

LAKE LEVELS AT LAKE ANNA PROGRESS REPORT 2009



The Gage Used by Dominion at the Dam to Measure Water Height

**A Progress Report By the
Lake Level Committee
Lake Anna Civic Association (LACA)
19 July 2009**

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LAKE LEVELS AT LAKE ANNA **PROGRESS REPORT 2009**

I. Executive Overview

After producing a substantial report and conducting a Membership Survey on low water levels in 2008, the Committee continued its work in 2009 on several fronts. Dominion completed a major step in its path to permitting Unit 3 (the IFIM study) and committed to a 3" rise in the normal Lake Anna lake level to mitigate the water loss impacts of Unit 3, if built. In the process, Dominion committed to working with LACA and others on several projects to improve safety conditions during droughts and installing new mechanisms to better monitor Lake Anna water and temperature levels. This 2009 Progress Report chronicles all these activities and other significant events of the past year and efforts expected to continue in 2009, 2010 and beyond.

II. Background and Summary of 2008 Report

A. Lake Level Issues

In December 2007, LACA responded to many concerns of members about impact of various potential actions that could adversely affect lake levels by forming the Lake Level Committee. Concerns included:

- more frequent and more severe droughts,
- the proposed third reactor (Unit 3) at the North Anna Power Station,
- a new development called Cutalong that proposed withdrawing water from a Lake Anna tributary,
- water supply plans of surrounding counties that indicated potential water withdrawals. and
- a potential new water treatment facility downstream that could require additional flows over the dam.

The Committee was tasked with helping members better understand the problems and causes of low lake levels and make recommendations to the LACA Board of Directors regarding possible future actions. Committee members include Doug Smith, Allan Lassiter, Ken Remmers, Don Jernigan, Rich Biondi, and Mike Sowers.

B. 2008 Report Findings

Low water conditions, whether natural or man-made, adversely affect all lake users. The largest new impact to levels is the proposed third reactor (Unit 3) whose cooling system will evaporate water at rates that could reduce lake levels significantly.

After 6 months of research and study, the Lake Level Committee drafted a report with 13 recommendations. Titled **Lake Levels at Lake Anna**, the report was adopted in full by the LACA Board of Directors on June 4, 2008; the report was widely distributed, was the subject of several news articles and can be found on the LACA website at www.Lakeannavirginia.org.

The thirteen recommendations concerned methods to mitigate low lake levels due to drought, Unit 3, and the other factors and recommendations to better position LACA to effectively advocate water level issues for its members. See Section V. for a status report on these recommendations.

III. Major Events since 2008 Report Publication

A. Tour of the Lake Anna Dam

The Lake Level Committee, while going over the Lake Level Report with Dominion, requested a tour of the North Anna River Dam so we could better understand its operation and effect on lake levels. Dominion graciously agreed to host such a tour on July 25, 2008. During the tour we learned about the two hydroelectric generators that produce additional electricity when flow rates allow and about the skimmer and how it is used to control lake level. We also toured the Partlow station operated by USGS and learned of the history of Dominion contributions to its creation and maintenance. Backup systems and redundant communications methods keep the operator at the dam in contact with the North Anna Plant to ensure correct operations of the dam. The Committee left with the impression that Dominion is doing a good job of operating the dam, but the instruments of control (lake height gage and USGS flow rate measures) make precise adjustments difficult. Go to the LACA web site, www.Lakeannavirginia.org , for a full report on the dam tour.

B. Working with the Lake Level Task Force

In order to create a united lake-area community of support for lake level concerns, LACA representatives joined forces with those of the Friends of Lake Anna (FOLA) and the Lake Anna Boating and Recreation Association (LABARA) to form the Lake Level Task Force. The Task Force was very active in working with lake level concerns.

1. Briefings

A series of briefings were provided to members of Boards of Supervisors of Louisa and Spotsylvania Counties, members of General Assembly, and the Director of Virginia Department of Environmental Quality, and others.

