

STATE OF RHODE ISLAND

1999

Annual Report to the Governor

on the Activities of the

DAM SAFETY PROGRAM



Dam No. 157 - Harris, Coventry

Department of Environmental Management
Office of Compliance and Inspection

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History of Rhode Island's Dam Safety Program

The Rhode Island dam inspection and inventory program had its inception in 1883, and was under the authority and responsibility of the Commissioner of Dams and Reservoirs. At that time, there were 86 dams included in the inventory records; today, there are 510 registered dams.

All of the 510 registered dams have been classified by size. This classification provides a relative description of Small, Medium or Large, based on the storage capacity and height of the impounded water. 195 of the dams meet or exceed the minimum criteria for a Small dam, and have been classified as Small, Medium or Large. These dams are ones that were thought to pose a threat to human life or property in the event of a dam failure. The remaining 315 dams are below the minimum criteria used to define a Small dam; however, for program identification reasons they have been classified as Small dams.

The 195 dams have also been classified to identify the potential hazard to human life and property in the event of a dam failure. These classifications are as follows:

High Hazard – Failure of the dam would most probably result in the loss of more than a few lives and extensive property damage.

Significant Hazard – Failure of the dam could possibly result in the loss of life and appreciable property damage.

Low Hazard – Failure of the dam would result in no apparent loss of life and only minimal or no property damage.

As is indicated above, these classifications relate to the potential for harm if the dam fails; it does not relate to the current condition of the dam. There are currently 16 high hazard dams, 41 significant hazard dams and 138 low hazard dams classified. The remaining 315 dams, whose size is below the minimum criteria used to define a Small dam, have not been assigned a hazard classification but are assumed to be Low Hazard.

As set forth in Rhode Island General Laws, Chapters 46-18 and 46-19, a dam owner has the responsibility for the safe operation of their dam, and is liable for the consequences of accidents or failures of the dam. In general, a dam owner is required to use "*reasonable care*" in the operation and maintenance of a dam and/or reservoir. This responsibility includes the proper operation, maintenance, repair and rehabilitation of a dam, which are the essential elements in preventing a dam failure.

The regulations governing the administration and enforcement of Rhode Island's Dam Safety Program are contained in the General Laws of Rhode Island, Chapter 46-19. The Department of Environmental Management (DEM) has the responsibility to inspect dams to determine their condition, to review and approve plans for construction or substantial alteration of a dam or reservoir and to order the owner to make repairs or to take other necessary action to make the dam or reservoir safe.

Inspection Program

Each dam's classification and its size determines the frequency of inspection. The higher the classification and size, the more frequently the inspection is conducted. A dam of any classification would also be inspected upon request by the owner, a town/city official, or by a person owning or representing property liable to damage from the dam.

The inspections performed by DEM are visual inspections and are conducted under a general inspection format based on guidelines established in 1976 by the United States Army Corps of Engineers (ACOE) for the National Program for the Inspection of (Non-Federal) Dams.

Following a visual inspection, a dam inspection report is prepared, identifying specific deficiencies and, when warranted, recommending corrective measures. A copy of the report is forwarded to the owner, with the expectation that the deficiencies will be corrected.

Professional Associations

Rhode Island has been a member of the Association of State Dam Safety Officials (ASDSO) since its inception in Denver, Colorado in 1984. ASDSO membership consists of state representatives along with corporate and individual members representing dam owners and professional engineering firms. ASDSO was formed to serve these initial functions:

- Provide a forum for the exchange of ideas and experiences on dam safety issues;

- Foster interstate cooperation on dam safety issues;

- Provide information and assistance to state dam safety programs;

- Provide representation of state interests before Congress and federal agencies responsible for dam safety; and

- Help improve state dam safety programs.

ASDSO has helped to improve dam safety in Rhode Island mainly through its sponsorship of regional dam safety workshops and its national annual conferences. In addition, various grants have provided funds for the purchase of computers, camera and video equipment and various types of field equipment to aid in the inspection and inventory of dams. These grant programs have also been supported, in part, by the Federal Emergency Management Agency (FEMA).

