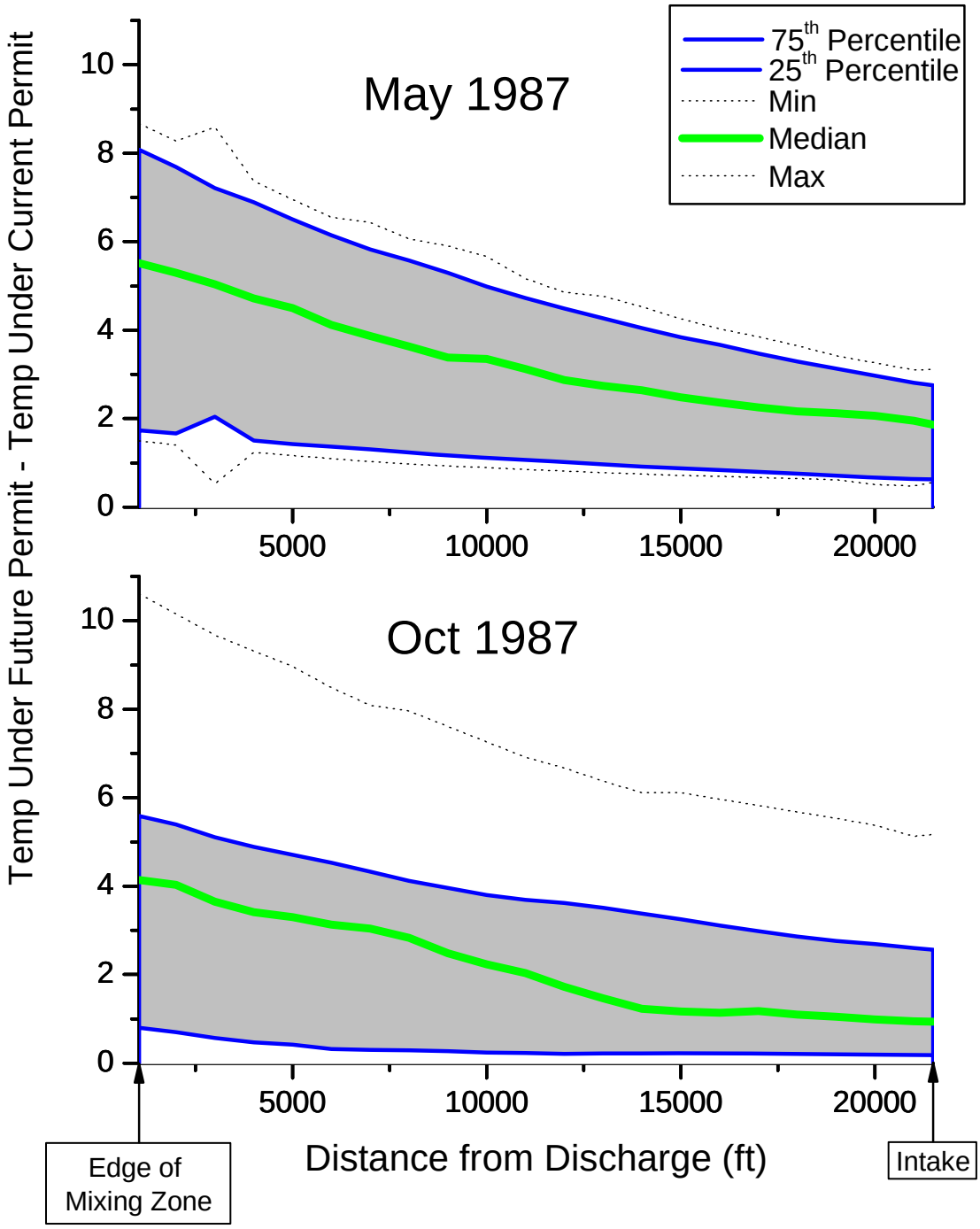

Figure 4-3. Predicted Temperature Increases under Proposed Thermal Permit Limits as a Function of Distance from the Edge of the Mixing Zone in Coffeen Lake using 1987 Meteorological Conditions

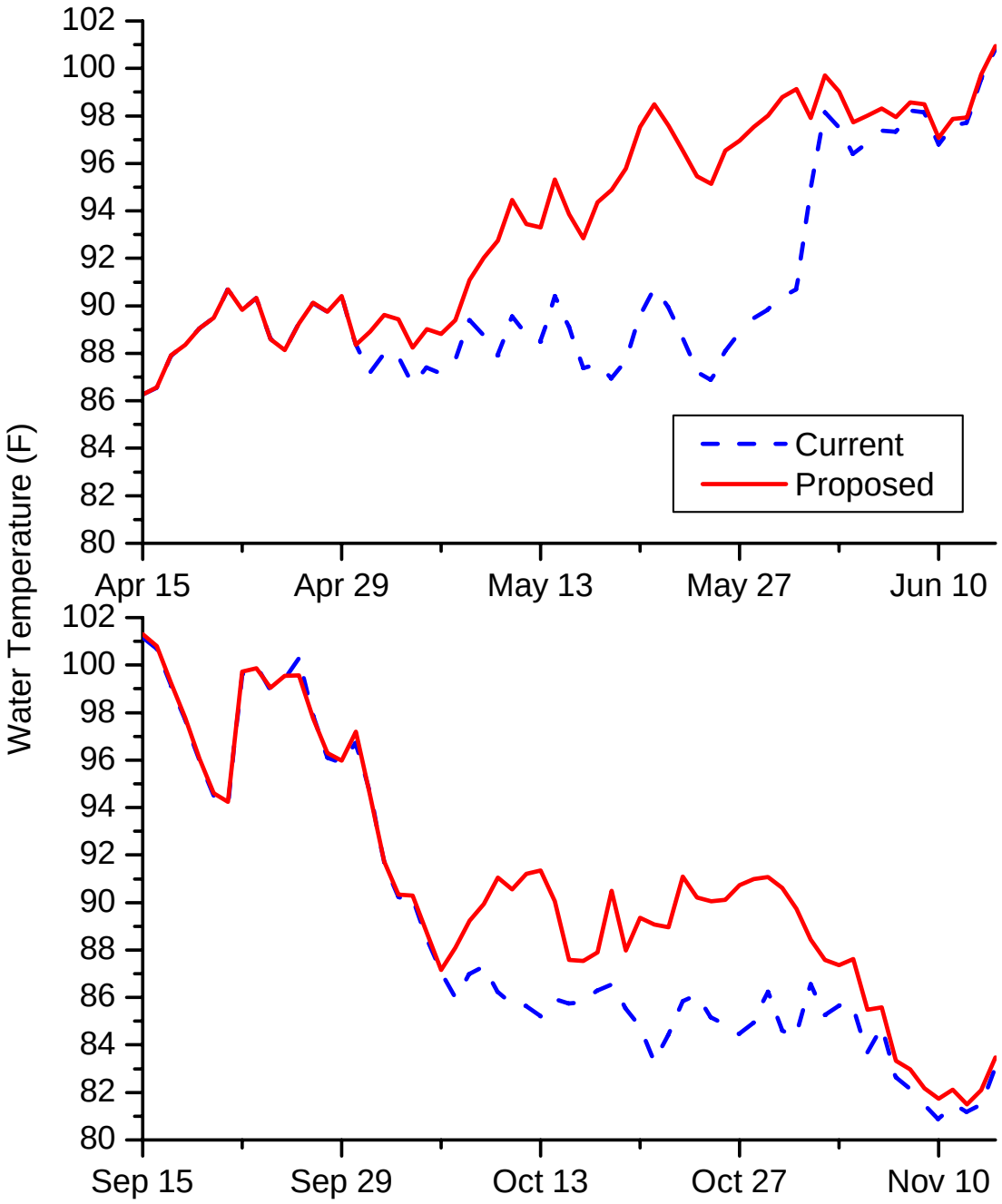

Figure 4-4. Predicted Mean Daily Near-Surface Water Temperatures at the Mixing Zone Boundary under Current and Proposed Thermal Standards for May and October using 1987 Meteorological Conditions

Table 4-1. Upper Thermal Tolerance Limits and Optimal Temperatures by Fish Species and Life Stage (Literature Sources in Appendix A)

Month	Species	Life Stage	Upper Tolerance - SF* (^{o}F)
May	Largemouth bass	Larva	86
		Juvenile	95.5
		Adult	93.9
May	Bluegill	Spawning	89
		Embryo	89
		Larva	89.6
		Juvenile	95
		Adult	103.1
May	Channel catfish	Spawning	85
		Embryo	83
		Larva	83-85?
		Juvenile	97.7
		Adult	95-97.7
October	Largemouth bass	Juvenile	95.5
		Adult	93.9
October	Bluegill	Spawning	89
		Embryo	89
		Larva	89.6
		Juvenile	95
		Adult	103.1
October	Channel catfish	Juvenile	97.7
		Adult	95-97.7

*(UILT or CTM)-3.6^{o}F(safety factor)

5 DISCUSSION AND CONCLUSIONS

5.1 Revisions Limited to May and October

The proposed revisions to thermal standards for Coffeen Lake are limited to the months of May and October, the two transition months between winter and summer thermal conditions. As such, the revised standards would more realistically reflect a natural thermal environment, where temperature increases or decreases occur more gradually than the abrupt change inherent in the existing site-specific standards.

The purpose for petitioning a change in the thermal standards for these two months is to be able to avoid instances where unusually warm weather, droughts, or other circumstances would cause reductions or suspension of electricity generation simply to avoid overly restrictive thermal standards for May and October alone.

5.2 Minimal Effects on the Current Thermal Regime

If raised thermal standards were to result in higher water temperatures in the mixing zone in May, one need not expect warmer temperatures to carry over throughout the remainder of the summer season. Historically, warm May temperatures often have been followed by relatively cool temperatures during summer months and vice versa. Although heat can be retained in the lake for a period of time, annual variability in meteorological conditions appears largely to have controlled monthly water temperatures under past plant operating conditions.

5.3 Warm May and October Temperatures Promote Survival and Growth

Higher, stable water temperatures during late winter and early spring have been shown to promote earlier spawning and improved survival and growth or development of early life stages of fish, particularly largemouth bass. The largemouth bass fishery of Coffeen Lake appears to be exceptional primarily due to warmer temperatures which have resulted in earlier spawning under more stable thermal conditions, a prolonged growing season, faster growth and earlier attainment of a size permitting a fish diet, and improved overwinter survival and possibly growth. While eggs and larvae tend to be more temperature sensitive than juveniles and adults, early spawning by largemouth bass has resulted in these life stages being completed by May in Coffeen Lake, especially by late May when temperatures would be highest. In May, young largemouth bass primarily would be juveniles, with tolerances for temperatures that more typically would be experienced in summer months. The fact that juvenile largemouth bass have prospered under the summer temperature regime in Coffeen Lake suggests that May temperatures approaching (but less than) June temperatures would easily be tolerated.

Higher May temperatures should not adversely affect bluegills, which have successfully spawned in late spring and throughout summer when temperatures are highest. Spawning success at these temperatures has been demonstrated amply by an abundance of small bluegill in Coffeen Lake. Higher October water temperatures might even prolong their spawning season, which in the past has continued into September and October.

