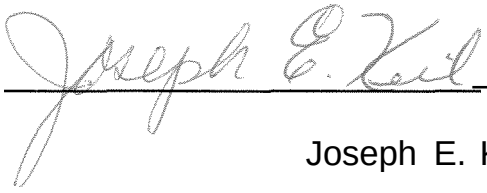
Operations & Maintenance Manual

Estling Lake Dam

New Jersey Dam Number 25-169

Federal ID Number NJ00184

Prepared June 2011 by: Churchill Consulting Engineers



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PART I: BACKGROUND DATA

A. Introduction

Estling Lake Dam is located on Den Brook, a tributary of the Rockaway River, in Denville Township, Morris County, NJ. The Estling Lake Corporation (ELC) maintains the lake and associated spillway, and the embankment that impounds the lake is owned by New Jersey Transit Rail Corporation. This Operations and Maintenance ("O&M") Manual has been prepared for these joint owners.

Estling Lake Dam is comprised primarily of an embankment approximately 1,200 feet long and 19 feet high originally constructed in 1870 by the Delaware, Lackawanna and Western Railroad to support a two-track railroad operation. The construction of this embankment created the impoundment known as Estling Lake. The embankment material is reportedly from local sources.

Estling Lake was used as a source of ice by a railroad subsidiary, the Estling Lake Ice Co. In the early 1900s the embankment was widened to accommodate four tracks by placing fill on the upstream side of the existing embankment. In subsequent years, the system was electrified and the two northern most tracks were removed from the downstream portion of the dam crest. Due to changes in railroad ownership the records concerning the details of the embankment construction, spillway design and culvert design are not available and reportedly have been lost.

Located along the embankment is the spillway made of concrete, block, and stone. It has two installed, manually operated drawdown valves, one of which has never been used. Under normal conditions, water cascades over this spillway onto energy dissipating steps, which lead to a 14' high, 57' wide stone arch culvert under the embankment. This constitutes the only outlet for the lake. Downstream, along the toe of the embankment, is the backwater of Indian Lake, owned by a separate entity. Indian Lake has a water elevation of approximately 6 feet lower than Estling Lake at normal capacity.

The crest of the dam is approximately 30 feet wide and carries two railroad tracks along its southern or upstream side and a gravel roadway for railroad maintenance vehicles along its northern, or downstream side. The upstream slope of the embankment consists of large rip rap mixed with small stones. The downstream and upstream slopes of the embankment lay on a 1V:2H gradient.

The spillway and all its components are made of stone masonry. The spillway crest consists of 32-foot long capstones. The spillway itself has no defined entrance, as the Lake abuts the spillway weir. There is a stepped arch drop box. The spillway wing walls are on the north and south side. The spillway crest is in good condition. The drop box is also of made of stone masonry and is in good condition.

B. Project Description

In accordance with the New Jersey Department of Environmental Protection ("NJDEP") Dam Safety Standards ("DSS"), NJAC 7:20, a "regular inspection" of the dam was performed by Washington Group International, Infrastructure Division, 2 World Trade Center, New York, N.Y. 10004 in February 2001. A formal inspection was performed by Jenny Engineering Corp., 2 Edison Place, Springfield, N.J., 07081 in 1997. A Phase I inspection was performed in 1979. A second formal inspection was performed in 2011 by Churchill Consulting Engineers and a regular inspection was performed in 2015 by HDR, Inc. and SWM Consulting, LLC. The most recent formal inspection was performed in 2017 also by HDR, Inc. and SWM Consulting, LLC.

This O&M Manual will provide a mechanism by which additional remedial repairs and routine maintenance items can be performed to avert long-term degradation of the spillway and embankments. "Informal inspections" also identified herein as "maintenance inspections" must be performed by the designated Inspector appointed by ELC and/or New Jersey Transit ("Informal inspection" means the visual inspection of the dam by the owner to detect any signs of deterioration in the structure.)

In accordance with NJDEP files, Estling Lake Dam has been classified as a Class I, High Hazard structure. Due to the Class designation for the dam, NJDEP DSS mandates that a "regular inspection" be perfom1ed by a New Jersey licensed professional engineer (''P.E.") once every two years. A proposed inspection schedule is tabulated in Part II - Section, G.

C. Project Authorization

This O&M Manual has been prepared in accordance with the NJDEP DSS, Section 7:201.1 1 "Dam Operating Requirements and Inspections: New and Existing Dams." This manual was prepared by ELC with assistance from New Jersey Transit in 1997 and updated by New Jersey Transit with assistance from ELC and Churchill Consulting Engineers in 2013.

ELC and New Jersey Transit share ownership of certain portions of the Estling Lake Dam structure. Estling Lake owns and is responsible for the spillway and wingwalls of the dam. NJ. Transit owns and is responsible for the embankment that forms the dam, and the culvert under their right-of-way, which carries the outfall of the Lake.

D. Project History

As discussed in the Introduction (Part I, Section A), the Estling Lake dam was constructed in 1870 by the Delaware, Lackawanna and Western Railroad to support a two-track railroad operation. Estling Lake was thus formed, and a rail subsidiary, Estling Lake Ice Company, harvested ice from the lake. In the early 1900s the embankment was widened to accommodate four tracks. Due to numerous changes in railroad ownership, records concerning details of embankment construction, spillway and culvert design aren't available and apparently have been lost.

As discussed in the Project Description (Part I, Section B) the original formal inspection of the dam was conducted in 1997 and the original regular inspection of the dam was performed in 2001. As noted

above, the most recent formal inspection was conducted in 2017 by HDR, Inc and SWM Consulting, LLC. Recommendations were made for remedial actions because of this formal inspection. They include:

Short-Term:

1) Develop and implement a Vegetation Management Plan (NJ Transit).

Long-Term:

1) ~~Restore spalling concrete on culvert wingwalls~~ (Complete - Estling Lake Corporation) and culvert (New Jersey Transit).

2) ~~Restore and repoint spillway joints~~ (Complete - Estling Lake Corporation).

3) ~~Replace missing low-level outlet intake trash rack. It is the middle trash rack on the east low-level outlet.~~ (Complete - Estling Lake Corporation).

4) ~~Complete baseline spillway crack mapping and high precision survey~~ (Complete - Estling Lake Corporation)

Studies:

All previously recommended studies have been submitted or are in progress and will be submitted this year.

E. Project Contracts

Miscellaneous Correspondence (Part I, Section F) contains correspondence and contract information regarding general maintenance and material purchases for the Dam. Any new correspondence or contract data must be copied and included in Miscellaneous Correspondence (Part I, Section F).

F. Miscellaneous Correspondence

A record of routine or corrective maintenance performed by the ELC and New Jersey Transit will be kept and included as a part of this manual. This section shall contain an ongoing record of relevant correspondence regarding Dam Compliance History. It shall include correspondence from the Dam Safety Section regarding compliance issues, dam classification/reclassification, and professional services. This section shall be reviewed and updated annually along with the entire O&M manual to incorporate pertinent correspondence.

G. Glossary of Terms

The following terms are provided so that the members of the inspection crew will be familiar with terms relating to the darn.

Abutment - That part of the natural ground against which a dam is constructed. Right and left abutments are those respective sides of an observer looking downstream.

Appurtenant Structures - Ancillary features of a dam, such as the outlet pipe and spillway.

Crest - The term "crest of dam" is often used when "top of dam" is meant.

Dam - A berm built across a watercourse for impounding water.

Drainage Area - The area that drains naturally to a body of water.

Embankment - A slope of fill material, usually earth or rock, that is longer than it is high or the sloping side of a dam.

Homogeneous Earthfill Dam - An embankment dam constructed of similar earth material throughout.

Freeboard - The vertical distance between a known water surface elevation and the top of a dam.

Normal Water Level - The lowest level of the spillway over which water normally flows.

Outlet Pipes - The opening at the dam through which water can be freely discharged from the reservoir.

Piping - The progressive development of internal erosion by seepage, appearing downstream as a hole or seam discharging water that contains soil particles.

Probable Maximum Precipitation (PMP) - The maximum amount of rainfall that can be expected to occur on a drainage area.