2. Petition

The Task Force created and circulated a petition seeking support for concerns about low lake levels. It was signed or got letters of support from individuals and organizations representing

some 6500 people and 30 businesses near Lake Anna. LACA did not officially support the petition. It remains available in files of the Task Force.

3. Spotsylvania County Resolution

In Jan 2009 members of the Spotsylvania County Board of Supervisors drafted a resolution for presentation to the Board expressing concern about the impact of the third reactor on lake levels and the lack of sufficient information on the impact of Unit 3 on recreation on the lake. The Spotsylvania County Attorney then held a series of meetings which included Dominion and the Lake level Task Force in order to discuss issues surrounding Unit 3 operations. These meetings and information provided by Dominion led to the following conclusions:

- Dry cooling is not a feasible alternative for cooling Unit 3
- Raising the lake level by 3 inches is predicted to mitigate the impact of Unit 3 on lake levels, except in times of drought.
- LACA should focus efforts on actions that can improve safety in drought conditions. These include better marking of obstructions, better identification of dry hydrants, possible warning indicators on low or narrow bridges, and improved measures of lake level.

4. State Legislation- Senate Bill 1484 (SB 1484)

In the 2009 meeting of the General Assembly, Senator Edd Houck introduced legislation that would have required a recreation study of Lake Anna before any permit is issued that affects the Lake Level Contingency Plan. The bill was discussed at length in the Senate Committee of Agriculture and Natural Resources which "tabled" the bill after Dominion publicly committed to a 3 inch rise in the standard lake level when implementing the third reactor.

C. IFIM

A public Stakeholder update meeting was held on March 4, 2009 at which the results of the Instream Flow Incremental Methodology (IFIM) study were presented. Dominion presented the Study with results that were negotiated with the various State Agencies over a period of several months. The initial guidelines from the State agencies for the unit 3 were:

- a) Minimize the times when 20cfs flow over the dam occurs.
- b) Seasonal (March to June) increase in lake level by 3 inches (raising the lake in March and lowering in early July)
- c) Run the unit 3 cooling system in MWC water conservation mode during February through May whenever dam releases are less than 177cfs.

Dominion ran a computer model of the lake including outflows, evaporation, and rainfall and correlated that to measured lake heights. This correlation was performed with the existing conditions of Units 1 and 2 operating. Then the model was run with units 1, 2 and 3 and the current lake level and lastly the model was run with units 1, 2 and 3 and the level increased by 3 inches all year round. The computer runs showed that with the 3 inch rise and unit 3 operating; the time at 20cfs was increased from the existing condition by less

than 1%. The only time the lake level was worse is in drought conditions, lake levels at 248 msl or lower. In drought conditions and unit 3 operating lake levels would fall an additional 3 to 9 inches depending on the length and severity of the drought.

The results concluded:

1. Target a normal pool elevation of 250.25 ft in Lake Anna year round (3 inch rise)
2. Provide recreational flows to North Anna River each Saturday when elevations exceed 250.0 ft during June and/or July. This would equate to 0.23 inches of lake level per event.
3. Memorandum of Agreement (MOA) with DGIF to provide funds (undefined but could be \$100,000/ year) to enhance watershed aquatic habitat. This was traded for the state agencies demand for running the unit 3 cooling system in MWC water conservation mode during February through May whenever dam releases are less than 177cfs (saving Dominion 2.4 Million dollars of energy costs running cooling system fans in the Maximum Water Conservation mode vs. the Energy Conservation mode).

The entire IFIM draft report is available on the VDEQ web site under the Public Information Section. LACA submitted comments to VDEQ in late March, 2009. Our comments centered around concern that the recreational flows to support lower river use in June and July were agreed to after all the analysis was done and that the flows envisioned would negate fully 30% of the advantages provided by the 3 inch lake level rise. It would then follow that all conclusions of the study related to the 3 inch rise are wrong and LACA has requested that the recreational flows should only be done when the lake is above the 250.25 level. As of this writing DEQ has not yet responded to these comments.

The IFIM Report remains a draft and has not yet been adopted/ approved by DEQ and the NRC, as required in the Early Site Permit for the third and fourth reactors.