Channel catfish probably have experienced earlier than normal spawning in Coffeen Lake caused by warm water temperature during the spring months. Like largemouth bass, early spawning would allow completion of egg and larval life stages prior to May (especially late May), leaving juveniles which are much less temperature sensitive and have been shown to thrive through summer temperatures much higher than those that they would experience in May under the proposed revised thermal limits.

The diversity in the water temperatures existing in the eastern and western arms of Coffeen Lake should be advantageous for all fish species. While water temperatures may be too warm or too cool for a particular species and life stage at a particular location, there are areas elsewhere in the lake where water temperatures will be closer to optimal. The northern portion of the western arm, which is minimally influenced by thermal discharges from the plant, can serve as both a nursery for young fish and a thermal refuge for older fish during the warmest times of the year.

5.4 No Evidence of Detrimental Effects of Current Temperatures on Recruitment, Growth, and Condition

No significant relationship was found between the thermal history (in terms of degree-days accumulated from May through August) and recruitment of YOY largemouth bass, or the growth and condition of all three RIS. There was an indication that warmer temperatures could increase the growth rates of largemouth bass during their first year of life, but this relationship was not statistically significant. Since the range of temperatures occurring in the summer have not influenced recruitment, growth, or relative weight for these three species annually, it is even less likely that detrimental effects could result from temperatures that would be experienced in May and October under the revised standards.

Recruitment, growth, and condition of fish are good indicators of the availability of an adequate food supply supported by lower trophic levels in the lake community, i.e., primary producers such as phytoplankton, epiphyton, and macrophytes, as well as primary and secondary consumers such zooplankton, benthos, and phytomacrobenthos. The lack of evidence of detrimental effects of water temperatures on fish recruitment, growth, and condition indicate that these lower trophic levels also are adapted to the thermal environment of the lake and should not be affected by revised standards for May and October.

5.5 Evidence of Thermal Adaptations by Fish Populations

Intensive monitoring of the fish populations in Coffeen Lake by Southern Illinois University-Carbondale and the Illinois Department of Natural Resources (IDNR) has indicated that the fish populations have adapted and thrived in the thermal environment of the lake.

Largemouth bass in their first three years of life in Coffeen Lake are larger than in other lakes and reservoirs in Illinois, and in other midwestern and southern states. Overall, their mean relative weight in recent years has been 100 or greater, indicating a population of very healthy, robust largemouth bass. According to very recent IDNR data, proportional stock density (the percentage of stock fish equal to or exceeding quality length) consistently has been higher than that agency's goal, indicating a high quality fishery for large bass.

Average annual growth for bluegill at ages 0 and 1 in Coffeen Lake has been average when compared to other regional bluegill populations, indicating that water temperatures likely are not affecting early growth rates. However, growth at later ages has been stunted, probably due to competition for food with other species such as redear sunfish, gizzard shad, and threadfin shad, and not due to thermal effects. Relative weights for bluegill have been below management goals, further indicating that food may be limiting.

Growth for channel catfish in Coffeen Lake, as determined by length at annulus formation, falls within the range of values for other channel catfish populations in rivers, lakes, and other reservoirs in the Midwest or South. Condition, as measured by relative weight, has been well within the targeted range until very recently, coinciding with a three-fold increase in abundance as shown by IDNR fall electrofishing surveys.

Standing crops in Coffeen Lake during 1979-1980 were either higher or intermediate among mean values for standing crops in other lakes and reservoirs in Illinois, the Midwest, and mid-south. Data are not available concerning the abundance of fish through all the years since 1980. However, recent catch-per-effort data show that the populations are relatively stable with no consistent trend, suggesting that Coffeen Lake populations still compare favorably to those in other locations.

5.6 Fish Kills Unlikely to Result

Fish kills involving more than a few fish in Coffeen Lake in recent years have been restricted to the warmest temperatures during summer months, especially when the lake is stratified and dissolved oxygen (DO) concentrations have been depleted. These conditions would not be expected to occur during either May or October, even under the proposed revisions to the thermal standards. In 1999, 2001, and 2002 fish kills involving the recovery of more than 100 fish have occurred only after a rise in water temperatures to daily means of 100^{o}F or more, as measured near the surface at the boundary of the mixing zone in the eastern arm of the lake. Proposed revisions to the May and October thermal standards will keep maximum hourly temperatures of this magnitude to a very small fraction ($\leq$2 percent) of the hours and limit mean temperatures to 96^{o}F for the month.

In recent SIUC surveys of the lake, DO concentrations in May and October were 4 mg/L or higher at depths other than very near the lake bottom in Segments 1 and 2, which are areas nearest the discharge (see Section 2.3.2). Segments 3 and 4 were less stratified and generally had cooler temperatures and higher DO concentrations that, if necessary, could serve as refuge areas. Studies conducted in Coffeen Lake have provided evidence that fish have behaviorally adapted to the warmest temperatures in the lake by avoiding them and seeking areas with cooler temperatures, such as outside the eastern arm (see Section 3.2). The fact that fish kills in 2001 and 2002 did not continue after the initial temperature rise to 100^{o}F or more in the mixing zone suggests that fish avoided the warmest areas in the lake at this time and sought thermal refuges where they would no longed be exposed to these temperatures or to depleted DO levels.

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Appendix A. Temperature (T) and Dissolved Oxygen (DO) Requirements for Coffeen Lake Target Species

Species	Life Stage	Maximum T	Source	Minimum DO (mg/l)	Source
Largemouth bass	spawning	20C	Lake Shelbyville, IL (Miller and Storck 1984)		
	spawning	24C	Heidinger 1975		
	embryo	29.5C post-fertilization; 32.3C pre-hatching	TL50 (McCormick and Wegener 1981)	3.0 for good survival @ 20C and 23C; sharply decreased with 2.8 @25C, 2.0 @ 15-20C	Carlson and Siefert 1974
	larvae	31.2C @ 20, 32.4C @ 24C, 33.0C 2 27C, 31.7C @ 30C	<24 hr old TL50 (McCormick and Wegener 1981)	3.0 for good survival @ 20C and 23C; sharply decreased with 2.8 @25C, 2.0 @ 15-20C	Carlson and Siefert 1974
	larvae	33.7C @ 20C	11-12 days old (7 mm) TL50 (McCormick and Wegener 1981)		
	juvenile	40.9+0.40C CTM and 37.3C chronic TM @32C acclimation	50-60 mm TL northern LMB (Fields et al. 1987)	≤1.5 avoided	50-90 mmTL (Whitmore et al. 1960)
	juvenile			0.92 @ 25C, 1.19 @30C, 1.40 @ 35C	Critical DO; shock expt. for 4-15 g fish (Moss and Scott 1961)

Species	Life Stage	Maximum T	Source	Minimum DO (mg/l)	Source
	juvenile			0.92 @ 25C, 1.19 @30C, 1.40 @ 35C	Critical DO; shock expt. for 4-15 g fish (Moss and Scott 1961)
	adult	36.4C @ 30C	Brown 1974 (in Wismer and Christie 1987)		
Bluegill	spawning	33.8C	Spotila et al. 1979 (in Wismer and Christie 1987)		
	embryo	33.8C @ 26C	Carlander 1977		
	larvae	34C @ 26C	Carlander 1977		
	juvenile	37C @ 33C	EPA 1974 (in Wismer and Christie 1987)	0.75 @ 25C, 1.0 @ 30C, 1.23 @ 35C	Critical DO shock expt. for 5-20 g fish (Moss and Scott 1961)
	adult	41.5C	CTM (Carlander 1977)		
	adult	38.3C @ 22.8C	CTM (Reutter and Herdendorf 1976 in Wismer and Christie 1987)		
Channel catfish	spawning	29.5C	Scott and Crossman 1973		
	embryo	28.4C	Brown 1974 (in Wismer and Christie 1987)		
	juvenile	36.6C @ 26C, 37.8C @ 30C, 38.0C @ 34C	Brown 1974 (in Wismer and Christie 1987)	0.95 @ 25C, 1.03 @ 30C, 1.05-1.09 @ 35C	Critical DO shock expt. for 13-22 g fish (Moss and Scott 1961)

Species	Life Stage	Maximum T	Source	Minimum DO (mg/l)	Source
	juvenile	38.5-40.0 @ 26-34C	Allen and Strawn 1971		
	adult	32.8C @ 20C, 33.5C @ 25C	Brown 1974 (in Wismer and Christie 1987)		

EXHIBIT 12

IDNR Lake Management Status Report dated March 23, 2007

LAKE MANAGEMENT STATUS REPORT

Date of Report: March 23, 2007
Fisheries Manager: Jeffrey Pontnack
District: 14/15
Lake Name: Coffeen Lake
County: Montgomery
Water Number: 600
Ownership: State
Acreage: 1,102

Listing of the Sport Fish Regulations in Effect

A) White, Black, or Hybrid Crappie- 10" minimum length limit; 10 fish per day creel limit.
B) Largemouth Bass- 15" minimum length limit; 3 fish per day creel limit.
C) Channel Catfish- All jugs must be attended at all times while fishing.
D) Striped, White, or Hybrid Striped Bass- 17" minimum length limit; 3 fish per day creel limit.

Listing of Fisheries Management Activities Completed with Evaluation of Success

A) Treated Coontail, and Creeping Water Primrose with Reward / Rodeo respectively, on June 8th, 2006. (Successful)
B) IDNR with local volunteers placed fish cribs into Coffeen Lake during December of 2006. (Successful)
C) Conducted a standardized fish population survey on October 16-17, 2006. (Successful)
D) Completed the Lake Management Status Report (2004) on February 4, 2005. (Successful)
E) Stocked 13,562, 1.5" STB on June 22, 2005. (Successful)
F) Stocked 12,321, 2.0" STB on July 7, 2006. (Successful)
G) Installed Ad Rule Part 115 to regulate competitive fishing tournaments at Coffeen Lake in 2005. (Successful)

Lake Management Plan Progress Tables

Fall Electrofishing

LMB	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06	LMP OBJ.
YAR	0.2	0.5	0.1	0.2	0.1	1-5
PSD	81	85	89	78	79	50-70
RSD 15	43	57	52	62	23	40-50
RSD 18	5	9	12	15	6	15-25
RSD 20	1	3	2	2	1	5-15
WR	101	99	97	102	95	90-110
CPUE	20	82	62	93	163	> 60

BLG	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06	LMP OBJ.
YAR	9	8	0	8	34	1-5
PSD	0.4	0.7	0	0.3	0.4	20-40
RSD 7	0	0	0	0	0.4	10-20
WR	87	84	88	89	82	90-110
CPUE	89	86	66	60	77	> 100

RSF	Fall 00	Fall 01	Fall 03	Fall04	Fall 06	LMP OBJ.
YAR	0 .9	2	0	2	1	1-5
PSD	13	34	0	3	12	20-40
RSD 8	3	17	0	1	0	10-20
WR	88	84	88	89	84	90-110
CPUE	22	47	15	23	27	> 30

WHC	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06	LMP OBJ.
PSD	73	73	98	100	95	40-60
RSD 9	27	55	93	96	90	30-40
RSD 10	17	38	79	91	72	20-30
RSD 12	8	8	6	55	59	10-20
WR	93	93	94	100	96	90-110
CPUE	25	26	37	28	11	> 30

GZS	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06	LMP OBJ.
WR	98	96	98	91	87	90-110
CPUE	168	69	61	65	28	> 150

CCF	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06	LMP OBJ.
YAR	0	0	0.1	0.4	0.1	1-3
PSD	7	16	29	35	22	40-60
RSD 18	7	4	17	12	16	20-30
RSD 20	0	0	13	5	2	10-20
WR	93	94	90	87	85	90-110
CPUE	3	7	4	12	11	> 10

STB	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06	LMP OBJ.
WR	-	-	-	104	91	90-110
CPUE	0	.71	0	.71	0.2	> 1

THS	Fall 00	Fall 01	Fall 03	Fall 04	Fall 06
CPUE	4,204	354	2,558	156	0

Recommendations for Observed Problem Trends

A) Treat aquatic vegetation as needed in 2007.
B) Conduct a standardized fish population survey in October of 2007.