Reservoir Area - The surface area of the lake when filled to the normal water level.

Rip-rap - A layer of large stones, broken rock, or precast blocks placed in random fashion on the slope of an embankment dam, on a reservoir shore, or in the channel as a protection against wave action or erosion. Very large rip rap is sometimes referred to as armoring.

Seepage - The internal movement of water that may take place through small spaces in a dam, its foundation, or its abutments.

Spillway - A structure over which normal or flood flows are discharged.

Toe of Dam - The junction of the downstream face of a dam with the ground surface, also referred to as downstream toe. Also known as the junction of the upstream face with ground surface, called the upstream toe, which is usually under water.

Part II: Operation and Maintenance

A. General

A well-organized O&M program will protect the dam against deterioration and prolong its life. All components of the dam including the embankment, the spillway, and the reservoir are susceptible to damaging deterioration over time. The cost of a proper O&M program is minuscule compared to the cost of major repairs for reconstruction of the dam after a failure. This manual establishes a basic O&M program based primarily on systematic inspections by appointees of the ELC and New Jersey Transit. During each inspection, a checklist of items as defined in Inspections and Inspection Checklist (Part II, Section E) must be used. The completed checklist must be dated and signed by the "Inspector" and incorporated into this manual.

This manual is intended as a guide for the ELC and New Jersey Transit and outlines the proper procedures for conducting routine O&M for the dam. The ELC and/or New Jersey Transit shall appoint a key site person, from within their organization (Inspector), who will perform annual inspections. This manual will then be transferred yearly to the appointed "Inspector." A continuous record of the O&M for the dam must be maintained. The Designated Inspectors List (Part II, Section B) lists the Officials and various contractors. This section must be updated periodically pending a change in the Officials, the Inspector, the Engineer, or the Contractor.

At least two (2) copies of this manual shall be kept by the ELC and New Jersey Transit at all times. All correspondence and dam maintenance checklists shall be reproduced in triplicate and distributed for inclusion into the manuals. One (1) copy of this manual along with all updates and inclusions shall be forwarded to:

New Jersey Department of Environmental Protection
Division of Dam Safety & Flood Control, Bureau of Dam Safety
P.O. Box 420
Trenton, New Jersey 08625-0420

This section of the manual has been prepared to provide the Inspector with a simple and systematic method for inspecting, operating and maintaining the dam. For the most part, the O&M for the dam involves observation rather than evaluation. The following sections provide a step-by-step procedure to assist the Inspector in performing all duties in a rational and orderly manner. The Inspector must become familiar with the background information in Part I of this manual. The Inspector must also review the plans which are included in Part II, Section C.

Finally, prior to conducting an inspection or performing routine O&M, the Inspector must review the Tools and Equipment List (Part II, Section D), the Inspections and Inspection Checklist (Part II, Section E) and the "Guide for Preparation of Report on Conditions of Dam" (Part II, Section I) of this manual. Each time an inspection reveals the need for maintenance, the Inspector shall notify the ELC or New Jersey Transit who may hire a contractor to perform the work under the direction of a NJ Licensed Engineer. Each time maintenance is performed on the dam, the Inspector must record the incident and place a copy of the maintenance checklist in this manual Part II, Section F. Inspections must be performed once every year between March and December and after each major storm event. Routine maintenance, as defined in Part II, Section F, shall be performed immediately after each inspection and after each major storm event.

B. Designated Inspectors List

This Section must be updated periodically to reflect the name(s) and telephone number of the Inspection and Contractors who are appointed by the ELC.

Inspector - Spillway, Estling Lake Corporation	Telephone Number
Richard Price	Summer: (646) 894-0679 Winter: (973) 520-3952
Inspector - Embankment, NJ Transit	
Kenny Santos	(201) 725-5129
Guiseppe Sanzone	(973) 879-7012
Designated Contractor	
NJ Transit (Rail Operations)	(973) 768-9478
Contact Person: David Lobycz	(862) 270-6015 (24-Hour)
Professional Engineer	
George Nickels, P.E.	(973) 491-7836
Director	
Richard Price (Estling Lake Corporation.)	Summer: (646) 894-0679 Winter: (973) 520-3952

C. Plan Review

This section contains existing plan documents. This section shall be periodically updated to incorporate additional plans and sketches that are developed for the operations maintenance inspection or rehabilitation of the dam and its ancillary features. The Inspector shall review available plans prior to conducting an inspection of the dam.

D. Tools and Equipment

The following is a list of required inspection equipment for routine O&M procedures and inspections:

1. A clip board, a pencil and the inspection checklist. A copy of the checklist is included in the following section.

2. A standard 6-foot collapsible ruler.

3. A camera - photographs or observed portions of the dam will provide a measure of performance when comparing past and present maintenance practices or conditions.

4. A probe any stiff light stick or rod with a blunt tip of sufficient strength to penetrate soil. The probe can provide information on conditions below the surface of the dam such as the depth and softness of a saturated area.

5. A weed whacker can be used to clear non-visible areas and to perform routine maintenance on the embankments.

6. A flashlight - a flashlight can be used to observe the inside of the 24-inch Outlet Pipe.

Maintenance at the dam may include heavy equipment including the following:

1. Chain saw.

2. Stump grinder.

3. Wheelbarrow.

4. Backhoe.

5. Dump truck.

The following materials for immediate use if warranted by the inspection are available:

1. Native, silty sand for filling erosion rills and gullies.

2. Topsoil mixture, fertilizer and seed.

3. Large stone rip rap for emergency repairs caused by erosion.

4. Synthetic geofabric netting and stakes to prevent seed and top soil from blowing away.

E. Inspections and Inspection Checklist

Prior to performing inspections, the Inspector must observe the water level in the lake and on the outlet side of the dam. No amount of water should flow over the spillway during an inspection. (The lake must be lowered by operating the gate at the low-level outlet). This procedure allows the Inspector to freely observe the spillway. If the inspector identifies a need for immediate maintenance of the spillway, the lake should be lowered an additional amount by opening the low-level outlet to facilitate the repair. Prior to lowering the lake, an application for Lake Lowering must be filed with the *NJDEP, Division of Fish and Wildlife*. A sample application is included in Part II, Section H of this manual.

The most effective means of conducting the inspection is to treat each dam component as an individual element, inspect it thoroughly, and fill out the checklist prior to moving on to the next element. The checklist sequence for inspection of each dam element is as follows:

1. The crest: walk along the top of the dam from one end to the other and look for erosion, puddles, or settlements, cracks in the walkway surface or animal burrows, etc.
2. The upstream embankment: walk along the upstream face of the dam and to the water's edge and observe erosion, puddles or wet areas, slumps, wood vegetation or animal burrows. (Look below the waterline for any additional irregularities or animal burrows.
3. The downstream embankment: walk along the downstream face of the dam in a zigzag, top to bottom to observe any erosion, puddles or wet areas, sand boils, slumps, woody vegetation or animal burrows.
4. Spillways: observe the spillways from the crest. Walk along the stone masonry sill noting any cracks, leaks, heaving or erosion. Check the abutment-spillway interface for any sign of erosion.
5. Outlets: Observe the condition of the outlet culvert at the upstream headwall. Check the condition of the cast iron pipe to note any blockage or cracks. (To view the outlet culvert, it will be necessary to lower the water level in Indian Lake. Prior to lowering, notify downstream owners and the Township. Using chest waders and a ladder access the control valve on top of the upstream headwall to lower the level of the lake. Once the lake is lowered, the valve should be operated through its full range, however, the valve must be closed for inspection of the spillway.) Observe the condition of the 24" cast iron pipe by viewing it from the upstream and downstream end. Observe the condition of the upstream extension (corrugated steel) of the outlet pipe.
6. The lake: Stand on the upstream face on the crest and look upstream to observe any irregular conditions within the lake such as vortices and cloudy water could indicate that material is moving.
7. The downstream area: Walk along the bed of the downstream channel and observe any unusual conditions which may affect the performance of the dam, such as debris, sand boils, unexpected or changing seepage, vegetation or excessive sedimentation.

