# THE UTILIZATION OF HIGHWAY EMBANKMENTS AS DAMS FOR IMPOUNDING WATER

REPORT OF
THE STATE DEPARTMENT OF HIGHWAYS
to
THE GOVERNOR
and
THE GENERAL ASSEMBLY OF VIRGINIA


HOUSE DOCUMENT No. 13

COMMONWEALTH OF VIRGINIA
Department of Purchases and Supply
RICHMOND
1963

Richmond 19, Va., July 22, 1963

*The Honorable Albertis S. Harrison, Jr.*
*Governor of Virginia*
*State Capitol*
*Richmond, Virginia*

Dear Governor Harrison:

House Joint Resolution No. 75 directs the Highway Department to study and submit a report covering the advisability and feasibility of using highway embankments for impounding water to provide ponds and lakes.

We are submitting with this letter the original and one copy of the report.

It is believed the report fully covers the intent of House Joint Resolution No. 75, however, we will be pleased to provide further information as may be desired.

With highest regards,

Sincerely yours,

H. H. Harris, Commissioner

# THE UTILIZATION OF HIGHWAY EMBANKMENTS AS DAMS FOR IMPOUNDING WATER

July 22, 1963

To:

HONORABLE A. S. HARRISON, JR., *Governor of Virginia*

AND

THE GENERAL ASSEMBLY OF VIRGINIA

*Gentlemen:*

House Joint Resolution No. 75, agreed to by the House of Delegates on March 7, 1962, and by the Senate on March 10, 1962, directed the State Department of Highways to make a study and report upon the advisability and feasibility of utilizing highway embankments as dams. The text of the resolution is as follows:

"Whereas, some states in the construction of embankments on their highways have made arrangements at suitable streams for the construction of ponds and lakes, employing the embankment of the highway as a dam, and it appears that this plan might be used in Virginia to increase recreational facilities and thereby improve the tourist trade; now, therefore, be it

"Resolved by the House of Delegates, the Senate concurring, That the State Department of Highways is directed to make a study and report to the Governor and General Assembly of Virginia, not later than September one, nineteen hundred sixty-three, upon the advisability and feasibility of constructing at suitable places embankments and fills in connection with highway construction in such manner that the roadway bases can be used as dams for ponds and lakes. If the Department reports that such construction is feasible, it shall submit such legislation as may be desirable in connection therewith."

In the early part of 1946, the State Soil Conservation Committee requested the Highway Department to permit the use of highway embankments as dams for impounding water for farm ponds. The Department studied the request and decided that, where existing embankments could be strengthened to serve as dams or where during new construction it was feasible to provide the proper embankments to serve as dams, it could be permitted at the discretion of the Department.

On May 11, 1946, the Commissioner approved "Specifications for the Construction of Farm Ponds Adjacent to Highways." The specifications outlined the requirements to be met by the property owner and further provided that as a result of such construction the Department would not incur any additional expense, the property owner to bear, if any, the additional expense.

Interest in impounding water for reasons other than farm ponds, such as recreational and aesthetics, resulted in requests for permits for these uses, all falling in the general category of conservation of water and expanded usage of water resources.

In 1952, the General Assembly enacted a statute pertaining to the matter. This statute is codified as § 33-123.1 of the Code of Virginia of 1950, as amended, and which reads as follows:

"Use of streams and low lands obstructed by newly constructed highways as fish ponds or water storage areas. Whenever any highway is being constructed and the highway is to pass over any stream or low land the obstruction of which is necessary to such construction or if the present highway construction can be utilized to provide a suitable dam for a fish pond or water storage area, then upon application of the adjacent property owner requesting that it be so used, the State Highway Commission may permit such use, provided that such dam shall be subject to the provisions of article 8 of this chapter, and any additional cost incurred thereby shall be borne by such property owner."

The first impoundments were very small, but there has been a steady increase in the size of impoundments for which permit requests have been submitted. The increase in size of impoundments and the advancement of highway design has necessitated revisions in the criteria and specifications governing such use of embankments as dams.

The latest revision has just recently been approved on March 25, 1963, and is as follows:

## "GENERAL INSTRUCTIONS AND CRITERIA PERTAINING TO THE USE OF HIGHWAY EMBANKMENTS AS DAMS"

"In accordance with the provisions contained herein, the Virginia Department of Highways may approve the use of highway embankments as dams.

Highway embankments as referred to herein shall include all of those roads and streets within the jurisdiction of the Virginia Department of Highways.

The term 'dam' as used herein shall mean a barrier to confine or raise water for storage or diversion or to create a hydraulic head.