C) Stock STB in 2007.
D) Creel Coffeen Lake as soon as possible. It appears this impoundment will be creeled by the INHS in the year 2007.
E) Monitor growth and WR's of predator species (possible GZS/THS decline).
F) Place fish cribs in to the lake in 2007, if time, fuel, and manpower are available.
G) Remain active with the project to raise water levels.

Game Species Narrative

LMB- This population in Coffeen lake remains solid, although larger fish (15" - 19") dropped off relative to previous samples. Reproduction, and recruitment are par, with the CPUE jumping over two fold as related to the three year mean. RSD 15, and 18 declined, while RSD 20 remained stable. This reduction in larger fish will be watched to see whether it's a trend, or some other variable. As well, WR's for this fish group dropped from an average of 102 in 2004 (last sample) to 95 in 2006. This seems to be occurring with all species in this water body. A notation has been made, and this will be monitored. Additional forage may be needed.

BLG- Conversely, this fishery continues to struggle. The YAR remains terribly high, while PSD's, RSD's, and WR are all below targeted objectives. As well, the CPUE has increased somewhat since 2004, but remains near the 4 year mean. I'm not really surprised to see this in a large cooling lake with minimal vegetative cover. You would think this population would produce a few harvestable sized fish with the outstanding bass regime. At this point this isn't occurring.

RSF- This species remains below par, as well. The length frequency has improved slightly, yet far from a solid population. All structural indices are below the stated objectives at this time. The CPUE jumped a bit, but landed near the 4 year average. As with Bluegill, this fish group is a lower priority due to lack of angler interest. It would be nice to create an easy fix for these two species in Coffeen Lake. At this juncture, I'm not sure there is one.

WHC- Fall 2006 White Crappie densities (11 fish/hr.) declined considerably from our previous years field work (28 fish per hr.), and the 4 year mean (22 fish per hr.), respectively. At this time I'm not sure if this is a function of angler harvest, poor spawns, or this species occupying deeper waters during our sample. Overall structural indices for this group remain superb although top heavy (RSD 10 = 72; RSD 12 = 59). I believe this is an indication of poor spawns over the last few years, hence reduced CPUE. Body condition remains solid, with the fall 2006 average WR at 96, and the four year mean value at 95. Anglers have been delighted with this fishery over the last 5 years. I am beginning to hear grumblings due to reduced numbers. This phenomenon is mostly likely due to it's cyclical nature, yet will be seriously monitored.

CCF- Conversely, Channel Catfish abundance has risen over the past two samples. The fall 2006 CPUE was 11 fish/hr. which relates to the four year mean of 7 fish/hr. This population continues in anguish. The 2006 length frequency shows the majority of fish (81 %) weighed one pound, or less. Only (7 %) of this species exceeded 2 lbs. As well, body condition has declined since this increase in CPUE has come to fruition. The average WR in 2006 was 85, which compares to 87,

and 91 for the 2004, and four year mean, respectively. Thankfully I hear few complaints pertaining to this species, as most anglers devote their time to LMB, and WHC angling.

STB- For the third time in five samples, this species has been captured via fall electrofishing gear. Overall data is minimal due to the fact evaluation of this species has not been conducted. The explanation for this is budget shortages, and lack of manpower/time. In 2006, one STB was seen measuring 7.7", and weighing .18 lbs. Site staff report anglers are becoming more interested in this trophy predator due to overall increases in catch rates. STB up to 20 lbs. are being caught in this impoundment. At this time, this pelagic fish will continue to be stocked as long as hatchery supplies allow it.

Signature of Biologist: Jeffrey Pontmack/ Jeffrey Pontmack CFP

Date: March 23, 2007.

cc: file

COUNTY Montgomery

WATER (NAME) Coffeen Lake

FISH STOCKING RECORD

DATE	SPECIES	NO.	Size Range or Avr. Wgt.	CONDITION	SOURCE	REMARKS
~~1994~~	~~STB~~	~~10,000~~				
1996	STB	11,000				
1998	STB	11,000				
2000	STB	11,000				
2001	STB	9,000				
6-24-03	STB	16,500	1.7"		Jake Wolf	
6-22-05	STB	13,562	1.5"		Jake Wolf	
7-7-06	STB	12,321	2.0"		Jake Wolf	tempered - good release.

F.M. 2.0 Distribution: State and Public—District, Area, Central Offices (8/70)

(26662—10M—12-70) 2-0

LAKE MANAGEMENT STATUS REPORT

Date of Report:	Fisheries Manager:	District No:
3/20/00	Charley Marbut	15
Lake Name:	County:	Water No:
Coffeen Lake	Montgomery	600
Ownership (S,PUC,PUO)		ACREAGE:
S		1102

LM STATUS REPORTS WILL INCLUDE THE FOLLOWING SECTIONS:
1. Listing of the Sport Fish Regulations in Effect
2. Listing of Management Activities Completed with Evaluation of Success
3. Lake Management Plan Progress Table
4. Recommendation for Observed Problem Trends

1. Listing of the Sport Fish Regulations in Effect.

Large or smallmouth bass. . . . . 15 inch minimum length limit
Large or smallmouth bass. . . . . 3 fish daily creel limit
Striped, white or hybrid. . . . . 17 inch minimum length limit
Striped, white or hybrid. . . . . 3 fish daily creel limit

2. Listing of Fisheries Management Activities Completed with Evaluation of Success

05-03-99 - Spring Supplemental Population Survey (LMB) (successful)
07-15-99 - Signs for Fishing Regulations (successful)
07-28-99 - Fish kill investigation (successful)
10/18/99 - Fall population survey (7.0 hours) (successful)
10/29/99 - Resource Review Meeting

1999E. COFFEEN LAKE. SPECIES FREQUENCY

BGH 4	BLG 852 (888)	BOW 4	BRH 23	CAP 28	CCF 102	FCF 1
GOS 7	GSF 20	GZS 908	LBH 7	LMB 440	LOS 63	RGH 18
RLH 2	RSF 135	THS 8	WHC 265	YEB 10	YLB 2	

Total frequency: 2899.

SIGNATURES:

Charley Marbut 3-20-00

District Fisheries Manager — Date

Regional Fisheries Administrator — Date

3. Lake Management Plan Progress Table

A. Bluegill

BLG	LMP GOALS	1997	1998	1999
YAR	1 - 5	--	--	--
PSD	20 - 40	0.4	1	0
RSD-7	10 - 15	0	0	0
Wr	90 - 110	86		84
HARVEST (lbs/ac)	1 - 2	--	--	--
CPUE (#/HR)		196	99	127

888 bluegill were collected. 56% were smaller than 4.0 inches, 44% were between 4.0 and 5.9 inches and no bluegill were collected 6.0 inches or larger. This population has remained basically unchanged.

B. Redear

RSF	LMP GOALS	1997	1998	1999
YAR	1 - 5	--	--	--
PSD	20 - 40	44	19	40
RSD-7	10 - 15	44	23	6
Wr	90 - 110	93	83	85
HARVEST (lbs/ac)	1 - 2	--	--	--
CPUE (#/HR)		52	18	21

The redear population has declined in 1999 with the loss of aquatic weeds. In 1994 the population began to decline, then began to stabilize in 1996 and has remained constant from 1996 to 1998. Loss of aquatic weeds was the major contributing factor then, and a resurgence of aquatic weeds was responsible for the improvement from 1996 to 1998. The percent of redear larger than 6.0 inches was 78 in 1992, 44 in 1994, 18 in 1995, 28 in 1996, 67% in 1997, 42% in 1998 and 39% in 1999. There was a significant improvement of the population in 1997, but the loss of aquatic weeds in 1998 also coincided with a decline of the redear population in 1998. The aquatic weeds seem to grow well for a year or two, then die off. The redear population fluctuates on the same cycle. In 1994 25% of the redear were larger than 7.0 inches, 8% in 1995, 14% in 1996, 20% in 1997, 20% in 1998 and 6% in 1999. The quality of this fishery has declined and is not expected to improve in 2000.

C. White Crappie

WHC	LMP GOALS	1997	1998	1999
PSD	40 - 60	45	62	65
RSD- <9.0	50	65	48	54
9.0 - 10.9	40	31	32	30
> 11.0	10	4	20	16
Wr	90 - 110	98	87	87
HARVEST (lbs/ac)	0.30	--	--	--
CPUE(#/hr)		104	23	38

The crappie population has steadily improved through 1996 and peaked in 1997 with a CPUE of 104/hr, and reached a low in 1998 of 23/hr. In 1999 CPUE had increased to 38/hr, but Wr values were poor with an average of 87. In the 1999 survey, of the fish collected, 54% were less than 9.0 inches and 46% larger than 9.0 inches. 16% were larger than 11.0 inches with one being 18 inches in length and weighing 2.58 pounds.

D. Largemouth Bass

LMB	LMP GOALS	1997	1998	1999
YAR	1-5	0.5	--	--
PSD	40 - 70	76	66	73
RSD-18	5	13	12	13
8.0 - 11.9	30	24	37	31
12 - 14.9	32	28	20	28
> 15.0	38	48	43	41
CPUE(#/hr)	68	79	43	67
< 8.0	18	19	12	5
8 - 11.9	20	14	12	19
12 - 14.9	18	17	6	18
> 15.0	12	29	13	25
HARVEST (lbs/ac)	7 - 10	--	--	--
CATCH (lbs/ac)	15 - 20	--	--	--
Wr	90 - 110	102	98	96

Numbers of largemouth bass collected in the population survey of 1998 (CPUE - 43/hr) was 47% lower than the average of previous years (CPUE - 81/hr). The 1999 survey was 17% (CPUE - 67/hr) below the previous average but there was no significant difference between the number bass collected and the goal (CPUE - 68/hr). Even though the numbers of bass collected in 1999 were lower than the average number of bass collected in previous years, the population remained above the desired goal. Only the number of bass collected less than 8.0 inches was below the desired goal. Successful reproduction/recruitment maybe a potential problem. The numbers of bass 15.0 inches and larger was twice the desired goal, indicating a large number of quality size bass present. Relative weight (Wr) was good at 96. Wr was 92 for bass less than 12.0 inches, 99 for 12.0 to 15.0 inch bass, and 105 for bass 15.0 inches and larger. There appears to be adequate forage for bass of all lengths.

The loss of the aquatic weeds have been a major loss to the fishery. Weed beds provide aquatic insects for small fish to eat, places for small fish to avoid predation and increases the number of fish available for recruitment into the population. Also weed beds provide habitat for larger fish and increases the success rate of the angler.