The inspection checklist included in this section should be copied and completed every time an informal (maintenance) inspection is performed. In general, informal inspections should be performed annually between September and October. After each inspection, the Inspector will report to the ELC and New Jersey Transit, which will direct maintenance operations as necessary.

ESTLING LAKE CORPORATION AND NEW JERSEY TRANSIT
INSPECTION CHECKLIST

Dam Name: Estling Lake Dam **NJDEP File No.: 25-169**

Maintenance Crew:_____Date: _____

Weather:_____

Directions: 1. Lower the lake prior to conducting inspection.
2. Mark an "X" in yes, no or N/A column and note any unusual condition.

OBSERVED ITEM	YES	NO	N/A	DIMENSIONS, LOCATIONS, COMMENTS, ETC.
Crest: (Walk along top of dam from one end to the other)				
a. Observed cracks? (how long?)				
b. Observed ruts or holes? (how big?)				
c. Trees? (how many?)				
d. Observed settlements?				
e. Observed erosion gullies?				
f. Observed bare areas?				
g. Animal burrows?				
Upstream Slope: (start at top and walk up and down slope across entire dam)				
a. Observed ruts or holes?				
b. Trees? (how many?)				
c. Observed slumps or settlements?				
d. Observed erosion gullies?				
e. Observed bare spots?				
f. Animal burrows?				
g. Wet areas or seepage?				
Downstream slope: (start at top and walk up and down slope across entire dam)				
a. Observed ruts or holes?				
b. Trees? (how many?)				
c. Observed slumps or settlements?				
d. Observed erosion gullies?				
e. Observed bare spots?				
f. Animal burrows?				
g. Wet areas or seepage?				
h. Sand boils?				
i. Unexpected or changing seepage				

OBSERVED ITEM	YES	NO	N/A	DIMENSIONS, LOCATIONS, COMMENTS, ETC.
Primary Spillway:				
a. Debris or obstruction in spillway?				
b. Is spillway straight?				
c. Are gabions intact?				
d. Observed cracks or leakage?				
Downstream Channel: (Walk down channel bed)				
a. Debris in channel?				
b. Excess sediment build-up?				
c. Excessive vegetation?				
d. Evidence of uneven settlement?				
e. Other conditions?				
Low level outlet:				
a. Observed blockage?				
b. Joints misaligned?				
c. Joints leaking?				
d. Is valve operable? (CW to Open CCW to Close)				
e. Observed cracks in headwall?				
f. Observed spalling or scaling?				
g. Exposed reinforcing steel?				
Lake Area: (stand near crest and look				
a. Observed excessive silt?				
b. Is plant growth excessive?				
c. Is water cloudy?				
d. Are shores eroded?				
e. Vortices (swirling funnel on water surface) Other observations?				
f. Other observations?				
Recommendations for Maintenance:				

F. Operation and Maintenance and Routine Maintenance Checklist

The ELC and NEW JERSEY TRANSIT are responsible for maintenance at the Dam. There are three (3) categories of maintenance: immediate maintenance, corrective maintenance, and continuing maintenance. Accordingly, each of the maintenance conditions will be determined during the annual inspection. This portion of the report also contains a section on technical guidance describing corrective action.

1. Immediate maintenance demands immediate attention, requires notification of the Dam Safety Section, and must be performed under the supervision of a New Jersey licensed professional engineer. Immediate maintenance usually requires construction equipment and professional guidance. Immediate maintenance includes the following:

a. A severe slope failure.

b. A breach or near breach caused by severe progressive erosion.

c. Overtopping of the crest by upstream or downstream waters.

d. Deterioration of the outlet culvert.

e. Increasing uncontrolled seepage through the embankment.

f. A blocked spillway or outlet channel.

2. Corrective maintenance should be performed as soon as possible after an inspection and may require a Dam Safety Permit. A dam permit application is included in Part II, Section H of this manual. Corrective maintenance includes the following:

a. Clearing of trees, shrubs and underbrush on the dam embankment, crest, or near the spillway.

b. Filling eroded areas or gullies and seeding to stabilize the area.

c. Operate the stem of the outlet gate on an annual basis.

d. Removal of burrowing animals and filling the holes.

Corrective maintenance can be performed by the ELC volunteers and/or New Jersey Transit with some technical guidance.

3. Continuing maintenance will occur on a regular basis and can be performed during the informal inspections or in accordance with maintenance schedule outlined in Part II, Section G of this manual. Continuing maintenance includes the following:

a. Observation of any wet areas, springs or potential seepage in the embankment.

b. Removing small shrubs or underbrush on the dam embankment.

c. Filling small eroded gullies.

d. Filling of ruts caused by pedestrian traffic along the crest.

e. Removing accumulated trash and debris.

f. Monitoring upstream development within the watershed.

g. Operating the stem at the outlet gate on an annual basis.

h. Removal of burrowing animals and their dens from the dam.

i. Fertilizing and over-seeding grassed area.

j. Mowing grass areas.

Continuing maintenance can be performed by the Inspector or volunteers of the ELC and/or NEW JERSEY TRANSIT on an ongoing basis. Some technical guidance for routine operations follows.

4. Technical Guidance (Outlet Valve and Animal Burrows)

The proper operation of the outlet gate and burrowing animal control are critical to the proper operation of a dam. The technical maintenance tips provided in this section should be followed to insure proper dam operation.

Animal burrow control is a key feature of the O&M of the dam. Rodents such as woodchucks, muskrats, ground squirrels, rabbits, moles, and beavers endanger the structural integrity of the embankment. Animal burrows are easily recognized in the spring because fresh soil is generally found at the mouth of the burrows. Early detection and control in April is essential in controlling burrowing activity. Muskrats are nocturnal and can be found in marshy areas. Their burrows are difficult to detect since they tend to burrow below the water line. Beaver activity will become apparent through visual observation of tree cuttings. Animals should be removed immediately upon detection. Woodchucks, squirrels, rabbits, moles and muskrats can be exterminated or flushed out with smoke. Beavers must be relocated. The animal burrow must be filled with soil or a mixture of water to 9 parts soil and 1 part cement. The soil mixture should be placed as deep as possible and compacted with a pole.

The proper operation of the outlet gate is critical to the operation of the dam. The outlet gate at the dam provides the only means for the emergency lowering of the lake which is essential for the safe operation of the dam. The gate must be operated through its full range and inspected once per year during the maintenance inspections. Observed irregularities or leakage in the operation of the gate should be investigated and corrected immediately. Note that this valve operates CW to open, CCW to Close.

ESTLING LAKE CORPORATION AND NEW JERSEY TRANSIT
CONTINUING MAINTENANCE CHECKLIST

Dam Name: Estling Lake Dam **NJDEP File No.: 25-169**

Maintenance Crew:_____Date: _____

Weather:_____

Directions: Mark an "X" in YES or NO column. Note Location and Equipment Used.

MAINTENANCE ITEM	YES	NO	LOCATION AND EQUIPMENT USED
Crest:			
a. Remove trash			
b. Fill ruts and holes			
c. Fill potholes in pavement			
d. Remove trees and shrubs, etc.			
Upstream Slope:			
a. Remove trash			
b. Fill ruts, holes and gullies			
c. Fill and compact animal burrows (remove rodents)			
d. Remove trees and shrubs, etc.			
e. Replace stone rip rap			
Downstream slope:			
a. Remove trash			
b. Fill ruts, holes or gullies			
c. Fill and compact animal burrows (remove rodents)			
d. Remove trees and shrubs, etc. (10 feet from mow line)			
e. Fertilize and overseed grass areas			
Subsurface drains:			
a. Clean out drains			
b. Repair any cracked pipes			
Outlet culvert:			
a. Clean out debris			
b. Patch joints			
Low level outlet valve:			
a. Operate valve			
b. Lubricate valve			
Lake Area:			
a. Remove trash			
b. Remove excess growth			
c. Repair erosion			

G. Schedule of Inspection and Maintenance

The following schedule shall be requirements for inspection (see checklist in Section E; except when a Regular Inspection is scheduled) or after any significant stom1 event. A Regular Inspection for the dam shall be performed every two years (except when a formal inspection is scheduled or after any significant stom1 event). A final inspection for the dam shall be performed every six years. All inspections will be performed between March and May or between September and November. The following table shows the inspection schedule for the next 7 years. Subsequent inspections shall follow the same format:

Type of Inspection	Year
Formal	2023
Regular	2025
Regular	2027
Formal	2029
Regular	2031

All maintenance items identified in the inspections shall be completed during May for the spring inspection, or during November for the fall inspection of the same year (see checklist in Part II, Section F). In addition, continuing maintenance shall be performed during each inspection and after every major storm event (see checklist in Part II, Section F).