D. Cutalong

The permit for Cutalong was approved by the State Water Control Board (SWCB) in October 2008. LACA was able to work with the developers and DEQ to encourage the taking of the water needed to water the golf course while the lake is at levels at or above 249.75' msl and hence do not adversely effect lake levels. LACA continues to support the Cutalong development. Recommendation #6 in the 2008 Report remains valid. LACA should carefully review any proposed water withdrawal from the Lake or its tributaries.

E. Low Water Survey and Report

Recommendation # 11 in the 2008 Report called for a survey of the LACA Membership in an attempt to quantify the effects, good or bad, of low water levels. Members were asked to describe their experiences during the most recent low water period (July 07- March 08). The full report ([Low Water Level Survey and Analysis](#)), adopted by the LACA Board on December 4, 2008, was widely distributed, was the subject of several news articles and can be found on the LACA website at: www.Lakeannavirginia.org

Important highlights include:

- 62% of respondents cannot use their docks, boathouses or slips when water levels fall 2' (248' lake elevation), rising to 88% at 3' and 92% at 5' (2001-02 drought)
- Members lost 4, 239 “recreation days” during this period (VERY significant as most of this low period was “off season”)
- 27% hit an object and 22% ran aground; fortunately no accidents or injuries were reported
- 92% supports Dominion’s proposal to raise the lake level 3 “ to mitigate the water use of Unit 3, if built; those opposed were concerned about bulk heading or rip rap. No one expressed concerned about docks or piers
- 40 % irrigate from the lake and 70% indicated they would stop during low water periods, “if asked”.

These results represent LACA Members only. As a result, the Report recommended that other Lake organizations do similar surveys (but avoiding duplication) to have lake-wide results including all lake-front properties, the 130 “common areas” and day users at the marinas and the State Park.

IV. New Information

A. Evaporation Rates for the Unit 3

In the fall of 2008, Dominion clarified the likely water consumption rates of the third unit. After review of new data, the Lake Level Committee agreed that 12 million gallons per day was a more accurate representation than the 16 MGD that were previously used. The primary reason is that 16 MGD is a maximum rate in the water conservation mode of operation, whereas 12 MGD is an average rate expected in the summer months.

B. Impact of the 3 Inch Rise

Modeling data in the In-stream Flow Incremental Methodology (IFIM) study and additional detailed data that has been provided by Dominion has led the Committee to conclude that if the 3 inch rise is implemented with the third Unit 3, the evaporative losses to lake levels will be fully mitigated, except in times of drought. In times of drought, Unit 3 can add an additional 3 to 9 inches of lake level reduction depending on the length and severity of the drought. This conclusion is based on the modeling results presented in the draft IFIM report, which recognized that this remains a predicted outcome. Actual implementation results may be different.

Dominion has committed to the 3 inch rise, during the legislative testimony regarding SB 1484 and during the Spotsylvania and IFIM meetings.

C. The Dominion/LACA/LAAC “Projects”

During the Spotsylvania meetings (see Section III. B. 3.) Dominion agreed to work with LACA and others on cooperative efforts to make Lake Anna safer and more usable in times of drought. These projects include:

1. Identification of hazards that become dangerous at drought lake levels and an improved hazard marker system to warn boaters.
2. Online lake monitoring system beginning with a new gauge at the dam that will make data on lake levels and temperature available to all Lake users.
3. Consolidation of information on dry hydrants, to be made available to fire and rescue officials, to include the location of dry hydrants and limits on their usability in low water conditions.
4. Creation of a bridge inventory to develop recommendations on marking bridges with low clearances or width restrictions that could put boaters at risk in dry conditions or at higher levels suggested with the 3 inch rise in standard lake level.

LACA will be working with Dominion, the Lake Anna Advisory Committee, and others over the coming months to implement real improvements for boaters on Lake Anna.

D. Water Temperatures

Water temperature rise was examined in detail by NRC in their review for the Environmental Impact Statement within the Early Site Permit for Unit 3. Consideration was given to the fact that with expected water level losses, there would be less water in the lake and the potential might exist for heat buildup as the water circulates thru the lagoons and the cold side and back thru the reactor. The NRC conclusion was that water temperature change would be less than 0.1 degrees and that there would be times when the water in the discharge canal would actually be cooled by a very small amount by the action of Unit 3.