E. Gizzard Shad

GZS	LMP GOALS	1997	1998	1999
PSD	30 - 60	2	5	3
CPUE(#/hr)	150	338	132	130
<4(#/hr\%)	45 \ 30	254 \ 75	0 \ 0	7 \ 5
4.0 - 5.9	60 \ 40	35 \ 10	66 \ 50	38 \ 29
6.0 - 7.9	30 \ 20	25 \ 8	26 \ 20	61 \ 47
> 8.0	15 \ 10	24 \ 7	40 \ 30	24 \ 18
Wr	90 - 110	89.	96	96

The gizzard shad population is large and of a desirable size to support both small and large predator fishes. The size distribution has shifted toward larger size shad. In 1997 large numbers of shad less than 4.0 inches were collected, and in both 1998 and 1999 a reduction in number greater than 97% was noted. One strong year class was present in 1999 at 6 inches in length and comprised 44% of the population. Relative weight (Wr) of all lengths was good at 96.

Channel Catfish: This population remains large in numbers with a good length frequency distribution. As in all "hot water" lakes, there is an abundance of small channel catfish. This fishery will provide quality angling to the anglers. Average relative weight (Wr) was good at 91.

Striped Bass: Anglers reported catching legal fish in 1997. This species drew moderate angler attention in 1998 and 1999. As the population continues to develop and matures, an angling base is expected to develop for this species. A special survey will be conducted in May to evaluate this species.

EXHIBIT 13

Capital Expenditures for Solar-Powered Aerators

COST CNTR: CWS00 POWER PLANT BILL OF MATERIAL - INVOICED

BOM: 218307

OUTAGE: NONE **ESTIMATED COMPLETE:** 11/30/2007 **MATERIAL REQUIRED** 08/03/2007 **PRIORITY:** 3

JOBNBR: JR498260 01

ACCOUNTING: 1 92 506 CFO CFO W0910 01 OCWS NX DEPT
U DIV MAJ MIN FMC RMC T PROJ PR ACTIV RT COMMON

Originated: WOMACK,M 39605 07/27/2007
Requested: FRY,SR 34880 07/30/2007
Approved: SPERANEO,R 33177 07/30/2007

MATL FOR: Cooling system improvement

DELIVER TO: STOREROOM

QR: No

ITEM	QUAN	UNIT	DESCRIPTION	UNIT PRICE	TOTAL COST	Matl' ID NBR
1	1	EA	Solarbee Reservoir Circulators, 4 ea., delivered and installed (by the OEM). Quotation 20070726.	17,684.000	$17,684.00	
2	3	MO	Solarbee Reservoir Circulators, 4 ea., for the minimum lease period of three months. Quotation 20070726.	9,797.330	$29,391.99	

Total: $47,075.99

Comments:

Mike Womak is the Ameren contact. He has been working with Gerry Ryckman to set up SolarBee as a vendor.

Attached Documents:

Description	Document File Name
Q-AmerenPowerCoffeenIL20070726.pdf	\\corp.dir.ameren.com\dfs\func\emprv\Coffeen\emprvdoc\\Q-AmerenPowerCoffeenIL20070726.pdf

Items	Order Method	Requisition	Req Date	PO NBR	PO Date	Supplier	Ship to Address
1-2	NON-STK REQ	222284	07/30/2007	325103	07/31/2007 00:00:00	SOLARBEE INC 6232900	

COST CNTR: POWER PLANT BILL OF MATERIAL - INVOICED

BOM: 218440

OUTAGE: NONE

MATERIAL REQUIRED 08/10/2007 **PRIORITY:** 3

JOBNBR: NONE 0

Originated: WOMACK,M 39605 07/31/2007

Requested: WOMACK,M 39605 07/31/2007

Approved: ENSOR,DA 35586 07/31/2007

ACCOUNTING: 1 92 512 CFO 131 15707 01 OCWS EX DEPT
U DIV MAJ MIN FMC RMC T PROJ PR ACTIV RT

MATL FOR: N/A

DELIVER TO: STOREROOM

QA: NS

QR: No

ITEM	QUAN	UNIT	DESCRIPTION	UNIT PRICE	TOTAL COST	Matl' ID NBR
1	1	LT	Site Inspection, Pre-Test for Coffeen Cooling Tower Optimization as perClean Air Engineering Proposal Number 34352 Supplier: CLEAN AIR ENGINEERING 0370501	5,000.000	$5,000.00	
2	1	LT	Testing Services for the optimization of Coffeen Cooling Towers as per Clean Air Engineering Proposal Number 34352 Supplier: CLEAN AIR ENGINEERING 0370501	22,767.000	$22,767.00	

Total: **$27,767.00**

Comments:

Unsupported attachment type

Items	Order Method	Requisition	Req Date	PO NBR	PO Date	Supplier	Ship to Address
1-2	NON-STK REQ	149551	07/31/2007	325195	08/01/2007 00:00:00	CLEAN AIR ENGINEERING 0370501	

COST CNTR: CWS00 POWER PLANT BILL OF MATERIAL - INVOICED

BOM: 221030

OUTAGE: NONE **ESTIMATED COMPLETE:** 11/30/2007 **MATERIAL REQUIRED** 09/05/2007 **PRIORITY:** 3

JOBNBR: JR498260 01

ACCOUNTING: 1 92 506 CFO CFO _ W0910 01 OCWS NX DEPT
U DIV MAJ MIN FMC RMC T PROJ PR ACTIV RT COMMON

Originated: WOMACK,M 39605 08/30/2007
Requested: WILLIAMS,JI 33234 09/05/2007
Approved: WILLIAMS,JI 33234 09/05/2007

MATL FOR: Cooling Basin Circulators

DELIVER TO: STOREROOM

QR: No

ITEM	QUAN	UNIT	DESCRIPTION	UNIT PRICE	TOTAL COST	Matl' ID NBR
1	1	EA	Solarbee Reservoir Circulators, 4 ea., delivered and installed (by the OEM). Quotation 20070826.	17,684.000	$17,684.00	
2	3	MO	Solarbee Reservoir Circulators, 4 ea., for the minimum lease period of three months. Quotation 20070826.	9,797.330	$29,391.99	

Total: $47,075.99

Comments:

4 Additional Solarbee Circulators for installation in the Coffeen Plant Cooling Basin. Mike Womack is the contact. Solarbee is the vendor. This is the second order - first po is 325103. A new PO is preferred for this order.

Attached Documents:

Description	Document File Name
Q-AmerenPowerCoffeenIL20070826.pdf	\\corp.dir.ameren.com\dfs\func\emprv\Coffeen\EMPRV\EBOM_Docs\Q-AmerenPowerCoffeenIL20070826.pdf

Items	Order Method	Requisition	Req Date	PO NBR	PO Date	Supplier	Ship to Address
1-2	NON-STK REQ	224096	09/05/2007	330570	09/05/2007 00:00:00	SOLARBEE INC 6232900	

PO0113c

COST CNTR: CWS00 POWER PLANT BILL OF MATERIAL - PO PEND

BOM: 229779

OUTAGE: NONE

JOBNBR: JR498260 10

MATERIAL REQUIRED 12/20/2007

PRIORITY: 3

ACCOUNTING:

1	92	506		CFO	CFO		W0910	01	OCWS	BM	DEPT
U	DIV	MAJ	MIN	FMC	RMC	T	PROJ	PR	ACTIV	RT	COMMON

Originated: WOMACK,M 39605 12/12/2007

Requested: FRY,SR 34880 12/13/2007

Approved: SIMPSON,J 27922 12/17/2007

MATL FOR: Cooling Basin temperature reduction

DELIVER TO: STOREROOM

QR: No

ITEM	QUAN	UNIT	DESCRIPTION	UNIT PRICE	TOTAL COST	Matl' ID NBR
1	1	LT	Purchase 1 lot of four (4) Solarbee Circulators currently installed in the Coffeen Cooling Basin. This equipment is already installed. We will excercise the lease-to-purchase agreement as per the attached quotation. Supplier: SOLARBEE	137,946.400	$137,946.40	

Total: $137,946.40

Comments:

I can only change the PROJ on the NON-STK REQ tab, but if there is another action needed, please let me know.

Attached Documents:

Description	Document File Name
BO-SolarBee-1-AmerenPower-20071003.xls	\\corp.dir.ameren.com\dfs\func\emprv\Coffeen\EBomDocs\JR498260\\BO-SolarBee-1-AmerenPower-20071003.xls

Items	Order Method	Requisition	Req Date	PO NBR	PO Date	Supplier	Ship to Address
1	NON-STK REQ	229423	12/17/2007				

EXHIBIT 14

Summary of De-Rate Economic Impact Chart

SUMMARY OF DERATE ECONOMIC IMPACT

Unit	Type	Start	End	Duration	Eq Hrs	MW Hrs		Margin
9660 - THERMAL DISCHARGE LIMITS - ALL STEAM UNITS								
Coffeen 1	D1	05/02/2000 23:00	05/03/2000 05:00	6.00		1,139	$	14,328.62
Coffeen 1	D1	05/03/2000 23:00	05/04/2000 05:00	6.00		1,139	$	14,328.62
Coffeen 1	D1	05/04/2000 23:00	05/05/2000 00:00	1.00		190	$	2,395.23
Coffeen 1	D1	05/05/2000 00:00	05/05/2000 06:00	6.00		1,741	$	21,899.26
Coffeen 1	D1	05/05/2000 06:00	05/06/2000 00:00	18.00		1,799	$	22,626.39
Coffeen 1	D1	05/06/2000 23:00	05/07/2000 05:00	6.00		1,139	$	14,328.62
Coffeen 1	D1	05/07/2000 23:00	05/13/2000 00:00	121.00		22,991	$	289,224.26
Coffeen 1	D1	05/22/2000 00:00	05/22/2000 03:47	3.78		717	$	9,024.89
Coffeen 1	D1	05/22/2000 03:47	05/30/2000 00:00	188.22		35,761	$	449,875.90
Coffeen 1	D1	05/09/2007 00:01	05/12/2007 05:01	77.00		6,929	$	148,077.00
Coffeen 1	U3	05/12/2007 05:01	05/15/2007 23:27	90.43		30,746	$	657,046.29
Coffeen 1	PD	08/09/2007 01:05	08/09/2007 07:00	5.92		408	$	11,016.00
Coffeen 1	PD	08/10/2007 00:00	08/10/2007 06:00	6.00		473	$	12,760.20
Coffeen 1	PD	08/11/2007 00:30	08/11/2007 08:00	7.50		554	$	14,963.40
Coffeen 1	PD	08/12/2007 01:15	08/12/2007 08:00	6.75		534	$	14,412.60
Coffeen 1	PD	08/13/2007 01:00	08/13/2007 06:00	5.00		394	$	10,648.80
Coffeen 1	PD	08/14/2007 00:25	08/14/2007 07:00	6.58		394	$	10,648.80
Coffeen 1	PD	08/15/2007 00:30	08/15/2007 07:00	6.50		554	$	14,963.40
Coffeen 1	PD	08/15/2007 23:30	08/16/2007 07:00	7.50		0	$	-
Coffeen 1	MO	08/17/2007 00:12	08/22/2007 08:13	128.02		43,527	$	1,175,223.60
Coffeen 1	PD	08/23/2007 00:01	08/23/2007 06:00	5.98		479	$	12,943.80
Coffeen 1	PD	08/23/2007 23:55	08/24/2007 06:00	6.08		469	$	12,668.40
Coffeen 1	PD	08/24/2007 23:25	08/25/2007 07:55	8.50		680	$	18,360.00
Coffeen 1	PD	08/25/2007 23:40	08/26/2007 07:00	7.33		588	$	15,881.40
Coffeen 1	PD	10/13/2007 00:01	10/15/2007 05:00	52.98		4,770	$	60,915.45
Coffeen 1	PD	10/17/2007 00:01	10/23/2007 08:00	151.98		13,678	$	174,670.61
		CAUSE TOTAL		936.05		171,795	$	3,203,231.56

