



PAT MCCRORY
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MEMORANDUM

TO: ENVIRONMENTAL REVIEW COMMISSION
The Honorable Trudy Wade, Co-Chair
The Honorable Jimmy Dixon, Co-Chair
The Honorable Chuck McGrady, Co-Chair

FROM: Mollie Young, Director of Legislative Affairs

SUBJECT: Downstream Inundation Map Study Report

DATE: March 31, 2016

Pursuant to Section 9.(c) of Session Law 2015-7, the Department is required to study whether, under certain circumstances, downstream inundation maps prepared pursuant to GS 143-215.31 (North Carolina Dam Safety Law) should be prepared by a licensed professional engineer or a person under the responsible charge of a licensed professional engineer. Further, the Department is required to consult with the State Board of Examiners for Engineers and Surveyors in the conduct of this study and to report the results of this study no later than March 31, 2016. The attached report satisfies these requirements.

If you have any questions or need additional information, please contact me by phone at (919) 707-8618 or via e-mail at mollie.young@ncdenr.gov.

cc: Tom Reeder, Assistant Secretary for Environment, DEQ
Tracy Davis, Director of Energy, Mineral, and Land Resources, DEQ



**Department of Environmental Quality
Study of Downstream Inundation Maps
Associated with Emergency Action Plans
Pursuant to SL 2015-7 (Senate Bill 14), Section 9.(c)**

March 31, 2016

Background:

This report is intended to fulfill the study and reporting requirements of S.L. 2015-7, Section 9.(c) which states:

SECTION 9.(c): The Department of Environment and Natural Resources shall study whether, under certain circumstances, downstream inundation maps prepared pursuant to G.S. 143-215.31 (North Carolina Dam Safety Law) should be prepared by a licensed professional engineer or a person under the responsible charge of a licensed professional engineer. The Department shall consult with the State Board of Examiners for Engineers and Surveyors in the conduct of this study. The Department shall report the results of this study to the Environmental Review Commission no later than March 31, 2016.

With passage of the Coal Ash Management Act (SL 2014-122, Section 8.(a)), the General Assembly amended the North Carolina Dam Safety Law by requiring Emergency Action Plans (EAP) for all Intermediate and High Hazard classified dams. One of the most important pieces of the EAP and this requirement is the submittal of a dam failure downstream inundation map. This downstream inundation map shows the infrastructure, including roads, residences, commercial buildings, utilities, and other areas of concern, that could be impacted by flooding caused by catastrophic failure of a dam upstream. Following the passage of this important legislation, the North Carolina Board of Examiners for Engineers and Surveyors (NCBEES) determined that all inundation mapping constituted the practice of engineering (See Addendum A). Due to this determination by NCBEES, concern by dam owners and legislators regarding the costs for engineered maps when they did not always appear warranted spurred the General Assembly, through S.L. 2015-7, Section 9.(a), to subsequently amend the North Carolina Dam Safety Law to remove the requirement that downstream inundation maps be prepared by a licensed professional engineer except in the case of coal ash impoundments. Section 9.(a) states:

SECTION 9.(a): A downstream inundation map prepared pursuant to this section does not require preparation by a licensed professional engineer or a person under the responsible charge of a licensed professional engineer unless the dam is associated with a coal combustion residuals surface impoundment, as defined by G.S. 130A-309.201.

Study Process:

As the Division of Energy, Mineral, and Land Resources (DEMLR) of the Department of Environmental Quality implements the NC Dam Safety Law of 1967, DEMLR served as the lead agency to conduct this required study. As such, DEMLR staff drafted a set of circumstances under which a professional engineer should and should not be required to prepare a dam failure downstream inundation map based upon DEMLR staff's experience in reviewing various methods of developing downstream inundation maps across the state. This information was provided to the North Carolina Board of Examiners for Engineers and Surveyors (NCBEES) for review and comment in advance of a meeting between NCBEES and DEMLR on February 23, 2016. During this meeting, the requirements of the legislation and the circumstances that DEMLR regularly encounters to determine when downstream inundation map preparation meets the practice of engineering was discussed.

Findings and Recommendations:

The following sections of this report convey the findings and recommendations of the study group members.

Findings:

(1) *Circumstances that require the preparation of downstream inundation maps by a licensed Professional Engineer as a component of dam safety Emergency Action Plans*

- When an engineering computer model is used in the process of developing a downstream inundation map. These include, but are not limited to, HEC-RAS, HEC-RAS 2D, HEC-GeoRAS, HEC-1, HEC-2, HEC-HMS, HEC-GeoHMS, Flow 2D, Hydro-CAD, Geo-dam BREACH, SMPDBK, CCHE2D-FLOOD, FLDWAV, MIKE-21, BOSS DAMBRK, FLOW-3D, and RiverCAD.
- When engineered flow routing calculations are used to develop a downstream inundation map.
- When the dam is owned by a government entity (i.e. local, state and non-exempt federally owned and/or operated dams) (G.S. 143-215.25A).
- When coal combustion residuals are impounded.
- When an engineered inundation study is deemed necessary by DEMLR's Professional Engineers to adequately define the potential area of inundation for the purposes of emergency planning in the event of a dam failure. This would typically be in cases where the dam and impoundment are of sufficient size and the area downstream developed to the extent that the uncertainty associated with non-engineered downstream inundation maps is unacceptable for emergency planning purposes.