To further promote dam safety in Rhode Island and to foster interstate cooperation with our neighboring New England states, Rhode Island has been a member of the New England Association for Dam Safety (NEADS) since its inception in 1982. NEADS is comprised of delegates from each of the six New England states, each of whom is responsible for administering and/or managing the respective state's dam safety program.

NEADS and FEMA have co-sponsored public awareness and dam safety workshops. These workshops, which were dam-owner oriented, were usually one or two day events and covered such topics as dam hydraulics and hydrology, dam structure integrity, inspection and maintenance procedures, corrective action measures and emergency action planning.

Activities in 1999

In January 1999, following a 2-1/2 year vacancy, DEM hired a dam safety inspector. Following is a breakdown of the activities performed throughout the year.

High Hazard Dam Inspections

As was indicated in the 1998 Annual Report, during January and February of 1998, 14 high hazard dams were inspected by DEM with assistance from the ACOE and the Department of Transportation. Although the inspections revealed deficiencies at each of the dams, none of the observations appeared to indicate that the dams posed an imminent threat of failure. The high hazard dam inspection reports were finalized and a copy was sent to each owner.

Woonasquatucket River Dam Inspections

On January 19 and 20, respectively, the Senate and House each passed a resolution requiring DEM to inspect certain dams on the Woonasquatucket River, in response to the discovery of dioxin in the river. During January and February, DEM inspected every dam on the Woonasquatucket River from Smithfield south through Providence, in response to these resolutions. The dams which were inspected are as follows:

Dam No.	Dam Name	City/Town
131	Greystone	North Providence / Johnston
134	Lymansville	North Providence / Johnston
138	Atlantic Mills	Providence
139	Paragon	Providence
140	Rising Sun	Providence
135	Manton	Providence / Johnston
128	Esmond Upper	Smithfield

The Esmond Upper and Greystone were maintained in an acceptable manner and no recommendations for maintenance or repair were made. The remaining five dams were not properly maintained. Visual observations revealed that low level gates were inoperable, substantial vegetation was present and/or concrete surfaces were deteriorating.

Inspection reports, which included recommendations for repair and further investigation as needed, were forwarded to each owner. A final report of the Department's investigations was forwarded to the Governor and General Assembly (Attachment A).

Continued legislative interest in the dams on the Woonasquatucket River resulted in the Department requesting the assistance of the ACOE to perform a more detailed analysis of the Lymansville, Atlantic Mills, Paragon, Rising Sun and Manton dams. On April 27 and 28, DEM's Dam Safety Inspector accompanied three specialists from the ACOE, who inspected each of these dams for geotechnical, concrete and structural, and hydraulic features.

A final report, titled "Woonasquatucket River Dam Investigations Rhode Island", dated August 1999 was submitted to the Department. Visual observations revealed similar deficiencies as noted by DEM's inspections. In addition, each dam was analyzed to determine the maximum volume of water which could safely flow over the spillway. The results indicated that, during a storm that would be expected to occur once every 100 years, the Lymansville, Manton and Atlantic Mills dams could be susceptible to rapid erosion leading to washout of sediments behind the dam. However, a sudden catastrophic failure at any of the five dams appeared to be unlikely.

Significant Hazard Dam Inspections

A review of the Department's records indicated that many of the significant hazard dams had not been inspected for many years, and given the potential for loss of life and/or property damage in the event of failure, the Department began inspection of these dams in May. Of the 41 such dams, the following 32 were inspected:

Dam No.	Dam Name	City/Town	Embankment	Spillway	Gate
15	Union Mill	Burrillville	Fair	Fair	N/a
63	Valley Falls	Central Falls / Cumberland	N/a	Fair	N/a
64	Central Falls	Central Falls / Pawtucket	N/a	Fair	Fair
151	Quidnick Upper	Coventry	Fair to Poor	Fair	Fair to Poor
152	Anthony	Coventry	Fair to Poor	Fair	Fair
153	Washington Upper	Coventry	N/a	Fair	Poor
157	Harris	Coventry	Poor	Fair	Poor
158	Arkwright	Coventry	Fair to Poor	Fair	Good
166	Curran Upper	Cranston	Poor	Poor	Poor
198	Curran Lower	Cranston	Poor	Poor	Poor
82	Happy Hollow	Cumberland	Good to Fair	Good	N/a
403	Greenwich Bleachery	East Greenwich	Poor	Fair to Poor	Poor
18	Burlingame Upper	Glocester	Fair	Fair	Fair
165	Ponagansett	Glocester	Good	Good	Good
556	Clarkville	Glocester	Fair to Poor	Fair to Poor	Poor
169	Almy	Johnston	Poor	Poor	Poor
59	Manville	Lincoln / Cumberland	N/a	Fair	Poor
60	Albion	Lincoln / Cumberland	N/a	Fair	Poor
62	Pratt	Lincoln / Cumberland	N/a	N/a	N/a
553	Belleville	North Kingstown	Poor	Fair	N/a
84	Wenscott	North Providence	Good to Fair	Good	Poor
43	Slatersville Upper	North Smithfield	Fair	Fair	Poor
46	Slatersville Middle	North Smithfield	Fair	Fair	Poor
48	Forestdale	North Smithfield	N/a	Fair	Poor
65	Pawtucket Upper	Pawtucket	N/a	Fair	N/a
93	Canada Upper	Providence	Fair	Poor	Poor
160	Hope	Scituate	Poor	Fair	Fair
164	Barden	Scituate	Good to Fair	Fair	Fair
109	Stillwater	Smithfield	Poor	Poor	Fair
426	Peace Dale	South Kingstown	Poor	Poor	Fair
144	Pontiac Mills	Warwick	N/a	Fair	N/a
149	Centerville	West Warwick	Fair	Fair	N/a

N/a (not applicable) indicates that the component was not inspected, or the component is not a part of this dam.

As part of each visual inspection, the condition of the major components of the dam were subjectively rated as Good, Fair or Poor. The major components of a dam are the embankments, the spillway and the drawdown gate. Good is defined as meeting minimum guidelines, whereas no irregularities are observed and the component appears to be maintained properly. Fair pertains to a component which requires maintenance which has not led to the requirement of repairs (i.e. missing mortar in a masonry wall that has not yet caused displacement of the masonry units). Poor indicates a component that has progressed beyond improper maintenance and requires repair; the component no longer functions as it was originally intended (i.e. a drawdown gate with a removed lifting mechanism and a blocked outlet, or an earthen embankment with extensive, deep rooted vegetation). A component rated as poor requires an engineering evaluation and extensive work to return it to proper order.

Of the 32 significant hazard dams inspected, twenty-three of the reports have been completed and mailed to the owners; the other nine reports require completion and owner identification. As indicated in the table, twenty-one of the 32 dams inspected included at least one component which was rated poor. Dam No. 62 - Pratt, is no longer considered to be a dam, due to a redirection of the river around the spillway.

The remaining nine significant hazard dams will be inspected by March 2000 and the reports will be completed and mailed to the owners.

Low Hazard Dam Inspections

State law requires the Department to inspect any dam following a request by the owner or some other interested party which could receive harm by the failure of the dam. The following low hazard dams were inspected based on such requests:

Dam No.	Dam Name	City/Town	Embankment	Spillway	Gate
176	Coventry Reservoir	Coventry	Fair to Poor	Poor	Poor
555	Hawkins	Glocester	Fair	Fair	N/a
566 B	Bowdish Lower	Glocester	Poor	Fair	Poor
170	Simmons Upper	Johnston	Fair to Poor	Fair	Poor
121	Sprague Lower	Smithfield	Poor	Fair	Poor
537	Indian Lake	South Kingstown	Fair to Poor	Fair	Poor

N/a (not applicable) indicates that the component was not inspected, or the component is not a part of this dam.

In addition, two partial inspections occurred at low hazard dams. Dam no. 146 - Riverpoint Lower in West Warwick was inspected following the failure of the drawdown gate, which caused the water being held back by the dam to suddenly be released downstream. Town officials responded by inspecting downstream areas for potential flooding, although no such problems were reported to the Department. The dam owner subsequently repaired the gate.

Neighborhood concerns following Hurricane Floyd prompted DEM to inspect Dam no. 177 - Tiogue Lake in Coventry. The inspection was part of an ongoing investigation to determine if the dam, which is owned and operated by three separate parties, is maintained in a safe manner.