EVENTS BY EQUIPMENT CAUSE CODE
Coffeen, Coffeen 2
January 1999 - September 2007

SUMMARY OF DERATE ECONOMIC IMPACT

Unit	Type	Start	End	Duration	Eq Hrs	MW Hrs		Margin
9660 - THERMAL DISCHARGE LIMITS - ALL STEAM UNITS								
Coffeen 2	D1	05/11/2000 00:00	05/12/2000 00:00	24.00		2,638	$	33,181.01
Coffeen 2	D1	05/12/2000 00:00	05/13/2000 00:00	24.00		1,680	$	21,134.40
Coffeen 2	D1	05/13/2000 00:00	05/15/2000 00:00	48.00		13,922	$	175,133.73
Coffeen 2	D1	05/15/2000 00:00	05/16/2000 00:00	24.00		5,762	$	72,490.99
Coffeen 2	D1	05/16/2000 00:00	05/17/2000 00:00	24.00		2,761	$	34,730.86
Coffeen 2	D1	05/17/2000 00:00	05/18/2000 00:00	24.00		1,680	$	21,134.40
Coffeen 2	D1	05/18/2000 00:00	05/19/2000 00:00	24.00		2,162	$	27,192.93
Coffeen 2	D1	05/19/2000 00:00	05/20/2000 00:00	24.00		599	$	7,537.94
Coffeen 2	D1	05/22/2000 00:00	05/23/2000 00:00	24.00		840	$	10,567.20
Coffeen 2	D1	05/23/2000 00:00	05/23/2000 07:00	7.00		140	$	1,761.20
Coffeen 2	D1	05/25/2000 07:30	05/26/2000 00:00	16.50		661	$	8,312.86
Coffeen 2	D1	05/26/2000 00:00	05/27/2000 00:00	24.00		2,638	$	33,181.01
Coffeen 2	D1	05/27/2000 00:00	05/28/2000 00:00	24.00		3,242	$	40,789.39
Coffeen 2	D1	05/28/2000 00:00	05/29/2000 00:00	24.00		1,198	$	15,075.87
Coffeen 2	U3	05/18/2001 23:50	05/24/2001 18:45	138.92		77,795	$	546,900.26
Coffeen 2	D1	05/09/2007 02:19	05/11/2007 12:12	57.88		5,382	$	115,004.79
Coffeen 2	D1	05/11/2007 12:12	05/11/2007 23:29	11.28		1,680	$	35,901.60
Coffeen 2	D1	05/11/2007 23:29	05/12/2007 02:56	3.45		420	$	8,975.40
Coffeen 2	D1	05/12/2007 02:56	05/16/2007 05:47	98.85		9,195	$	196,501.42
Coffeen 2	D3	05/26/2007 00:01	05/29/2007 00:01	72.00		8,786	$	187,765.37
Coffeen 2	PD	08/09/2007 01:16	08/09/2007 07:00	5.73		554	$	14,968.80
Coffeen 2	PD	08/10/2007 00:00	08/10/2007 06:00	6.00		700	$	18,900.00
Coffeen 2	PD	08/11/2007 01:00	08/11/2007 08:00	7.00		644	$	17,388.00
Coffeen 2	PD	08/12/2007 01:50	08/12/2007 08:00	6.17		566	$	15,271.20
Coffeen 2	PD	08/13/2007 01:00	08/13/2007 06:00	5.00		459	$	12,398.40
Coffeen 2	PD	08/14/2007 00:25	08/14/2007 07:00	6.58		672	$	18,144.00
Coffeen 2	PD	08/15/2007 00:30	08/15/2007 07:00	6.50		661	$	17,841.60
Coffeen 2	D3	08/15/2007 23:55	08/16/2007 07:00	7.08		722	$	19,504.80
Coffeen 2	PD	08/17/2007 00:15	08/17/2007 07:00	6.75		689	$	18,597.60
Coffeen 2	PD	08/18/2007 01:05	08/20/2007 07:00	53.92		5,499	$	148,478.40
Coffeen 2	PD	08/20/2007 23:00	08/21/2007 06:00	7.00		678	$	18,295.20
Coffeen 2	PD	08/22/2007 00:01	08/22/2007 06:00	5.98		582	$	15,724.80
Coffeen 2	PD	08/23/2007 00:01	08/23/2007 06:00	5.98		582	$	15,724.80
Coffeen 2	PD	08/23/2007 23:55	08/24/2007 06:00	6.08		554	$	14,968.80
Coffeen 2	PD	08/24/2007 23:25	08/25/2007 07:55	8.50		997	$	26,913.60
Coffeen 2	PD	08/25/2007 23:40	08/26/2007 07:00	7.33		857	$	23,133.60
Coffeen 2	PD	10/13/2007 00:01	10/15/2007 05:00	52.98		7,526	$	96,112.13
Coffeen 2	PD	10/17/2007 00:01	10/23/2007 08:00	151.98		21,582	$	275,607.25
		CAUSE TOTAL		1,074.44		187,706	$	2,381,245.61

SUMMARY OF DERATE ECONOMIC IMPACT

359,502 $ **5,584,477.17** Grand Total since 199

EXHIBIT 15

Sargent & Lundy Report: Coffeen Cooling System Thermal Study

COFFEEN UNITS 1 AND 2

COFFEEN COOLING SYSTEM THERMAL STUDY

Report SL-009346

Revision 0

Prepared for
Ameren Energy Generating

June, 2008
Project No. 10087-073

55 East Monroe Street
Chicago, IL 60603

Ameren Energy Generating Coffeen Power Station Units 1 & 2 Coffeen Cooling System Thermal Study	Sargent & Lundy LLC	Report SL-009346 Project No. 10087-073 Date: June 9, 2008

Prepared By: _____
Jeffrey Mallory
Fossil Power Technologies

Reviewed By: _____
Mark Leutloff
Fossil Power Technologies

Approved By: _____
Mark Leutloff
Fossil Power Technologies

TABLE OF CONTENTS

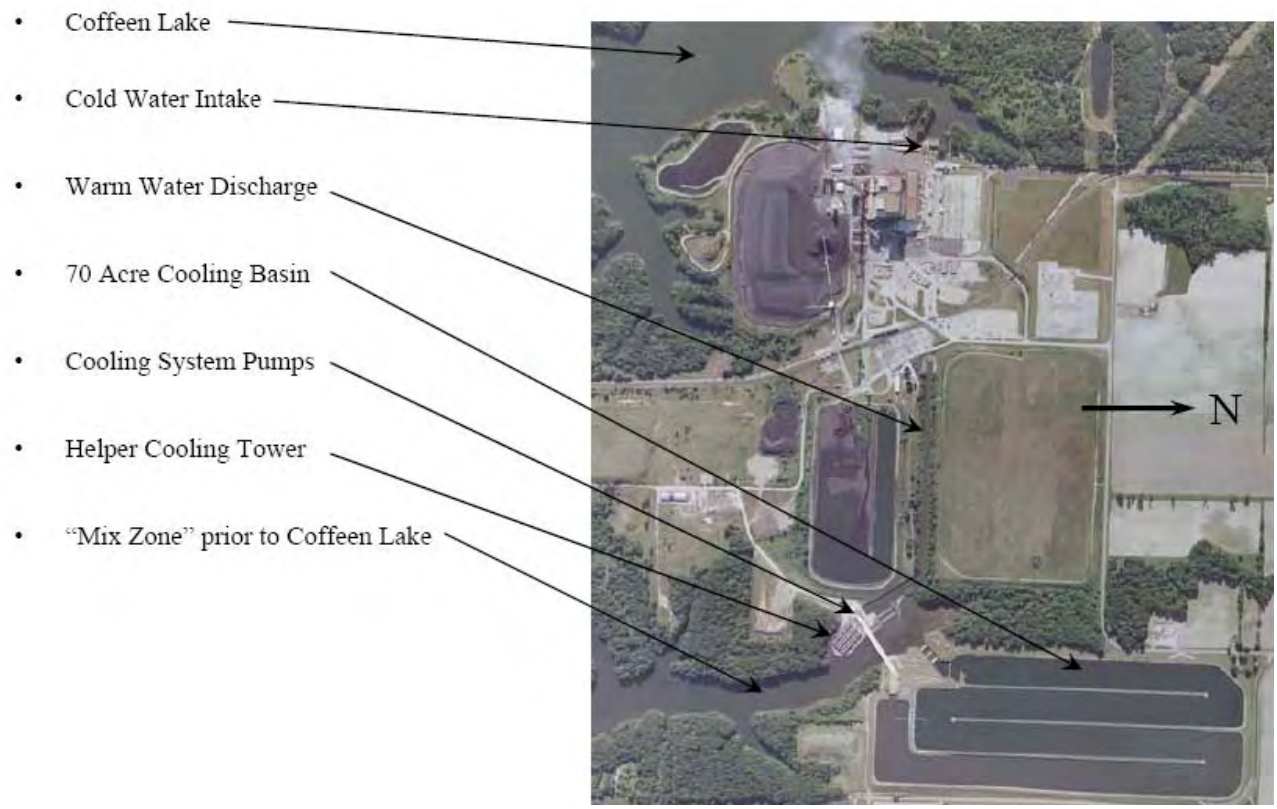
1. INTRODUCTION

This report provides an engineering assessment for Ameren to compare various options to meet its thermal discharge limitations for Coffeen Lake without affecting operational availability. Presently, Coffeen Station is not able to consistently comply with the monthly average thermal limits at Coffeen Lake as set forth in Ameren's NPDES permit without de-rating its units or otherwise affecting operational availability. Ameren's forecasting of future demands for Coffeen Station indicates that electrical output is expected to increase to 1,026 MW with a 90% capacity factor within the next few years.

This report evaluates the performance of Coffeen Station's cooling system based on the forecasted increases in future gross electrical output and capacity factor using S&L's thermal lake modeling software program. It considers several alternatives to improve performance to meet the current thermal limits and evaluates whether the alternatives are technically feasible. It also sets forth a cost estimate for each alternative that is considered technically feasible per the S&L modeling. Finally, it sets forth an evaluation of an alternative thermal limitation in Ameren's NPDES permit for the months of May and October.

The existing Coffeen Station cooling system consists of Coffeen Lake, the cooling basin, and cooling towers as shown in an aerial representation in Figure 1-1. Coffeen Lake is a 1,100-acre artificial impoundment created to support the water needs of the Coffeen Station.