E. Louisa County Drought Needs

Louisa County has developed a draft water supply plan that meets regulatory requirements. It projects population and water consumption needs over the next 50 years. It then identifies in general terms options for meeting those needs. Although it does identify Lake Anna and both the North and South Anna rivers as withdrawals options, there is no specific commitment to such withdrawals as it would depend on the development of Louisa County side of the lake to an extent that it would require public water systems. Currently all developments and even the proposed Cutalong with over 900 new homes would not require a public water supply.

F. Dry Cooling

Dry Cooling for the third reactor has been suggested as a way to conserve lake water during droughts. This method is similar to the radiator in your car where water in a closed system, flows through the radiator and a fan runs air over the radiator fins so that the heat transfer cools the water. Why can't the third unit be cooled in a similar fashion? Dominion told the committee that the problem with a 100% dry cooling is the temperature and humidity of Virginia in the hot summer months would not provide the delta temperature required between the hot water from the reactor and the air temperature. The best that can be done, given current technology, is HYBRID cooling which is a combination of wet and dry cooling. The committee independently checked with cooling system manufacturers and came to the same conclusion. The fourth reactor, if built would be the next generation of reactors which plan on using extremely high temperature molten metal. Air cooling would work well with the temperature of the molten metal and the outside Virginia air temperature. Much work will have to be done before this technology can be employed if at all. That is the reason the fourth reactor is only approved with dry cooling.

V. 2008 Report Recommendations Status

All thirteen Recommendations in the 2008 Report remain valid, although Recommendation # 3 was modified in 2008. Progress on each Recommendation (by LACA or other parties as indicated) is described below as follows:

- “**Complete**”- fully implemented with no further actions needed
- “**Modified**”- Recommendation changed
- “**In Progress**”- action begun but not completed
- “**No Action**”- no actions taken
- “**Rejected**”- rejected by the responsible party

Recommendation #1: That LACA support a seasonal (April – July) rise in the normal operating level of the lake to 250.25 feet msl. That its support be dependent on a finding of acceptable impact in the DEQ-required IFIM study. That the adjusted level be implemented upon final approval of the IFIM study by DEQ. Also that LACA insist that the IFIM study include the DCR requested “on lake study” as well as public involvement throughout the IFIM study.

In Progress: The study was presented as a draft and has still not been finalized. The IFIM study indicated no significant impact of the 3 inch rise on aquatics or structures. Dominion has publicly committed to a permanent rise in the lake level of 3 inches should Unit 3 become operational. This recommendation could be years before actually implemented by Dominion (2016 or later) so this Committee recommends an earlier implementation or at least a test period prior to full implementation, to determine if the IFIM models are accurate

and to help with drought modification. NRC and DEQ determined that a recreation study was not a required part of the IFIM study but the Dominion projects (see IV. C) may address many of these concerns. After LACA and other stakeholders' request, Dominion and DEQ did provide public access to the draft IFIM study and a public meeting (see III. C.)

Recommendation #2: That LACA work toward a modification to the Lake Level Contingency Plan that would set discharge rates from 40 cfs to 20 cfs by 5 cfs increments for each 6 inches of drop in the lake level until reaching 248 feet. That the discharge rate remain at 20 cfs until the lake returns to normal pool level.

In Progress: LACA has requested, in 6 venues since 2000, that the ‘step down- step up’ provisions in the LLCP be changed to a gradual (5cfs reductions for every 6 inches of lake drop) vs. the current process which maintains 40cfs until the lake reaches 248, then takes 9 days to reduce the flow to 20cfs. With IFIM and the Lake Anna Model, there are now tools to analyze the perceived impact (less time at 20 cfs flow and faster lake level recovery) if this change is implemented. Accordingly, this Committee is continuing to work with state agencies to promote a revision to the LLCP. DGIF is the key state agency we are working with on this issue. Dominion is neutral on the request and DEQ Northern Virginia’s permit writers have deferred to DGIF. One meeting has been held so far with DGIF on July 15th, 2009 where LACA presented its case for graduated flow release to DGIF and we are waiting for their response.