Grants

In September, DEM entered into a one year Memorandum of Agreement (MOA) with the ASDSO, regarding the National Performance of Dams Program (NPDP). The NPDP is creating a database of dam incidents throughout the United States. Dam incidents pertain to any irregularities, such as improper maintenance (i.e. any dam component which is rated fair or poor) or a component failure at a dam. The NPDP is very flexible in the manner in which they accept data; a copy of an inspection report is sufficient, from which they extract the relevant data. Since the Dam Safety Inspector completes a report for each inspection or site visit, an additional copy is made and submitted to the NPDP. In return for participating in the program, DEM was awarded a \$2,000 grant, which is anticipated to be used for equipment to improve the inspection and organizational aspects of dam safety.

Data Management

The Dam Safety Program made much headway in an effort to organize and update the available information. This included organizing and condensing the filing system, entering dam locations on the Geographical Information System (GIS) database, identifying current dam owners and updating the database to include dam owners and inspection information.

Public Outreach

Representatives of the Dam Safety Program promoted the program by speaking at meetings with organizations interested in the safety of certain dams. Meetings attended included the Providence Plan, whose interest was in the dams along the Woonasquatucket River; the Rhode Island Emergency Management Agency's Hazard Mitigation Committee, which is assessing potential hazards throughout the state in order to develop a mitigation plan; and the Institute for Business and Home Safety's RI Showcase State subcommittee meeting on Hazard Identification and Risk Assessment, which is attempting to establish a statewide natural hazards identification and risk assessment.

Hurricane Floyd

In September, Hurricane Floyd threatened the area with high winds along with an anticipated high rainfall in a short time period. This prompted the Department to take action regarding the more hazardous dams in the state. DEM staff attempted to telephone all owners of high and significant hazard dams, and inform them that if the water behind the dam rises to within six inches of overtopping, the owner should then contact the local emergency management official, whose name and telephone number was given. The local emergency management official was then directed to contact the state Emergency Management Agency, who would then take appropriate action. Fortunately, the storm was downgraded and the heavy rains did not occur.

Dam Safety Program Review & Workshop

The Department retained the engineering firm of Louis Berger & Associates, Inc. to review and evaluate the Dam Safety Program and make recommendations for improvement. Following the compilation of data and two public workshops on July 15, 1999, which provided generally positive feedback, a final report was submitted to DEM on September 14, 1999. Some of the more significant recommendations included defining a regulated dam, setting engineering evaluation frequencies based on revised hazard classifications, registration requirements, emergency response planning, additional enforcement authority and development of a mechanism for providing financial assistance for dam repairs. These recommendations would require the development of regulations and revisions to General Law, as needed.

Given the important policy recommendations in the aforementioned Berger report, the Department recommends the creation, under Executive Order, of a multi-disciplined state and local task force for dam safety. The task force should include a member of the Governor's Policy Office, the State's Emergency Management Agency, the Department of Environmental Management (Divisions of Planning & Development and Compliance & Inspection), the State Budget Office, federal partners, such as the Natural Resource & Conservation Service (NRCS) and most importantly representatives from city and town governments and private dam owner associations. The Task Force would carefully review all data contained in the Berger report as well as new inspection report information and formulate a broad-based strategy for both regulatory and financing issues for the repair of state, local and privately owned dams. Probably the

most important issue to address in this effort is to provide a financial mechanism for dam repairs.

State Owned Dam Repairs

The Department continued to move forward under its Capital Development Projects program, undertaking the engineering evaluation, design and/or reconstruction at the following state owned dams:

Dam No.	Dam Name	City/Town
566	Bowdish	Glocester
102	Olney	Lincoln
108	Stillwater	Smithfield

Substantial reconstruction of Dam no. 102 - Olney, in Lincoln Woods State Park, which is a high hazard dam, was completed in June at a total cost for engineering and construction of \$395,000.

An \$80,900 contract was awarded in October for the design of repairs to Dam no. 566 - Bowdish. The contract is to complete the engineering design, based on the findings in the engineering evaluation report completed in 1998.

The Department retained a consultant to complete an engineering evaluation report for the Dam no. 108 - Stillwater, which is also a high hazard. The contract for this service was awarded in November at a cost of \$19,000.

This completes the activities performed in 1999.

For further information on the dam inspection and safety program please contact David Chopy at 222-1360.