Figure 1-1
Aerial Representation of Current Coffeen Cooling System



The discharge temperature monthly average and peak limits at the edge of the "Mix Zone", which is the 26-acre area in the lake adjacent to the plant discharge, are set forth in the station's NPDES permit and were originally based on a 1,000 MW station operating at 70% capacity factor. These limits are shown in Table 1-1.

Table 1-1
NPDES Mix Zone Temperature Permit Limits

Months	Permit Monthly Average	Permit Monthly Peak
October through May	89°F	94°F(1)
June through September	105°F	112°F(2)

1. Temperature is allowed to exceed permit limit 2% of the hours in the month.
2. Temperature is allowed to exceed permit limit 3% of the hours in the month.

The station has periodically experienced loss of generation capacity to comply with the permit temperature limits. The 70-acre supplemental cooling basin was installed in the spring of 2000 and helper cooling towers were installed in the spring of 2002 in an effort to alleviate this problem. The station has the capability to direct the warm station discharge flow to the basin, the cooling towers, directly to the mix zone, or a combination of the three. Both the basin and the cooling towers are located upstream of the mix zone in order to cool the discharge to meet the mix zone temperature limits.

Despite the foregoing efforts, the station continues to experience loss of generation capacity during periods of high station power output and hot weather conditions, specifically during May and October, which correspond to the first and last months of the non-summer thermal limits. Coffeen Lake was originally designed to provide cooling capacity equivalent for operation of a 1,000 MW station with a 70% capacity factor. The maximum plant gross electrical output is currently 950 MW. Future gross electrical output of the plant including burning a higher percentage of Illinois coal and steam turbine and induced draft fan upgrades is expected to be 1,026 MW. The station is currently run at 95% or greater capacity factors for a 24 hour period as weather conditions and permit compliance allows and is currently averaging 82% capacity factor for 2008 (as of the date of this report), including a complete station outage lasting over 3 weeks. It is not possible to maintain these capacity factors during periods of hot weather during May and October. The higher future gross electrical output and capacity factors both increase the required cooling system capacity in order to meet the NPDES permit limits and avoid station derates.

In an effort to quantify the current installed cooling system capability and evaluate options to maintain compliance without resorting to de-rating, Ameren contracted Sargent & Lundy LLC (S&L) to perform a detailed evaluation of the existing cooling system. This study assesses various alternative enhancements to the existing cooling system, and the costs of such alternatives. The results provided input data for feasible system modifications to Ameren's financial evaluation team for economic analysis.

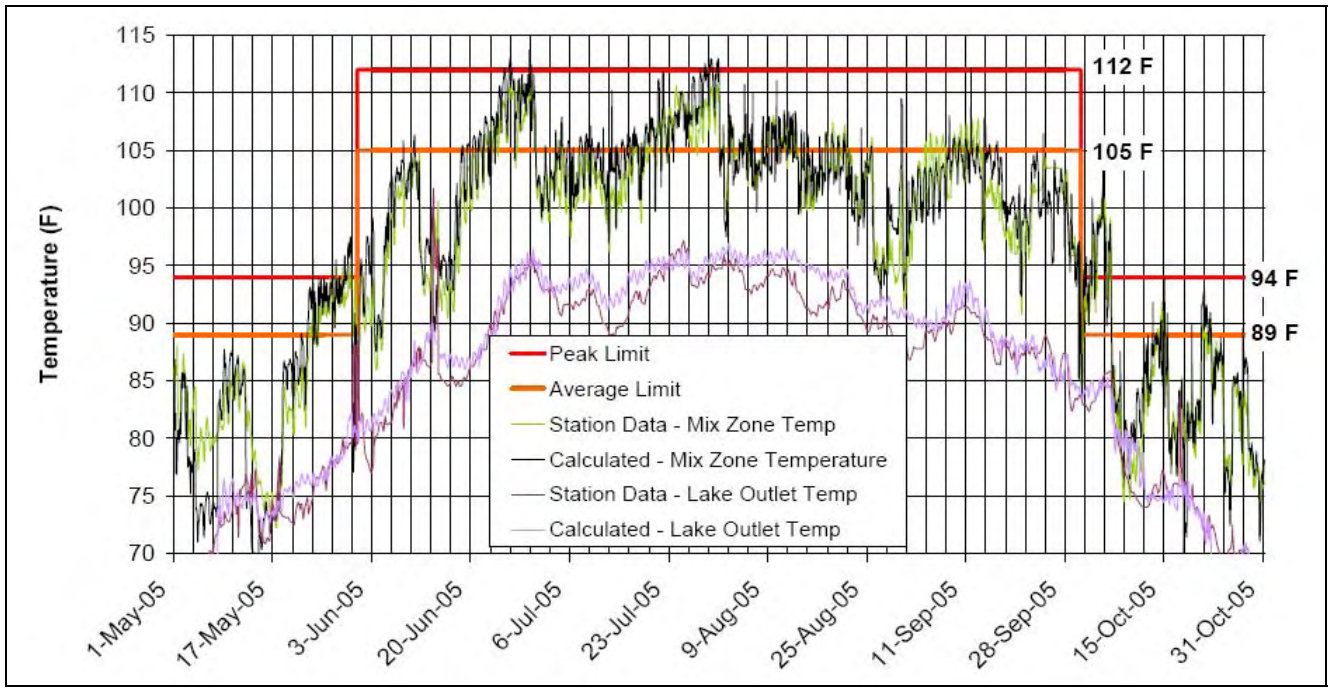
2. METHODOLOGY

The thermal performance of the Coffeen cooling system was evaluated using S&L's thermal lake modeling software program utilizing the following data:

- Historical hourly weather data
- Cooling water temperature rise across station
- Cooling water flowrates
- Cooling tower performance curve
- Lake and basin volume and surface area data

The model for the existing cooling system was benchmarked based on measured historical weather and corresponding plant operating data. The results of this model benchmarking are illustrated in Figure 2-1. The calculated mix zone temperature shown in black is overlaid on the actual measured mix zone temperature shown in green.

Figure 2-1
Coffeen Main Lake Calibration Based on 2005 Station Data

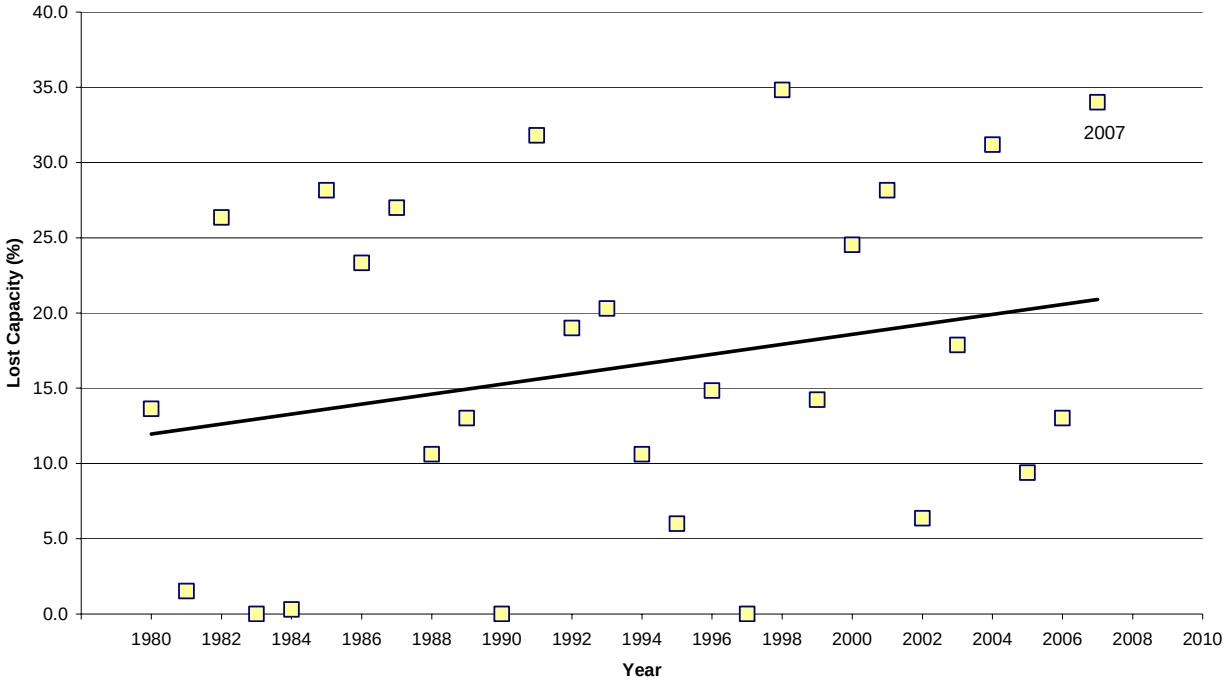


Based on the model, the calculated mix zone temperature is typically within +/- 2 ^{o}F compared to measured station data. The estimation of theoretical station generation capability based on the model is accurate within approximately +/- 5%.

Utilizing the model along with sets of historical weather data, theoretical plant operation at 1,026 MW and 90% capacity factor was modeled to determine the station capability for each evaluated year. The evaluations supported a common observation that May and October often have periods of unseasonably warm weather, closely resembling summer conditions. Furthermore, due to the time required for the water to circulate from the mix zone back to the plant intake, the first week of October can be especially problematic as the water arriving at the station intake may be near October's winter-permit temperature discharge limit. This occurs after the end of an unseasonably warm September where the station has been operated at a high capacity factor and there is insufficient capacity in the existing cooling system to adequately pre-cool the water before the start of October. These conditions severely reduce the station's generation until the plant inlet temperature drops due to reducing power output or the weather becomes cooler.

The evaluations identified the month of May as the most consistently limiting month per historical data. With a projected future capacity factor of 90%, the minimum calculated generation shortfall (in percentage below 90% capacity factor) is shown in Figure 2-2 for the month of May considering historical weather data from 1980-2007.

Figure 2-2
Theoretical Trend in Lost Capacity Factor in May Based on 90% CF at 1026 MW



Notes
1. Trend Line shows gradual increase in average losses over time from 12% in 1980 to 21% in 2007.
2. Average 16% loss per year (including 2007) = 122,135 MWHrs/yr = $2,334,000 lost based on $19.11 per MWHr (2007 dollars).
3. 34% loss in 2007 = 259,537 MWHrs/yr = $4,959,750 lost based on $19.11 per MWHr (2007 dollars).