Recommendation #3: That LACA ask DEQ to define discharge rates as two day averages so that Dominion can adhere more closely to specified discharge rates.

Modified: Initially thought to improve water flow management, further discussions of this strategy with Dominion indicated that this technique would not be helpful. Hence, the LLC modified this recommendation and the water loss calculations in the 2008 Report via Supplement # 2. Review this document on the LACA website at: Lakeannavirginia.org. After review of operations at the dam, the Committee recommends that LACA support upgrade of the marker pole used for controlling lake levels at the dam. An electronic monitor protected from wave action perturbations is needed. A temperature gage could make it possible for Dominion to post current lake levels and temperature on-line at the Dominion web site.

Recommendation #4: That LACA ask Dominion to seek to reduce total lake level impact of the third reactor in any modifications to design and operating procedures including new technologies such as dry cooling in the remaining permitting and construction phases. Design and operating changes to units 1 & 2 should also be considered in mitigating total lake level impact.

Modified: After consulting with Dominion and third party experts in cooling tower design for nuclear reactors, it appears that dry cooling cannot support a nuclear reactor of the size of Unit 3 with current technology due to insufficient temperature differences in summer months when demand is greatest. To the Committee’s knowledge, there has been no effort to reduce the impacts of Units 1 & 2.

Recommendation #5: That LACA work with Louisa County to address the needs of water for Dominion's reactors in its Long Range Water Plan. That it include an option to work with Dominion to import water from the James River to support both the needs of the fourth reactor (and possibly units 1-3) and other County water needs in its long term planning.

Rejected: Louisa County has released a draft water supply plan, which lists Lake Anna and the North and South Anna rivers as possible withdrawal sources but does not give any specific locations or water amounts. The plan does not anticipate any James River water for NAPS.

Recommendation #6: That LACA oppose any new consumptive use of surface water anywhere in the watershed (lake and direct tributaries) when the lake level is below 250 feet.

In Progress: The DEQ permit for Cutalong will result in minor withdrawals but set 2 important precedents: Dominion did not allow water from Lake Anna due to its control to the 255' elevation and DEQ limited withdrawals (the intake is up Contrary Creek, above the 255' elevation such that DEQ could approve it) when Lake elevations are higher than 248.5' during the first 2 years and 249.75 feet thereafter. These important restrictions recognize the water level problems in the Lake and would deter any regular, on-going consumptive withdrawals. The Cutalong withdrawal is only to establish the golf course, which will be maintained with treated effluent from consumptive uses after 2 years. All consumptive water will be provided by wells, not Lake Anna or Contrary Creek.

Recommendation #7: That LACA approach LAAC about taking the lead on establishing a water conservation mechanism for the Pamunkey watershed. LACA should also seek to have such mechanisms included in the long range water plans of Orange, Louisa, Spotsylvania, Caroline and Hanover Counties.

No Action: LACA's request for LAAC to help establish a water conservation district was tabled by LAAC due to draft Louisa County plan showing no anticipated significant shortages that would mandate multi-county cooperative efforts. VDEQ has indicated that a watershed plan may evolve by the State Water Control Board from the local water plans due in 2011, per State Law §62.1-44.38.1

Recommendation #8: That LACA representatives meet periodically (such as quarterly) with the DEQ staff at their Woodbridge offices to discuss pending or upcoming regulatory activity. The exchange could help DEQ understand LACA positions and allow LACA to better prepare relevant input.

In Progress: Two very productive meetings have been held. The first on August 7, 2008 was with LACA only (to review the 2008 Report) but the second on April 30, 2009 was

broadened to more Lake stakeholders (Dominion, LABP, FOLA, citizens, etc.). LACA and DEQ intend to continue these meeting for their valuable sharing of information.

Recommendation #9: That LACA representatives meet periodically with Dominion, Cutalong and other likely permittees to discuss pending or upcoming regulatory activity. The exchange could help the permittee understand LACA positions and allow LACA to better prepare relevant input.