H. Permit Applications

See Appendix III

I. "Guide for Preparation of Report on Conditions of Dams"

See Appendix IV

APPENDIX I

Miscellaneous Correspondence

[INSERT COPIES OF CORRESPONDENCE FROM PREVIOUS O&M MANUALS HERE]

APPENDIX II

Plan Review

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APPENDIX III

Permit Applications

State of New Jersey
Department of Environmental Protection
Dam Safety Permit Application

Submit to:
NJDEP Bureau of Dam Safety
501 East State Street
Mail Code 501-01A
P.O. Box 420
Trenton, NJ 08625-0420
(609) 984-0859 Fax (609) 984-1908

Read requirements and follow instructions carefully. Please print or type.

1a. Applicant/Owner_____Telephone_____
Legal Address _____
City or Town_____State_____Zip Code_____

1b. Applicant/Owner_____Telephone_____
Legal Address _____
City or Town_____State_____Zip Code_____

1c. Co-permittee_____Telephone_____
Legal Address _____
City or Town_____State_____Zip Code_____

2. Owner's Engineer
Name_____N.J. License No._____
Name of Firm_____
Address _____
City or Town_____State_____Zip Code_____
Telephone_____

3. Project Description _____
_____
_____

4. Estimated construction cost of project_____

5. Will the work require the lake to be lowered?_____

Date received:	Assigned to:

6. Project Location_____
Name of Dam_____
Across (Name of Stream)_____
At a Point_____
(A distance from mouth of stream or County or municipal boundary)
Municipality_____County_____
Latitude_____Longitude _____
Quad sheet Location_____Nearest downstream Municipality_____
Lot_____Block_____

7. GENERAL INFORMATION:

NJ File No._____
Federal ID No._____
Application No._____
Hazard Classification_____ Purpose of Dam_____
Dam Height (ft)_____ Normal Surface (ac)_____
Dam Length (ft)_____ Normal Capacity (af)_____
Dam Type_____ Maximum Capacity (af)_____
Upstream slope_____ Downstream slope_____
Spillway type_____ Design Flood Flow (cfs)_____
Other Spillway_____ Freeboard (SDF) (ft)_____
Drainage (sqr mls)_____ Spillway Capacity (cfs)_____

8. The Dam Safety Standards (N.J.A.C. 7:20-1 et. seq.) must be used in preparation of the following attachments which must be submitted in addition to this form:

A. Two sets of construction specifications.

B. Site location map (U.S.G.S. sheet)

C. Two sets of all construction plans and details.

D. Final design report including all supporting calculations.

E. Operation and Maintenance Manual (O&M).

F. Emergency Action Plan (EAP). Required for Class I and II only.

9. Have any other applications for this site/project been submitted, or have any state permits been issued for this project? (If yes, indicate status and project number below.)

	Permit Type	Application Status (i.e. pending/approved)	Project No.
9.1	Stream Encroachment Permit.....	_____	_____
9.2	Waterfront Development Permit.....	_____	_____
9.3	Statewide General FWW Permit.....	_____	_____
9.4	Freshwater Wetlands Individual Permit..	_____	_____
9.5	Pinelands Certificate of Filing.....	_____	_____
9.6	D & R Canal Commission Certificate.....	_____	_____
9.7	Temporary Water Lowering.....	_____	_____
9.8	Permanent Water Lowering.....	_____	_____
9.9	Water Diversion.....	_____	_____
9.10	Local Permits (Specify).....	_____	_____
9.11	Federal Permits (Specify).....	_____	_____

ENDORSEMENTS

A. <u>STATEMENT OF PREPARER OF PLANS, SPECIFICATIONS, SURVEYOR'S OR ENGINEER'S REPORT.</u>

I hereby certify that the plans, specifications, and engineer's report, if any, applicable to this project comply with the current rules and regulations of the New Jersey Department of Environmental Protection and that I am familiar with the laws and regulations governing the practice of engineering and land surveying in New Jersey and the definition of "responsible charge" therein and my responsibility under this definition.

_____
Signature

_____
Type: Name and Date

_____
Position, Name of Firm

Professional Engineer's
Embossed Seal

B. APPLICANT SIGNATURE

I hereby certify that I have obtained, or will obtain prior to the start of construction, necessary permissions from any and all property owners for property upon which the proposed work is to be done. I further certify under penalty of law that the information provided in this document is true and accurate. I am aware that there are significant civil and criminal penalties for submitting false or inaccurate information.

In addition, the undersigned hereby certifies:

1. Whether any work is to be done within an easement - Yes____ No____

2. Whether any part of the entire project (e.g., pipeline, roadway, cable, transmission line, structure, etc.) will be located within property belonging to the State of New Jersey - Yes____ No____

_____	_____
Type name	Type name
_____	_____
Signature of Applicant/Owner	Signature of Applicant/Owner
_____	_____
Date	Date

NEW JERSEY DIVISION OF
FISH AND WILDLIFE
Bureau of Freshwater Fisheries
P.O. Box 394 Lebanon, NJ 08833
Phone: (908) 236-2118 Fax: (908) 236-7280

WATER LOWERING PERMIT INFORMATION

AUTHORITY

Pursuant to N.J.S.A. 23:5-29 and N.J.A.C. 7:25-6:25, a water lowering permit must be obtained to partially or completely lower a body of water, regardless of ownership. Water withdrawal activities (water supply, irrigation etc.) which are already permitted or specifically exempted by the Department **do not** require a water lowering permit. For example: the lowering of water on a water supply reservoir for potable water use does not require a water lowering permit. However, a water lowering permit is needed for lowering the same body of water for dam repair, or aquatic vegetation control. If uncertain whether or not a permit is required please contact the Bureau of Freshwater Fisheries at (908) 236 – 2118 for clarification. The Division of Fish and Wildlife issues water lowering permits for the sole purpose of protecting the state's aquatic biota.

The timing, duration and extent of lowerings are tailored to each situation and are designed to avoid or minimize the loss of fish, and impacts to other biota. Permits are conditioned to further minimize these impacts to the extent possible and permittees assume responsibilities to protect aquatic biota while the waterway is lowered. Every lowering has an impact to both aquatic biota present within the waterway and downstream and no waterway should be lowered on a routine annual basis.

APPLICATION INFORMATION

Applications are available on the Division of Fish and Wildlife's website www.NJFISHANDWILDLIFE.com or by contacting the Bureau of Freshwater Fisheries at (908) 236 - 2118. Applications should be submitted at least **two months prior** to the date requested to begin lowering to allow time for review and processing. **There is a $ 2 application fee. A separate application is required for each waterbody requested to be lowered.**

Applications should be submitted to:

Division of Fish and Wildlife
Bureau of Freshwater Fisheries
PO Box 394
Lebanon, NJ 08833

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A map, which clearly shows the location of the waterbody in relation to the closest public road or intersection must be submitted with each application.

DIVISION OF DAM SAFETY MANDATED LOWERINGS

Dam owners who have been **mandated** by the DEP's Division of Dam Safety to lower water levels in their impoundment due to concerns with the safety of the dam structure must

immediately begin lowering the waterbody as specified in the mandate order and must contact the Bureau of Freshwater Fisheries at (908) 236-2118 to assure the protection of the aquatic biota. Owners have 15 days from receipt of such notice to submit a water lowering application to the Division of Fish and Wildlife. **A copy of the letter issued by Dam Safety mandating the lowering, and its extent, MUST be submitted along with the application.** Since unsafe dams pose serious safety and property risks they are exempt from timing restrictions. However, waterbody owners are still responsible for the protection of the aquatic biota within the waterway.