3. EVALUATED OPTIONS

In an effort to identify technically feasible and economically-viable options to alleviate the need to de-rate its units to maintain compliance with thermal standards, the following options were evaluated:

- Utilize existing system as-is and continue to artificially de-rate units.
- Install additional cooling towers
- Add cooling basin capacity
- Modify the station to utilize a closed-cycle cooling tower
- Modify the station to utilize an air-cooled condenser on one or both units
- Utilize the entire length of Coffeen Lake

3.1 Utilize Existing System Pursuant to Current NPDES Permit Limits

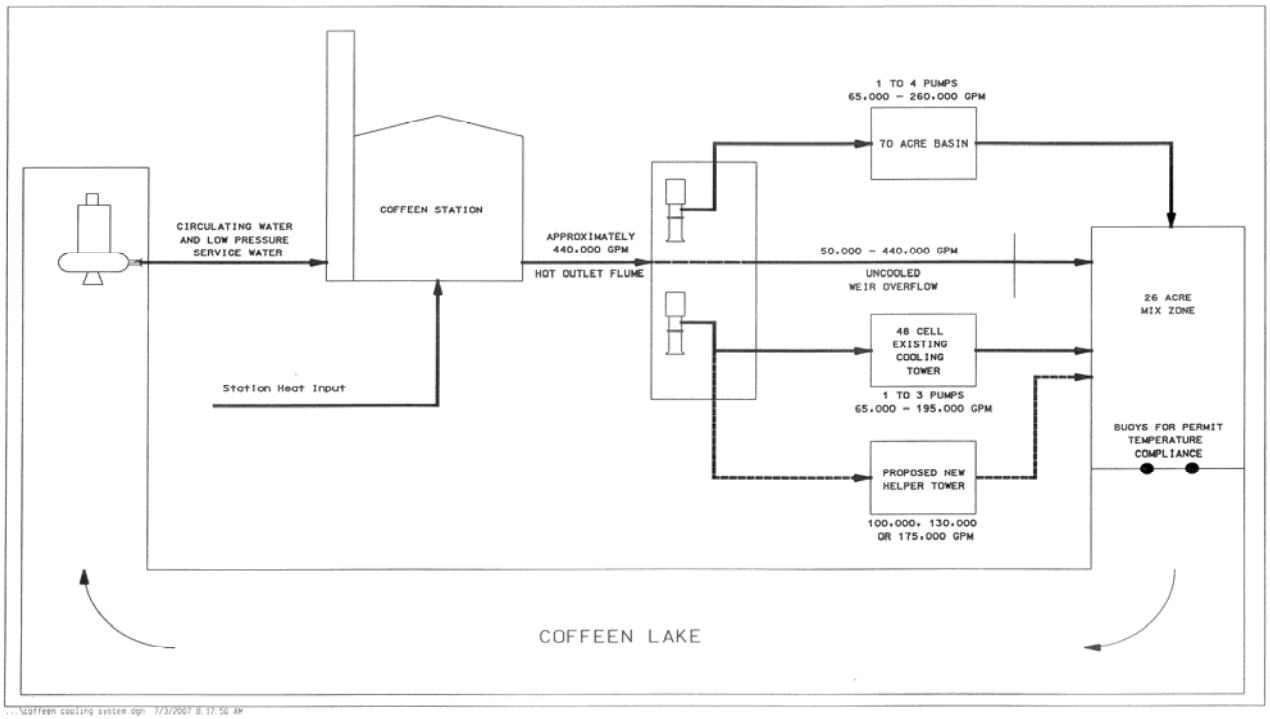
The current cooling system, as described in Section 1 above, consists of Coffeen Lake, the cooling basin, and the helper cooling towers. Both Coffeen Lake and the cooling basin reject heat through radiation (>50%), evaporation (<50%), and the remainder through convection and conduction. The helper tower primarily rejects heat through evaporation during the hot summer months and therefore requires more water per unit of cooling than the lake and basin. However, the helper tower performs better during hot periods than the lake and basin, both of which absorb a substantial portion of solar radiation during the daytime. As temperature or humidity rise, the cooling capacity of the Coffeen cooling system decreases and the cooling water enters the lake and returns to the station at higher temperatures.

Considering a future gross electrical output of 1,026 MW and a projected average monthly capacity factor of 90% for Coffeen Station, the current cooling system installation is not sufficient to maintain compliance with the existing thermal standard. Unit derating in May is significant for the majority of the evaluated years as illustrated in Figure 2-2. For the purposes of the economic comparison, maximum annual generation was calculated to be 88% annual capacity factor for 1992, which was a cooler year overall with relatively average weather in May as shown in Figure 2-2. The 2% shortfall of 90% capacity factor for 1992 corresponds to an average annual gross generation loss of 21 MW. The entire 2% loss was due to operation during the month of May and highlights the substantial reduction in generation capacity experienced by the station to comply with the current NDPES limits.

3.2 Augment Existing Towers with A New Field-Erected Tower

Three versions of an additional "helper" cooling tower, each having a different capacity, were added to the model as shown schematically in Figure 3-1. The proposed helper towers provide additional cooling capacity that may be utilized when the existing system capacity is insufficient.

Figure 3-1
Schematic Diagram of Coffeen Cooling System with Proposed New Helper Tower



Based on the models run for 1991, which was extremely hot and humid in May, the design parameters for a tower to maintain compliance with the existing thermal standards were determined and are included in Table 3-1 along with the design parameters of the existing towers.

Table 3-1
Helper Tower Design Parameters

Parameter	Existing Towers	New Tower
Number of Tower Rows	6	1
Length of Each Row (ft.)	230	560
Total Number of Fans/Cells	48	14
Installed Fan Power/Total Power (hp)	75 / 3,600	250 / 3,500
Fill Type	Film	Splash
Design Flowrate (gpm)	200,000	175,000
Cooling Range (^{o}F)	18	31
Wet Bulb Approach (^{o}F)	23	10
Static Head Limitation (ft.)	NA	<35

The new 175,000 gpm helper tower identified in Table 3-1 above provides an additional 150% of the existing tower cooling capacity based on 1991 conditions. Addition of a helper tower sized for the 1991 conditions would maintain compliance without de-rating during extreme weather conditions.

However, due to the infrequent need for a tower designed based on such extreme weather, smaller 100,000 gpm and 130,000 gpm design flowrate towers were also evaluated. The 130,000 gpm tower size was chosen to eliminate lost generation for all but one year out of a twenty-two year period (1980-2001) for which a detailed evaluation was performed. Full capacity was required for seven years in this evaluation period. As a least-capital cost option, the 100,000 gpm tower was considered and would result in 4% to 10% lost generation in May for seven years in the evaluation period.

3.3 Additional Cooling Basin Capacity

The possibility of augmenting the current cooling system by expanding the current cooling basin was reviewed to evaluate the feasibility of this option. At the initiation of this study, there was potentially an additional 96 acres of land available directly west and extending north of the current basin. However, the added basin capacity proved to be equivalent to only 25,000 gpm of new helper cooling tower cooling capacity during extreme weather conditions which would not result in compliance with thermal standards in May and October without substantial de-rating of the units. Furthermore, the area that was initially available for the expansion has been utilized for the new Wet Flue Gas Desulphurization (WFGD) project at the Coffeen Station. Therefore, this alternative was not considered technically feasible.

3.4 Closed-Cycle Cooling Tower

The option for converting Coffeen Station from a once-through, lake-cooled system utilizing Coffeen Lake to a closed-cycle cooling tower system was also considered. This major modification would remove the steam condensing heat load on the lake which would eliminate mix zone temperature compliance issues while marginally increasing overall station efficiency on an annual basis. In this configuration, the warm cooling water would be cooled in the new tower and pumped around in a closed-cycle through the steam condensers. A continuous blowdown stream of wastewater would require disposal to maintain the system chemistry.

While converting to a closed-cycle cooling tower is technically feasible, Coffeen Station was not originally designed or arranged to support such a major modification. The condenser water boxes and tubes are of particular concern as the design pressure would need to be increased by approximately 40% or more above the original design values to accommodate the additional static head associated with the closed cooling tower operation. Therefore, major upgrades to all of the main and auxiliary condensers and circulating water expansion joints and valves to support the additional pressure are considered. Modifications to the water boxes are further complicated by the condensers' locations in the station basement and would require extended

outages to perform the necessary modifications. The costs associated with a closed-cycle tower conversion are estimated to be $75,000,000 to install the new system and upgrade the condenser and the circulating water system components. This cost does not include financial losses due to plant outages.

An additional drawback to implementing a closed-cycle system includes the long length of circulating water piping required to locate the new tower in an area that will not cause cold-weather icing on the overhead transmission lines north of the station and to reach a suitable area to install the tower. Due to this extensive length, the pipelines must be larger diameter to minimize pressure losses, which in turn causes additional interferences with current underground utilities. There are numerous active underground utilities and pipelines, such as the existing circulating water lines and electrical ductbanks feeding the existing switchyard that must be relocated or rerouted to allow for installation of the piping and therefore resulting in extended outage times for installation. For these reasons, installation of the new closed-cycle tower system is high-risk in terms of unanticipated extensions of planned outages and associated project cost.

The disposal of closed-cycle cooling tower blowdown is also problematic. While a small portion of the blowdown may be able to be utilized in the new WFGD system, the majority would need to be discharged into Coffeen Lake or evaporated using expensive and complicated wastewater treatment systems. Due to the fact that a closed-cycle cooling tower at Coffeen will evaporate more water per year than the current lake and cooling basin-assisted system that utilizes radiation for a significant portion of the cooling, the average yearly lake level would decrease. Due to the extraordinary costs, probable impact to lake water levels, substantial risks, and the extended outages associated with implementation of a closed-cycle tower, this option was not considered technically feasible.

3.5 Air-Cooled Condenser

An air-cooled condenser operates in a similar manner to standard steam condensers where the steam from the low pressure (LP) turbines and boiler feed pump drives is condensed in a water-cooled heat exchanger. However, in an air-cooled condenser arrangement, the steam is directed into a very large radiator provided with numerous fans to condense the steam using the ambient air. The condensed water is collected in a collection tank and pumped back into the steam cycle.

In the same manner as the closed-cycle cooling tower, the station was not originally designed or arranged to facilitate the installation of an air-cooled condenser on either one of the units. There is no suitable area for installation near the existing condensers due to the location of the main switchyard and onsite coal pile considering the space that would be required for a condenser adequately sized for 1,026 MW of generation capacity. At a minimum, extensive and prohibitively expensive modifications to the plant infrastructure including, but not limited to the LP turbines, boiler feed pump drive turbines, the plant auxiliary electrical systems, turbine building foundations, condensate system, modifications to the steam line drains and turbine startup system, and various other items would be required. In addition to these issues, operation with an air-cooled condenser would lower the generation efficiency of the station and increase emissions, solid waste production, and operating expenses. Because of the numerous issues regarding implementation, this option was not considered technically feasible.

3.6 Utilize Entire Length of Coffeen Lake

The option of moving the station's cold water intake to the northern end of Coffeen Lake to allow the entire lake to participate in the heat rejection was also evaluated with the cooling system model. Implementation of this option would be challenging and costly because of the high pumping power necessary to circulate cool water back to the intake, large pipeline diameters, and long distance from the station to the new intake. More significantly, the results of the theoretical study showed negligible improvement in achieving compliance without de-rating units, considering that the slight gain in net electrical output would be offset by the increased pumping power that would be necessary to return the water to the station. Therefore this option was not considered technically feasible.

4. COST EVALUATION

4.1 Capital Costs

Table 4-1 summarizes the capital costs for the evaluated options that were considered technically feasible per the detailed modeling as discussed in Section 3 above. These costs include direct costs, indirect costs, available funds used during construction (AFUDC), and contingency.

Table 4-1
Fully Loaded Capital Cost Summary

Item	Option 1 Maintain Existing System	Option 2A New 175k gpm Helper Tower	Option 2B New 130k gpm Helper Tower	Option 2C New 100k gpm Helper Tower
New Cooling System Capital Cost	Note 1	$18,266,000	$15,283,000	$13,053,000

1. The entire existing tower would be replaced (like for like) in 2012 for a cost of $6,000,000 and again in 2022 for a cost of $8,700,000

Table 4-2 summarizes the additional annual average gross generation over a 22-year historical period for each option.