In Progress: LACA met with Dominion 3 times in 2008 (including the dam and Partlow gauge tour), 3 times during the 2009 meetings with Spotsylvania officials and at the IFIM public meeting. Further meetings are planned to implement the 4 water safety and recreational projects. These meetings have engendered a new spirit of cooperation and consultative discussions.

Recommendation # 10: That LACA continue to monitor and provide input into the Cutalong VWP process and to use the limiting elevations contained in it (248.5' for short term and 249.75' for long term uses) when future Lake Anna Watershed water withdrawal permits are contemplated.

Complete: Va. Water Protection Permit was issued in October, 2008. See #6 above concerning the important precedents in this permit and Dominion's actions

Recommendation # 11: That LACA sponsor a survey of Lake Area residents (LACA members or entire population) in order to gather some specific data on the effects of low water on boating and to the likely impact of raising the lake level 3 inches in the winter and spring months.

Complete: See Section III. F.

Recommendation #12: That LACA monitor the Water Supply plans for Louisa, Orange, Spotsylvania, Hanover and Caroline counties annually to determine if any additional withdrawals are proposed from Lake Anna, or downstream in the North Anna River which may ultimately affect lake levels.

In Progress: Of the 5 localities of interest, only Louisa has issued a draft report. LACA will continue to monitor the plans for Spotsylvania, Orange, Hanover and Caroline counties as they are released.

Recommendation # 13: That LACA participate in any stakeholder process involving lake issues and ask the appropriate authorities to initiate such a process when we think multiple issues/positions are involved.

In Progress: LACA will participate in any State-sponsored "stakeholders" meetings as they arise for future permits, Unit 3 work, etc. The Lake Anna Task Force did request that the stakeholders meeting it requested in a meeting with State officials on July 1, 2008 be

postponed until IFIM results and other activities could be accomplished. That meeting was tentatively set for March 27, 2009 but will be rescheduled at a more appropriate time.

VII. Future Actions

Much has been learned in the past year, especially regarding Unit 3 and its impact. New information has come to light and the full results of the long-awaited IFIM Study have been briefed with a draft report. LACA has worked extensively with Dominion and State and local entities to further the interests of LACA membership. Very significantly, a new cooperative approach has emerged among stakeholders, Dominion, and state and local entities that promises real progress.

A. IFIM

New data suggests that the 3 inch rise in standard lake level will result in mitigation of lake level concerns expect in times of drought. The Committee has now shifted its emphasis to working cooperatively to improve lake safety and usability in times of drought. Four specific projects are in planning stages.

Our primary remaining concern is about the IFIM recommendation to provide recreational flows in June and July to promote downstream recreation. These flows as briefed at the IFIM meeting would give back nearly a full third of the advantage of the 3 inch rise. We have requested that this could be fixed by simply allowing recreational flows only when the lake is at the new standard level (250.25 msl) or above vs. the currently specified 250 msl. Our comments to the IFIM are still in review by VDEQ – we await further action pending response to our comments.

B. New and On-Going Projects

In addition to IFIM, there are a host of continuing efforts that the Lake Level Committee and LACA will be involved in the future. As pointed out above, the 4 new Dominion projects will take considerable efforts in 2009 and 2010. In addition, LACA and its Lake Level Committee must continue to keep members informed of issues and advocate member interests in several areas:

- a. Meetings with DEQ and Dominion,
- b. Better managing the flow of water over the dam,
- c. The future VPDES permit that will set the actual water conditions for Unit 3 and the Lake Level Contingency Plan,
- d. The work of local governments in developing their water supply and drought plans, and
- e. The future Pamunkey water conservation district and any new environmental permits that may affect Lake Anna and its environs.

All of these actions will help LACA better prepare for the Stakeholders Meeting that has been postponed pending resolution of the IFIM study and other issues. In an October

2008 e-mail, DEQ Director David K. Paylor expressed interest in exploring “more robust lake level management strategies”. LACA needs to be ready to offer such robust options.