GENERAL INFORMATION

A variety of activities including dredging, dam repair, bulkhead and dock repair often require water levels to be lowered to be completed. These lowerings, although necessary, have significant impacts on the aquatic biota present within the waterway depending on their extent, duration and timing. Lowered water levels also inhibit the recreational use of a waterway, and can interfere with state stocking programs.

Poorly planned and unapproved lowerings can and do result in entire fish populations being destroyed often incurring several thousands of dollars in clean up costs and loss of recreational angling use of the waterway for several years which can affect area businesses.

Application approvals are based on whether fish, turtles and other aquatic biota will be adequately protected. Certain variables are particularly important in determining the impact of a lowering on aquatic biota. These variables are the time **of year, duration, extent of drawdown,** and **depth** from which the water is released. Guidelines presented below are designed to assist the applicant in preparing an acceptable water-lowering plan. It is recommended that potential applicants contact the Bureau of Freshwater Fisheries prior to submitting an application to discuss the proposed lowering. Assistance can be provided in completing the application form and informing the applicant of potentially acceptable terms and conditions.

Time of Year: Timing is one of the most critical components to minimizing impacts to aquatic biota. At certain times of the year aquatic biota (especially fish) are less likely to be adversely affected by a drawdown during others the results can be catastrophic. Applicants should also note that time frames suitable for water lowering are often different than stream encroachment and freshwater wetlands permit conditions that restrict the timing of sediment generating activities.. A well planned project schedule is key to preventing project delays due to water lowering timing restrictions. Applicants should refer to the attached table of preferred time frames for water lowerings to assist in project planning. Applicants are strongly urged to consult biologists with the Bureau of Freshwater Fisheries early in the planning process to determine the most appropriate timeframe for water lowering since multiple timing restrictions may apply.

Fall

Generally, the fall season (mid-September through October) is the most acceptable and desirable time of year to conduct a lowering. Cooler water temperatures prevail which minimizes stress on fish when they become concentrated in a smaller volume of water. Water levels must be drawn down to the full extent permitted by November 1 (waters north of Route 195) and by November 15 (waters located south of Route 195) in order to protect turtles and frogs during the onset of hibernation. Waterways may remain in the lowered state until project completion.

These dates also apply to partial lowerings for weed control purposes. Partial drawdowns during the winter months can help curb the growth of certain types of aquatic vegetation that occur in problem proportions by exposing the substrate (lake bottom) to freezing. The effectiveness of this method is highly varied and dependent on the extent that winter temperatures remain below freezing. Winter lowerings for weed control are not permitted to extend beyond March 1st for southern lakes, and March 15th for northern lakes. Lowerings for weed control purposes are generally limited to one to three feet depending on overall depth of the lake. Applications for weed control purposes will not be approved on a continual annual basis.

Winter

Except under special circumstances (dam safety concerns, catastrophic events etc.) water lowerings will not be approved to begin after November 1 for northern lakes, and November 15 for southern lakes. Lowerings for aquatic vegetation control must be lowered prior to these dates. These timeframes prevent hibernating turtles and frogs, buried in the substrate, from being exposed to the elements.

Spring

A waterbody should be full of water during the spring spawning and summer growing seasons. Pickerel and perch spawn in late winter after ice-out, bass spawn in May and June, and sunfish spawn in May, June, and July. Lowering during these periods can harm fish populations by eliminating suitable spawning areas. Fluctuating water levels can also contribute to egg mortality (by exposure to air) and death of newly hatched and small fish as they become stranded in weed beds and shallow pools. Lowerings for projects that must be conducted in the spring will be **limited in duration** (several days or weeks) **and extent** in order to avoid fish mortality.

Summer

Except in extreme circumstances (imminent dam failure, mandated lowering, etc.) water lowerings will not be approved to begin, or to extend over the summer months. Elevated water temperatures resulting in depleted dissolved oxygen levels can lead to stressed conditions for the entire fish population. These conditions are further exacerbated when fish are crowded in a reduced volume of water. These conditions almost always result in extensive mortality.

Duration: A body of water should not remain lowered any longer than is necessary to accomplish the objective of the lowering. Water levels should never be raised and lowered repeatedly. Waterbody owners should proactively develop water lowering plans to coordinate upcoming activities and projects.

Extent of Lowering: A stream, lake or pond should be lowered only as much as is necessary to accomplish the objective of the lowering. A pool of water which is capable of supporting the fish population should be maintained at all times. Substantial lowerings (remaining water level not sufficient to support the existing fish population) or complete draining of a waterway should only be done when absolutely necessary. These types of lowerings require that the fish be salvaged (collected and relocated), which can be costly. It also often results in the undesirable release of silt, detritus, and debris downstream, which can seriously affect water quality and damage critical habitat in the receiving water. These lowerings also result in loss of recreational use of the waterway for fishing for several years. Substantial and complete drawdowns for aquatic vegetation control are not permitted.

Depth of Water Release: Outlet structures typically have one or more devices (valve, dam boards, etc.) which control the water level and allow the waterbody to be dewatered. During the period from May through September, bottom waters should not be released as this water is typically low or deficient in dissolved oxygen and high in iron. These chemical characteristics can result in extensive mortality of the downstream aquatic biota and negatively affect downstream water uses. If a large portion of a lake's volume is located 10 to 12 feet or more below the surface, water must not be released directly from this or any deeper level during this five-month period. If a siphon or pump is used for dewatering, the intake must be screened and positioned up off the bottom to prevent clogging and transport of sediment downstream.

APPLICANT RESPONSIBILITIES

A water lowering permit does not relieve the permittee from any liabilities to any persons or property affected by the lowering. It is the responsibility of the applicant to coordinate lowering activities that may affect other water users such as state or local water supplies, area businesses, and/or surrounding homeowners **prior to application submittal**. All applications require the approval and signature of the waterbody owner(s).

The permit does not authorize the permittee to conduct any construction or alteration activities in conjunction with the lowering. Activities such as dam repair/construction, dredging, and dock repair/construction often require prior approval from other governmental agencies. It is the applicant's responsibility to procure any additional permit(s) required by other agencies. For questions relating to other potential permitting requirements please call DEP's Land Use Regulation Program at (609) 777 - 0454.

Applicants are responsible for submitting complete and accurate information. Additional information, if requested, must be submitted within the timeframe requested to facilitate application review. Failure to do so will result in denial of the application.

The timing, duration and extent of drawdowns are tailored to each situation and are designed to avoid or minimize the loss of fish, and impacts to other biota. Permits are conditioned to further minimize these impacts to the extent possible. The permittee always assumes the responsibility for protecting aquatic biota while the waterway is lowered. These conditions include but are not limited to the following:

Rate of Water Release: When lowering, water must be released slowly at a rate which will prevent the stranding of fish in off-channel pools within the lake basin and avoids flushing fish downstream. The rate of release must be controlled such that there is no over-bank flow of the primary downstream channel. If bottom waters are released, a slow rate of release will minimize the undesirable release and transport of silt, detritus and debris downstream.

Refilling: Refilling should begin as soon as possible once the objective of the lowering has been met, and must begin no later than the expiration date of the permit. When refilling, water flow out of the impoundment must be maintained. The water flow must be continuous and sufficient in quantity to prevent the destruction of downstream aquatic biota. For example, an outlet pipe may not be closed completely when refilling so that continuous, adequate flow downstream is maintained.

Prevent Loss of Fish: The permittee must take all reasonable measure to prevent the loss of fish. Even in the event of unforeseen circumstances (such as unusually warm weather patterns, heavy rains etc.) where conditions are aggravated by the lowered state of the waterway, the permittee is responsible for monitoring the fishery and taking any immediate action necessary to prevent the loss of fish life. This includes collecting and relocating the fish if necessary. Permittees should be aware that scientific collecting and fish stocking permits, also issued by the Bureau of Freshwater Fisheries, are required to collect and relocate fish. Applications are available on the Division's website www.NJFISHANDWILDLIFE.com or by contacting (908) 236 - 2118.