Table 4-2
Additional Annual Average Gross Generation

Item	Option 1 Maintain Existing System	Option 2A New 175k gpm Helper Tower	Option 2B New 130k gpm Helper Tower	Option 2C New 100k gpm Helper Tower
Additional Gross Generation (MW)	Base	20.52(1)	20.42(2)	19.19(3)

1. Calculated based on 1992 weather with no lost generation over 22 years.
2. Calculated based on one month limited to 87% CF over 22 years.
3. Calculated based on six months limited to 86% CF and one month limited to 80% CF in 22 years.

O&M costs for maintenance of the towers were based on input from cooling tower suppliers. The following methodology was applied based on a 30 year life of the tower:

- Structural components: (40% of tower capital cost) * 5% per year for years 25 - 30.
- Mechanical components: (25% of tower capital cost) * 2.5% per year for years 10 - 30.
- Tower Fill: (25% of tower capital cost) replaced in whole in year 15.

5. SCHEDULE

The following schedule is considered for installation of a helper cooling tower:

➢ Prepare Permit Applications	2 months
– IEPA Air Pollution Control Construction Permit	
– NPDES Operating Permit	
– Water Pollution Control Construction Permit	
➢ Agency Review	12 months
➢ Procurement	2 months
➢ Submit Drawings	1 month
➢ S&L Submittal Review	+1 month
➢ Release to Engineering for Bill of Material	+2 months
➢ Release of BOM, Start Construction, and Receipt of Material at Site	+4 months
➢ Construction Completion	+6 months
Total Completion Schedule	**30 months**

6. EVALUATION OF ALTERNATE NPDES PERMIT LIMITS

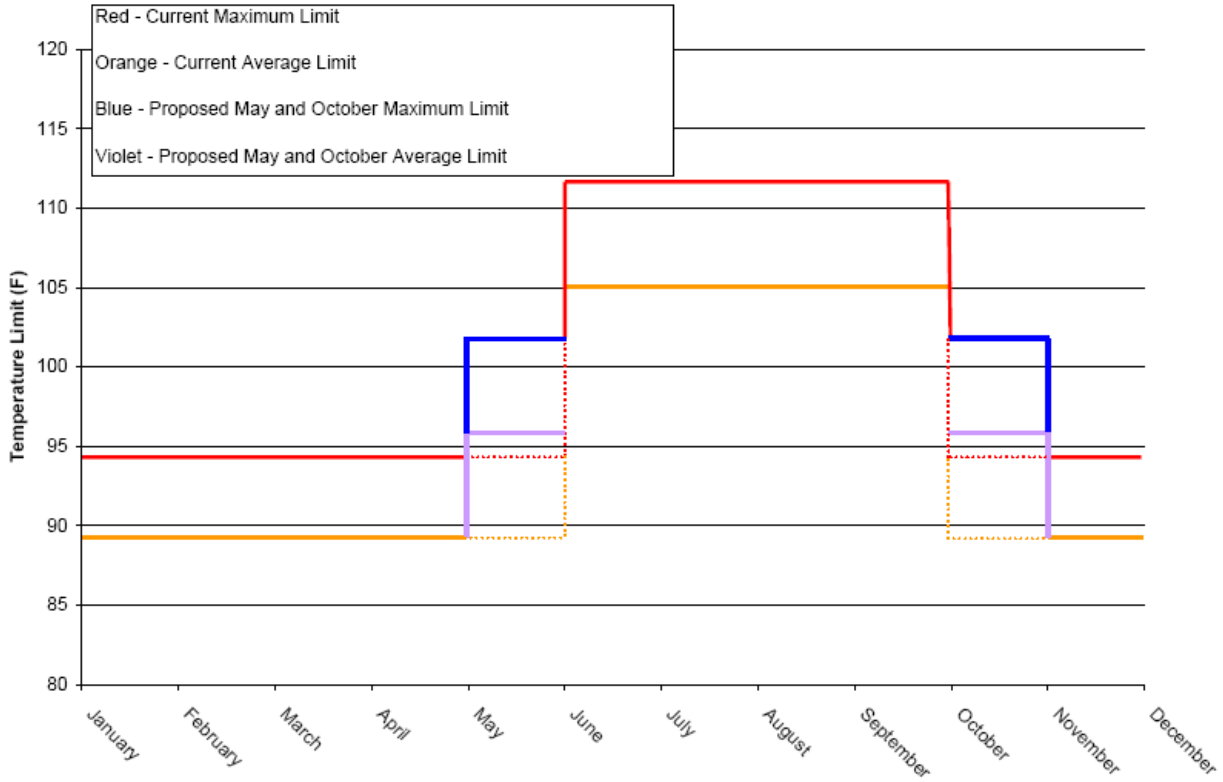
6.1.1 Subsequent to the evaluation of the potential cooling system modifications as summarized in Sections 3 and 4 above, an additional option of raising the NPDES permit limits in both May and October was requested to be evaluated. In response, the model was modified to establish what increase would be required to allow 1,026 MW gross electrical generation at 90% capacity factor while utilizing the existing cooling system. Table 6-1 and Figure 6-1 summarize the proposed NPDES limits to eliminate lost generation in May and October.

Table 6-1
NPDES Mix Zone Temperature Permit Limits

	Current Permit Limits		Proposed Permit Limits	
Months	Average	Peak	Average	Peak
May and October	89°F	94°F(1)	**96°F**	**102°F(1)**
November through April	89°F	94°F(1)	89°F	94°F(1)
June through September	105°F	112°F(2)	105°F	112°F(2)

1. Temperature is allowed to exceed permit limit 2% of the hours in the month.
2. Temperature is allowed to exceed permit limit 3% of the hours in the month.

Figure 6-1
Current and Proposed Coffeen NPDES Permit Limits



As shown in Figure 6-1, the proposed NPDES limits for May and October provide an intermediate increase/decrease permit level between the current winter and summer limits. The temperature changes are proposed to be taken in two smaller steps with one month between in lieu of one larger instantaneous increment. This modification may be beneficial to the Coffeen Lake ecosystem and will alleviate the required addition of cooling capacity for Coffeen Station.

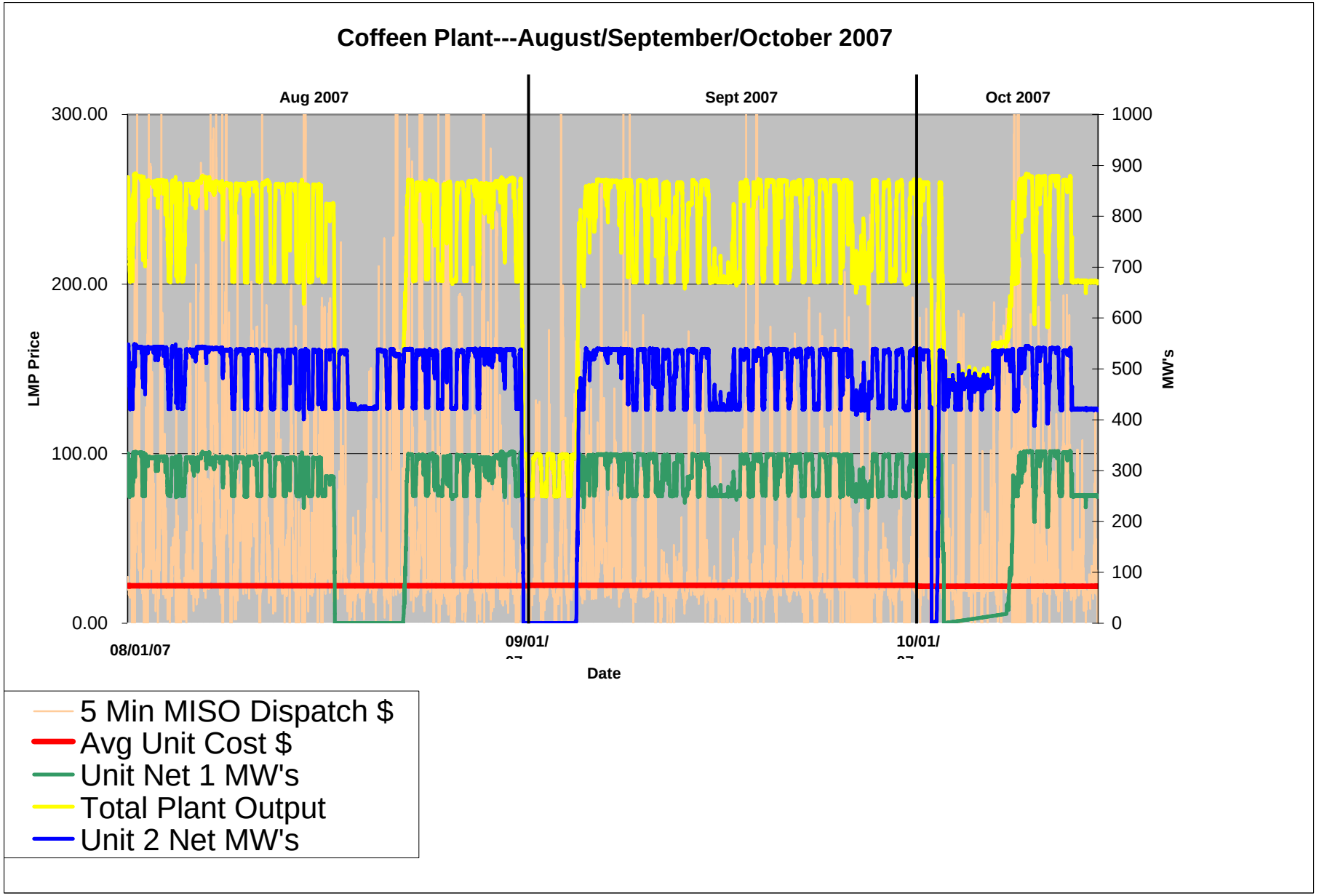
7. CONCLUSIONS

S&L evaluated performance of Coffeen Station's cooling system over the past years and assessed its ability to maintain compliance with current thermal limits under recent and historic weather conditions at forecasted demand conditions. The evaluation showed a gradual increase in average lost capacity over time. In 2007, Ameren experienced a 34% loss in capacity, which resulted in a financial loss of $5,000,000 due to derating. The purpose of this study was to evaluate several alternatives for improving cooling performance so that Coffeen Station would meet thermal limits without requiring de-rating of its units. The capital costs associated with technically feasible enhancements ranged from $13,053,000 to $18,266,000.

S&L also conducted an evaluation of potentially revising the NPDES permit limits for May and October. S&L has determined that providing an intermediate increase in the permit limits for May and October can accommodate the same rate of generation as cooling system modifications and would also reduce the dramatic change in lake temperatures currently realized with the Coffeen Station NPDES permit in its current form.

EXHIBIT 16

Net Generation and MISO Demand Chart


Coffeen Plant---August/September/October 2007
Aug 2007
Sept 2007
Oct 2007
300.00
200.00
100.00
0.00
LMP Price
1000
900
800
700
600
500
400
300
200
100
0
MW's
08/01/07
09/01/
10/01/
Date
5 Min MISO Dispatch $
Avg Unit Cost $
Unit Net 1 MW's
Total Plant Output
Unit 2 Net MW's