(2) *Circumstances that do not require the preparation of downstream inundation maps by a licensed Professional Engineer as a component of dam safety Emergency Action Plans conditional upon oversight and appropriateness determination by DEMLR Professional Engineers*

- When developed by a DEMLR Professional Engineer or under the responsible charge of a DEMLR Professional Engineer.
- When applying the Simplified Inundation Mapping System (SIMS) method that meets DEMLR's approval.
- When information is provided that has been produced by another government entity (Example: NC Flood Maps and flood data, NRCS, Department of Agriculture and Consumer Protection, etc.) that meets DEMLR's approval.
- When there are obvious, limited downstream hazards that can be verified and approved by DEMLR (Example: When there are only a few known roads/houses within miles downstream of the dam).
- When the maximum height of a dam as measured in accordance with 15A NCAC 2K .0223(a) is applied without allowance for natural attenuation of the flood wave caused by complete removal of the dam for a sufficient distance downstream of the dam such that it produces an obviously conservative approximation of the expected downstream inundation zone that meets DEMLR's approval.
- When a downstream hazards map is used instead of a downstream inundation map, such as a Google Earth map that shows an aerial view of a few houses or roads for miles downstream of a dam, that meets DEMLR's approval.

Recommendations:

While preparation of EAP downstream inundation maps by licensed Professional Engineers should be encouraged in the interest of public safety, it is recognized that dam owners' financial situations or other circumstances do not always make this a feasible option. Additionally, it is recognized that, in some circumstances, potential hazards located downstream of some dams may be conservatively identified without the need for an inundation study, as occurs often with rural high or intermediate hazard dams in some parts of North Carolina.

During consultation in the conduct of this study and preparation of this report, NCBEES recognizes DEMLR's longstanding history of employing Professional Engineers in various levels of the DEMLR organization that have been and will continue to provide sound engineering judgment and oversight of all aspects of the State Dam Safety Program. This includes ensuring that the appropriate methodologies are used to generate downstream inundation maps that provide sufficient information for emergency managers to incorporate in their downstream evacuation plans. It is also recognized that while the dam itself poses a threat to the downstream public and must be designed by a Professional Engineer, under the above

circumstances, the downstream inundation map may not be considered a threat to the public and may not have to be prepared by a Professional Engineer. Where it is determined that the methods and judgment used in the preparation of the inundation map would not be considered to reach the threshold of GS 89C as the practice of engineering, such maps would not be required to be prepared by a Professional Engineer as noted above. As such, DEMLR and NCBEES are in agreement with the above findings and circumstances of when downstream inundation maps require or do not require preparation by a Professional Engineer as a component of dam safety Emergency Action Plans.

To provide clarity for jurisdictional dam owners who are required to submit Emergency Action Plans, including downstream inundation maps, DEMLR and NCBEES recommend the following statutory amendment to reflect the findings of this report:

SECTION 9.(a): A downstream inundation map prepared pursuant to this section does not require preparation by a ~~licensed~~ professional engineer or a person under the responsible charge of a ~~licensed~~ professional engineer, provided it meets certain circumstances defined by the Department of Environmental Quality and North Carolina Board of Examiners for Engineers and Surveyors. However, downstream inundation maps for dams unless the dam is associated with a coal combustion residuals surface impoundment, as defined by G.S. 130A-309.201, shall be prepared by a professional engineer or a person under the responsible charge of a professional engineer.

DEMLR's Professional Engineers intend to administer the above guidelines in a consistent and appropriate manner when reviewing each downstream inundation map it receives. If there is a time when DEMLR does not have Professional Engineers on staff to provide the oversight as outlined in these guidelines, it is recommended that these guidelines be revisited and either appropriate adjustments made to the guidelines or appropriate amendments made to the statutory language under Section 9.(a) noted above.

APPENDIX A: Letter from the Engineering Committee of NCBEES



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Executive Director

NORTH CAROLINA BOARD OF EXAMINERS FOR ENGINEERS AND SURVEYORS

4601 Six Forks Rd Suite 310
Raleigh, North Carolina 27609

September 11, 2014

Mr. Tracy E. Davis, PE
NCDENR
Division of Energy, Mineral, and Land Resources
1612 Mail Service Center
Raleigh, NC 27699

Re: S729 Emergency Action Plans

Dear Mr. Davis:

The North Carolina Board of Examiners for Engineers and Surveyors administers the provisions of the Engineering and Land Surveying Act, Chapter 89C, of the North Carolina General Statutes.

This letter is to follow-up on the Board's Engineering Committee's consideration of the above-referenced matter.

The Committee reviewed your e-mail of July 10, 2014 as well as the presentation on North Carolina Simplified Inundation Maps for EAPs and the NCDENR document entitled North Carolina Simplified Inundation Maps For Emergency Action Plans dated December 2010.

After careful consideration, the Committee opined that inundation mapping must be done by a Professional Engineer as it falls within the definition of the practice of engineering [G. S. 89C-3(6)(a)], which states in part:

Any service or creative work, the adequate performance of which requires engineering education, training, and experience, in the application of special knowledge of the mathematical, physical, and engineering sciences to such services or creative work as consultation, investigation, evaluation, planning, and design of engineering works and systems, planning the use of land and water, engineering surveys, and the observation of construction for the purposes of assuring compliance with drawings and specifications, including the consultation, investigation, evaluation, planning, and design for either private or public use, in connection with any utilities, structures, buildings, machines, equipment, processes, work systems, projects, and industrial or consumer products or equipment of a mechanical, electrical, hydraulic, pneumatic or thermal nature, insofar as they involve safeguarding life, health or property, and including such other professional services as may be necessary to the planning, progress and completion of any engineering services.

The Board appreciates the opportunity to provide input on this issue. Should you have any questions please feel free to contact this office.

Sincerely,

Andrew L. Ritter
Executive Director

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