FISH SALVAGE

Fish must be salvaged (collected and relocated) when a waterbody is completely drained or lowered beyond the extent able to support fish. Salvages are the responsibility of the permittee and should be conducted during the early spring or fall (prior to November 1 for northern waters, and November 15 for southern waters) when handling and transportation is less stressful on the fish. Allowing fish to be flushed downstream is an unacceptable practice because it overloads the receiving waters with fish and can result in fish mortality downstream. A partial lowering in which the remaining volume of water is sufficient to maintain the fish population is preferred as this usually eliminates the need to conduct a fish salvage.

Before any fish can be collected or transferred to other waters of the state a scientific collecting permit and a fish stocking permit must be obtained from the Division. A scientific collecting permit allows the use of non-conventional fish collection methods such as electrofishing gear or seines, while a stocking permit allows the introduction of fish into another waterbody). If fish mortality occurs despite salvage attempts, the dead fish must be gathered and properly disposed.

Carp, Koi & Goldfish: In the event a salvage of a fishery is necessary, and fish must be relocated, pursuant to N.J.S.A. 23:5-30, it is illegal to relocate carp or koi. Carp are an invasive species and although well distributed in many waters throughout the state the transport and introduction of carp into any water, public or private, is prohibited. All carp and koi must be humanely destroyed. The Division of Fish and Wildlife does not support the practice of leaving carp or any fish species stranded along the shoreline, or simply left in the remaining pool of water.

Suggested methods to euthanize fishes humanely include: exposure to high concentrations of MS-222 or other chemical anesthetics. Pithing, decapitation, or induced hypothermia, are also acceptable provided they are done properly . Stunning with electroshock or anesthetics immediately prior to euthanasia may also be considered. Regardless of method, euthanasia should occur quickly.

Euthanized fishes shall be disposed of properly. Contact local disposal companies to discuss disposal options.

Restoring Fish Populations: For bio-diversity and mosquito control purposes, all permanent bodies of water should contain fish. Fish also play an important role in the life history cycle of several important mussel species. Waters which have been completely drained, or lowered to the extent that fish had to be relocated, should be restocked once refilled. Lakes that are open to the general public for fishing will be restocked with the appropriate fish species, at the proper stocking rates, free of charge by the Division of Fish and Wildlife. For lakes and waterways that are privately owned, or

restricted to local residents, fish can be purchased from private hatcheries. A stocking permit is required and a list of commercial hatcheries approved to stock fish in New Jersey is supplied with each application.

11/2011

NEW JERSEY DIVISION OF FISH AND WILDLIFE
Bureau of Freshwater Fisheries
P.O. Box 394 Lebanon, NJ 08833
Phone: (908) 236-2118 Fax: (908) 236-7280

APPLICATION FOR A WATER LOWERING PERMIT

$2.00 FEE

(Make Check Payable To: NJDFW)

ALL ITEMS MUST BE COMPLETED (PLEASE PRINT OR TYPE)

APPLICANT INFORMATION

ORGANIZATION	CONTACT PERSON:
STREET ADDRESS	
CITY/TOWN / STATE / ZIP CODE	
TELEPHONE (DAYTIME) ( )	TELEPHONE (EVENING) ( )

PROJECT LOCATION - ATTACH MAP TO APPLICATION*

NAME OF WATERBODY (ONE ONLY)

☐ OPEN TO THE GENERAL PUBLIC

NEAREST ROAD

**** A map that clearly shows the location of the pond in relation to the closest public roads or intersection must be submitted with each application.***

MUNICIPALITY / COUNTY

PROJECT DESCRIPTION

DATE REQUESTED TO BEGIN LOWERING / DATE REQUESTED TO BEGIN REFILLING

SIZE OF WATERBODY (ACRES) / MAXIMUM DEPTH (FT) / AVERAGE DEPTH (FT)

REASON FOR LOWERING (ONE ONLY)

- ☐ DREDGING
- ☐ DAM REPAIR
- ☐ DAM INSPECTION
- ☐ WEED CONTROL
- ☐ GENERAL MAINTENANCE
- ☐ BEACH/ SHORELINE CLEANUP
- ☐ DAM SAFETY

  DEP DAM SAFETY MANDATED ☐ YES* ☐ NO
- ☐ DOCK REPAIRS
- ☐ OTHER _____

* If mandated by DEP Division of Dam Safety, documentation mandating the lowering MUST accompany the application.

EXTENT OF LOWERING

(VERTICAL FEET THE WATER LEVEL WILL DROP AS MEASURED FROM THE CREST OF THE SPILLWAY)

DESCRIBE METHOD OF WATER RELEASE

FOR EXAMPLE: SIPHONED, OUTLET VALVE OPENED, SPILL BOARD REMOVED ETC.

DEPTH WATER WILL BE INITIALLY RELEASED

FOR EXAMPLE: RELEASE WATER 3 FT BELOW THE SURFACE; RELEASE SURFACE WATERS

OFFICIAL USE ONLY

DATE RECEIVED / PERMIT #

FEE: CASH ☐

CHECK ☐ EXMPT ☐

BIOLOGIST: (LAST NAME, DATE)

DECISION:

APPROVE ☐

DENY ☐ _____ INITIALS _____ DATE

DRAINAGE:

EFFECTIVE DATE:

EXPIRATION DATE:

CONDITIONS:

STANDARD ☐

ADDITIONAL ☐ _____

NORTH 195 ☐

LOWERING:

COMPLETE ☐ PARTIAL ☐

PERMANENT ☐ TR EXEMPT ☐

SALVAGE: REQUIRED ☐

_____ _____
PERFORMED BY DATE

_____
RELOCATED

Stocking Permit No: _____

Scientific Collecting Permit No: _____

CC: LAW ENFORCEMENT

North ☐ Central ☐ South ☐

ACTUAL DATE OF LOWERING:

ACTUAL DATE OF REFILLING:

ADDITIONAL PERMIT INFORMATION

HAVE ANY OTHER APPLICATIONS FOR THIS SITE OR ASSOCIATED WITH THIS PROJECT BEEN SUBMITTED, OR HAVE ANY OTHER STATE PERMITS BEEN ISSUED FOR THIS PROJECT? YES NO
IF YES, INDICATE STATUS AND PROJECT NUMBER BELOW

PERMIT TYPE	APPLICATION STATUS (PENDING/APPROVED)	PROJECT #
FRESHWATER WETLANDS		
STREAM ENCROACHMENT		
DAM SAFETY		
OTHER		

APPLICANT SIGNATURE

I CERTIFY UNDER PENALTY OF LAW THAT THE INFORMATION PROVIDED IN THIS DOCUMENT IS TRUE, ACCURATE AND COMPLETE AND OTHER PARTIES WHICH MAY BE AFFECTED BY THIS LOWERING HAVE BEEN NOTIFIED.

_____ _____ _____

DATE | SIGNATURE OF APPLICANT | POSITION/TITLE IF APPLICANT IS AN ORGANIZATION

PROPERTY OWNER'S CERTIFICATION

I HEREBY CERTIFY THAT THE UNDERSIGNED IS THE OWNER OF THE DAM ON THE LAKE/STREAM, OR IN THE ABSENCE OF A DAM IS THE PROPERTY OWNER RESPONSIBLE FOR THE WATERBODY, PROPOSED FOR LOWERING. THIS ENDORSEMENT IS CERTIFICATION THAT THE OWNER GRANTS PERMISSION FOR THE LOWERING AND CONSENTS TO ALLOW ACCESS TO THE PROPERTY BY REPRESENTATIVES OR AGENTS OF THE DEPARTMENT FOR THE PURPOSE OF CONDUCTING A SITE INSPECTION.