In general, when a permit is requested for use of an embankment as a dam, whether it be an existing or proposed embankment within the system or one ultimately to become a part of the system, it must be accompanied by plans and supporting data as outlined in the following paragraphs, unless the Virginia Department of Highways shall deem it advisable to prepare such plans itself.

1. Purpose of Impoundment

2. Location

A map of the vicinity with notations sufficient to accurately locate the project site will be required.

3. Plans

The plans shall in general contain the following:

a. Plan of reservoir area and dam site showing contours; the contour interval to be one foot between the crest of the spillway controlling the reservoir level and the elevation of the maximum allowable stage.

b. Sectional view of dam taken through control structure.

c. Details of control structures showing dimensions, types of materials, cutoff or antiseep collars, anti vortex devices, energy dissipators, and other pertinent details applicable to the particular project.

d. Where channel outlets are used for spillways, sufficient profile and cross sections shall be shown to permit checking the hydraulic characteristics.

e. Where the existing embankments are to be used, details will be given as to existing drainage structures.

4. Analyses—Computations

a. Hydrologic data used and its source.

b. Flood Flow Analysis:

Mass diagrams, hydrographs, elevations, storage curves, etc.—where applicable.

c. Hydraulic computations for control structures, outlet channels and other applicable devices.

5. Administrative Procedures:

The plans shall be prepared by a licensed engineer or by a governmental agency whose engineers have previously prepared similar plans. The Soil Conservation Service, United States Department of Agriculture, will generally assist in plan preparation when the impoundment is for conservation purposes.

Prints of plans and copies of supporting computations data shall be submitted in duplicate, one set to be reviewed by the Department and remain in the files of the Central Office, and the other to be returned with any pertinent notations. Prior to approval, for construction, revised prints of plans will be submitted in triplicate, one each for the Central, District and Residency Offices. All requests will be initiated through the Resident Engineer and be forwarded through proper channels to the Central office. Where applicable the petitioner will be required to furnish a performance bond or certified check to cover cost of work and any balance not expended by the Highway Commission will be returned to the petitioner.

All costs shall be borne by the petitioner and no permit will be granted for work which will result in additional expenditures by the Department. Where protective devices such as guard rails do not exist or would normally not be provided by the Department, such protective devices will be provided at the expense of the petitioner.

Under no circumstances shall the Department be committed to reconstruction, relocation, adjustment or protection of the highway at the expense of Highway funds without approval of the Commissioner.

Construction will be performed by or under the supervision of the Department of Highways. Decisions by the Department of Highways' Engineers will be final.

6. Design Specifications and Criteria

a. *Watershed Area:* The area contributing to a reservoir shall be accurately determined. Delineation on dependable topographic maps or aerial photographs, when available, may be used for this purpose.

b. *Reservoir Area:* When flood routing is employed to determine outlet structure sizes, the area of the impoundment must be determined with sufficient accuracy at various elevations to permit the development of a storage curve. Where maps having a close contour interval (one or two feet) are available they may be used in lieu of field survey or reconnaissance.

c. *Dam* (Roadway Embankments): The embankment will, in addition to being constructed to Virginia Department of Highways specifications, have either a core or upstream blanket. If upstream blanket construction is used, the material will consist of a layer of highly impervious material placed on the reservoir floor and extended up the upstream slope of the embankment. Figure 1 is a typical example, the dimensions being dependent upon the soil characteristics. In general a core will be required where the depth of impoundment is 15 feet or greater.

d. *Hydraulic Structures:* All structures conducting the effluent through highway fills shall be adequate to pass the design flood originating in the watershed. Generally, structures shall be so designed and constructed that the maximum high water stage from the design storm shall not be higher than eighteen inches below the outer edge of the shoulder of the highway at its lowest point adjacent to the reservoir. The design will generally be one having a twenty-five year or fifty-year recurrence frequency; however, the importance of highway and potential hazard may dictate greater or lesser magnitude storms. No movable gates or valves will be permitted to serve as outlet control structures; however, gates will be provided to permit draining for management purposes. In general, no portion of the roadway will be permitted to serve as a spillway.

e. *Landscaping:* The shore line shall be cleared of all weeds and stumps and maintained in a neat manner.

Where deemed necessary or desirable, by the Department, legal responsibilities and obligations shall be set forth as a condition in the permit or shall be provided for by a separate instrument."

Prior to the present revision approximately twenty-five per cent of the States were queried as to their opinions, experience and regulations pertaining to the use of highway embankments as dams.

The sampling of states was done in such a manner as to collect a representative sampling of the various geographical environments.