_____

(SIGNATURE OF DAM/PROPERTY OWNER)**

_____

(DATE)

_____

PRINT NAME AND ADDRESS OF OWNER ABOVE IF DIFFERENT FROM ITEM #1

** Multiple signatures required for dams/waterbodies owned or managed by more than one entity

APPLICANTS' AGENT (MUST BE COMPLETED IF APPLICANT IS NOT AN INDIVIDUAL)

I, _____, THE APPLICANT, AUTHORIZE TO ACT AS MY
(SIGNATURE OF APPLICANT)

AGENT/REPRESENTATIVE IN ALL MATTERS PERTAINING TO MY APPLICATION THE FOLLOWING PERSON:

_____ _____

(NAME OF AGENT)

_____

_____ _____

(TITLE, POSITION OR OCCUPATION) | TYPE OR PRINT NAME OF AGENT'S FIRM (IF APPLICABLE) AND ADDRESS OF AGENT IF DIFFERENT FROM ITEM #1

I AGREE TO SERVE AS AGENT FOR THE ABOVE-MENTIONED APPLICANT:

_____ _____

(SIGNATURE OF AGENT) | (DATE)

N.J.A.C. 7:25-6.25

WATERBODY: _____

I hereby acknowledge that I am aware that all waters in New Jersey located north of Route 195 must be drawn down to their full permitted extent by November 1, and all waters located south of Route 195 by November 15, in order to protect hibernating aquatic biota. In addition, no waters should be lowered or within a lowered state from July 1 to September 15.

Except in the event of a DEP Dam Safety mandated lowering, it is the responsibility of the permittee to plan, and implement all lowerings in accordance with these timeframes. Additional timeframes and permit conditions may apply.

_____ _____

Date Signature of Applicant

APPENDIX IV

Guide for Preparation of Report on Condition of Dams

Guidelines
for
Inspection of Existing Dams

New Jersey
Department of Environmental Protection
Engineering & Construction
Division of Dam Safety & Flood Control
Bureau of Dam Safety
Trenton, NJ 08625

January, 2017

Guide for the Inspection and Preparation of a Report on the Condition of a Dam

New Jersey Dam Safety Inspection Program

State law relating to the construction, repair, modification, and inspection of existing and proposed dams has been in existence since 1912. The law was amended in 1981 and cited as the Safe Dam Act, N.J.S.A. 58:4-1 et seq. The Dam Safety Standards N.J.A.C. 7:20-1 et seq. were promulgated in May 1985 ***and last readopted in June 2008***.

The New Jersey Dam Safety Program is implemented by the Department of Environmental Protection's Engineering and Construction, Division of Dam Safety and Flood Control, Bureau of Dam Safety. The objective of the program is to protect lives and property from the consequences of a dam failure or the improper release of impounded water. A primary means of achieving this goal is through the maintenance and periodic inspection of in-service dams.

The New Jersey Dam Safety inspection program is intended to identify conditions that may adversely affect the safety and functionality of a dam and its appurtenant structures; to note the extent of deterioration as a basis for long term planning, periodic maintenance or immediate repair; to evaluate conformity with current design and construction practices; and to determine the appropriateness of the existing hazard classification. The professional engineer performing the inspection should, where appropriate, recommend subsequent investigations required to resolve uncertain conditions and corrective measures to enable the dam to continue to perform its intended functions. ***For Class I and Class II dams, all addresses, e-mail, and phone numbers contained within the Emergency Action Plan must be verified and current. Inspection reports will be deemed incomplete without this information.***

Inspection Guidelines

The New Jersey Dam Safety inspection guidelines are designed to assist the dam owner with understanding the requirements, responsibilities, and duties inherent with dam ownership and to assist the professional engineer by providing a consistent approach to dam inspection and in-service evaluation.

Several different types of dam inspections can be performed. Dams and appurtenances should be inspected regularly to identify conditions that may adversely affect the safety of a dam and its ability to perform intended functions. An inspection may include the periodic evaluation of the as-built dam to ensure conformity with current design and construction practices.

Dam Classifications

The State of New Jersey recognizes four (4) classes of dams. Class I dams are those structures which, should they fail, would likely cause loss of life. Class II dams are structures which, should they fail, would likely cause substantial downstream property damage but are not considered to be a threat to life. Class III dams are structures which would cause little or no downstream damage should they fail. Class IV dams are structures which are less than 15 feet in height, impound less than 15 acre feet of water to the top of dam, and drain less than 150 acres. No dam may be included in the Class IV category if failure of the dam could cause downstream property damage or loss of life.

When Dams Should be Inspected

Class I and Class II dam owners are required to have a regular inspection performed every two years and a formal inspection performed every six or ten years respectively. Class III and Class IV dam owners are required to have a regular inspection performed every four years but are not normally required to perform periodic formal inspections. On those years a formal inspection is performed, a regular inspection will not be required. All dams over 70 feet in height or which can potentially store more than 10,000 acre feet of water, regardless of hazard classification, are required to be inspected every year with a formal inspection conducted every third year. All dam inspections shall be performed from March through December.

Types of Inspections

Formal Inspection - The inspection and performance evaluation of Class I and Class II dams under the supervision of a qualified, New Jersey licensed professional engineer to review and determine the safety and integrity of the dam and appurtenant structures. Formal inspections require a detailed field examination and should include a thorough review of the records on project design, construction, and performance. Where appropriate, a reanalysis employing advanced methods and modern design criteria and practices should be conducted in order to determine if the structure meets current design criteria. In addition, formal inspections require that the long-term behavioral patterns revealed by instrumentation and spillway discharges be closely examined. Detailed underwater inspections should be included as needed. A Department approved Emergency Action Plan and Operation and Maintenance Manual should be confirmed and their adequacy determined. ***All addresses, e-mail, and phone numbers contained within the Emergency Action Plan must be verified and current. Inspection reports will be deemed incomplete without this information*** Technical experts and specialists may be required to evaluate individual features and conditions; however, a qualified New Jersey licensed professional engineer must make the final coordinated evaluation. A review of prior regular and formal inspection reports should be undertaken to evaluate trends in performance.

Regular Inspection - The visual inspection of a dam by a qualified, New Jersey licensed professional engineer to detect any signs of deterioration in material, developing weaknesses, or unsafe hydraulic or structural behavior. For Class I and Class II dams, a Department approved Emergency Action Plan should be confirmed and its adequacy determined. ***All addresses, e-mail, and phone numbers contained within the Emergency Action Plan must be verified and current. Inspection reports will be deemed incomplete without this information*** For all dams, a Department approved Operation and Maintenance Manual should be confirmed and its adequacy determined. All instrumentation data should be reviewed and evaluated.

Informal Inspection - The visual inspection of the dam by the dam owner or operator to detect apparent signs of deterioration or other deficiencies related to the dam structure or its functionality. Informal inspections require that personnel conducting the inspection be knowledgeable about the dam and its appurtenances.

Emergency Inspection - An emergency inspection is an unscheduled inspection of a dam and its appurtenances necessitated by a potentially adverse natural event such as a large flood, earthquake, landslide or when a condition develops that appears to immediately threaten the safety of the dam. An emergency inspection is applicable to any hazard classification and requires immediate attention. Any required emergency repairs resulting from the emergency inspection should be conducted in compliance with N.J.A.C. 7:20 - 1.4 (i).

Inspection Reports and Qualifications of Inspection Personnel

Formal and regular dam inspections must be performed by a qualified, licensed professional engineer. The term "qualified engineer," as used in these standard guidelines is intended to mean an individual who:

1. Is a licensed New Jersey professional engineer.

2. Is competent in items related to dam investigation, design, construction, and operation for the type of dam being inspected.

3. Has at least 10 years of relevant experience in dam investigation, design, construction, operation, and evaluation.

4. Understands the effects of adverse dam incidents and failures and the potential cause of failures.

The text of the report on the condition of a dam should be concise and provide all relevant dam and dam related facts, findings, conclusions, analysis, recommendations, and data. ***For Class I and Class II dams, all addresses, e-mail, and phone numbers contained within the Emergency Action Plan must be verified and current. Inspection reports will be deemed incomplete without this information***. In addition, each report should contain clear, color photographs with each photograph indicating the date it was taken, the State dam reference number, and the photograph location. The visual inspection checklist provided by the Department should be completed and accompany all inspection reports. At the discretion of the Department, a completed visual inspection checklist, together with relevant color photographs and a completed NJ Dam Safety Compliance Schedule Form, will be considered the minimum information required for an acceptable inspection report.

Inspection reports for Class I, Class II and Class III dams should be submitted to the Department within 30 days of the completion of the inspection. Reports for Class IV dams are to be submitted to the county and/or municipality that has jurisdiction over the dam structure.