The results of the consultations revealed that opinions and policies varied between high enthusiasm and adamant opposition to such use of highway embankments.

The primary considerations in permitting the use of highway embankments for impounding water are the legal implications, the potential hazards to the highway user and the landowners within the area, the maintenance problems and the use regulation.

Requests for permits are made by individual land owners such as farmers who wish to use the water for various farm needs and in some cases for recreational purposes.

Organized groups, such as sporting clubs, may initiate a request for permits to impound water for various types of recreational use.

# EMBANKMENT PROTECTION FOR IMPOUNDING WATER

(For Heads Less Than 15 Feet)

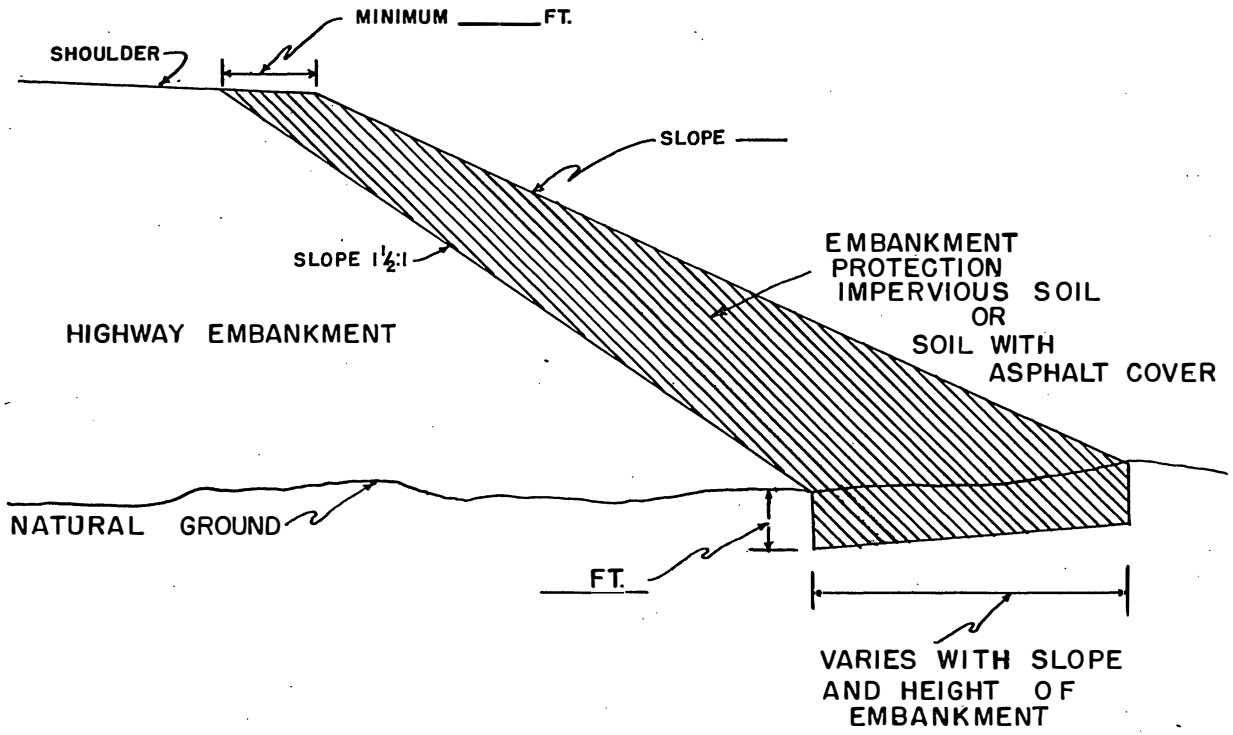


Figure 1

At the present time, developers of large residential areas are incorporating into the plans, lakes for recreational use and aesthetic reasons. Most of these dams will have streets crossing them and, ultimately these streets will, if meeting the Department's requirements, become a part of the highway Secondary System.

Experience has indicated that each case must be evaluated on its own merits because each past case has presented problems not previously encountered.

The legal implications vary according to whether or not the petitioner is an individual property owner, a land developer, a corporation or some other organization.

The engineering aspects vary with the terrain conditions, type of highway, size of impoundment and the use of contiguous land.

Inasmuch as this is a relatively new field, it is considered that there is insufficient experience upon which workable legislation could be enacted. Also due to the multiplicity of different situations encountered, it is extremely difficult to draft legislation to have uniform application.

Therefore, it is recommended that no additional legislation be enacted at this time, and that the matter continue to be handled as a policy matter by the Department of Highways.

Respectfully submitted,

H. H. Harris, Commissioner