Informal inspections may be performed by the dam owner or operator and the resulting inspection report shall be part of the owner or operator's permanent file. Unless specifically requested, informal inspection reports are not to be submitted to the Department. The Department may require the owner or operator of any dam to perform an inspection of any type at any time.

VISUAL INSPECTION CHECKLIST

This general checklist should be used as an aid when examining all dams. This checklist may not, however, include all features or conditions found at a specific dam that are relevant to the safety of that dam. All features integral to the safety of the dam being examined should be inspected and their condition reported.

NJ INSPECTION YEAR:

TYPE OF INSPECTION: (formal, regular, informal):

DAM NAME:

DAM FILE NO.:

LOCATION:

OWNER:

OPERATOR:

DATE OF INSPECTION:

RESERVOIR INFORMATION

Normal Reservoir Elevation (ft):

Reservoir Elevation at time of inspection (ft):

WEATHER CONDITIONS (including recent rainfall):

INSPECTION PERSONNEL

New Jersey Licensed Professional Engineer(s):

Name	Affiliation	Area of Expertise

Non-Licensed technical expert(s) and advisor(s):

Name	Affiliation	Area of Expertise

State Representative(s):

Name	Affiliation

Dam Owner Representative(s):

Name	Affiliation

Others:

Name	Affiliation

GENERAL INFORMATION

Name of Dam:

Fed. I.D. No. N.J. Dam No.:

River Basin:

Town: County:

Block: Lot:

Nearest Downstream City-Town:

Stream Name: Tributary of:

Latitude (N): Longitude (W):

Type of Dam:

Purpose of Dam:

Hazard Category: Drainage Area (sqr mls):

Height (ft): Length (ft):

Normal Surface (ac): Normal Capacity (af):

Maximum Capacity (af): Spillway Capacity (cfs):

HISTORY

Date Constructed: Dates(s) Reconstructed:

Designer: Constructed By:

Owner & Address:

Owner/Operator present during inspection (yes or no):

PREVIOUS INSPECTIONS (date of)

Last Inspection: Last Regular Inspection:

Phase I Inspection: Last Formal Inspection:

EMERGENCY ACTION PLAN (Required for all Class I and Class II dams)

Date of Approved Plan:

Date of Plan Revision:

Is the notification flowchart complete and current? ***(If the notification flow chart is not complete and current, all modifications, corrections, and additions must be made and replacement pages submitted with this report)***

Is inundation mapping or a description included?

Are emergency materials and equipment identified?

When was the plan last tested?

DOWNSTREAM HAZARD CLASSIFICATIONS

Present Hazard Classification:

Changes in Downstream Land Use and Habitation:

Is present classification appropriate?

OPERATION AND MAINTENANCE

Date of Operation and Maintenance Plan:

Are instructions adequate?

Do operating personnel follow instructions?

What are operating personnel capabilities?

EXAMINATION OF EMBANKMENT DAMS AND DIKES

DESCRIPTION OF STRUCTURE

Embankment Material:

Cutoff Type:

Impervious Core:

Internal Drainage System:

Movement (Horizontal and Vertical Alignment):

Junctions with Abutments or Embankments:

Miscellaneous:

CREST

Vertical Alignment:

Horizontal Alignment:

Surface Cracks:

Settlement:

Unusual Conditions:

UPSTREAM SLOPE

Slope (Estimate) (H:V):

Trees, Undesirable Growth or Debris, Animal Burrows:

Sloughing, Subsidence or Depressions:

Slope Protection:

Surface Cracks or Movement at Toe:

Unusual Conditions:

DOWNSTREAM SLOPE

Slope (Estimate) (H:V):

Trees, Undesirable Growth or Debris, Animal Burrows:

Sloughing, Subsidence or Depressions:

Surface Cracks or Movement at Toe:

Seepage:

External Drainage System (Ditches, Trenches, Blanket):

Condition Around Outlet Structure:

Unusual Conditions:

ABUTMENTS AND TOE AREA

Erosion at Contact:

Seepage or Wet Area Along Contact:

Signs of Movement:

Depressions, Sinkholes:

Unusual Conditions:

SEEPAGE AND TOE DRAIN / RELIEF WELL FLOW SUMMATION

Location	Estimated Flow	Color (Turbidity)

(Attach additional sheets for facilities with more than one embankment dam or dike)

EXAMINATION OF CONCRETE AND MASONRY DAMS

DESCRIPTION OF STRUCTURE

Type of Dam (Gravity, Arch, etc.):

Internal Drainage System:

Movement (Horizontal and Vertical Alignment):

Miscellaneous:

UPSTREAM FACE

Condition of Concrete or Masonry:

Cracking:

Location	Orientation	Length	Width	Type

DOWNSTREAM FACE

Condition of Concrete or Masonry:

Cracking:

Location	Orientation	Length	Width	Type

Leakage Through Dam (Location and Estimated Flow):

CREST

Condition of Concrete or Masonry:

Cracking

Location	Orientation	Length	Width	Type

Signs of Movement:

Differential Movement (Joint or Crack Separation or Offset):

GALLERIES

Cracking

Location	Orientation	Length	Width	Type

Differential Movement (Joint or Crack Separation):

Leakage into Galleries (Location and Estimated Flow):

Condition of Gallery Drains:

FOUNDATION

Condition of Rock or Concrete Lining:

Cracking:

Signs of Movement:

Seepage (Location and Estimated Flow):

ABUTMENTS AND TOE AREA

Seepage or Wet Areas:

Signs of Movement:

Cracking:

Erosion:

Unusual Conditions:

(Attach additional sheets for facilities with more than one concrete or masonry dam or dike)

EXAMINATION OF SPILLWAYS AND OUTLET WORKS

TYPE(S) AND DESCRIPTION OF SPILLWAY(S)

Primary:

Secondary (auxiliary):

Emergency:

Other:

FOR EACH SPILLWAY THE FOLLOWING ASPECTS MUST BE EXAMINED WHERE APPROPRIATE

ENTRANCE CHANNEL

Description:

Vegetation (Trees, Bushes):

Debris:

Channel Side-Slope Stability:

Slope Protection/Erosion:

Unusual Conditions:

SPILLWAY CREST

Description:

Condition of Material:

Signs of Movement:

Joints:

Unusual Conditions:

DROP BOX

Description:

Condition of Material:

Signs of Movement:

Joints:

Floor:

Unusual Conditions:

SPILLWAY WING WALLS

Description:

Condition of Material:

Signs of Movement:

Joints:

Drains:

Unusual Conditions:

DOWNSTREAM APRON

Description:

Condition of Material:

Signs of Movement:

Unusual Conditions:

CULVERTS

Description:

Condition of Material:

Joints:

Signs of Movement:

Seepage:

Location	Estimated Flow	Turbidity

Unusual Conditions:

TRASH RACKS

Description:

Condition of Material:

Unusual Conditions:

CHUTES

Description:

Condition of Material:

Signs of Movement:

Unusual Conditions:

STILLING BASIN

Description:

Condition of Material:

Signs of Movement:

Erosion:

Unusual Conditions:

EXIT CHANNEL

Vegetation (Trees, Bushes):

Debris:

Channel Side-Slope Stability:

Erosion:

Unusual Conditions:

LOW LEVEL OUTLET

Description:

Condition:

Trash Rack:

Leakage: Location Estimated Flow

Unusual Conditions:

Was the low level outlet operated during the inspection?

Were there difficulties operating the low level outlet?

When was the low level outlet last operated and did this conform with the Operation and Maintenance procedures?

Miscellaneous:

STILLING BASIN FOR LOW LEVEL OUTLET

Description:

Condition of Material:

Signs of Movement:

Erosion:

Unusual Conditions:

EXIT CHANNEL FOR LOW LEVEL OUTLET

Description (Trees, Bushes):

Debris:

Channel Side-Slope Stability:

Slope Protection Erosion:

Unusual Conditions:

EXAMINATION OF OTHER FEATURES

INSTRUMENTATION (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) location, condition:

(A separate report including instrument readings, condition of instruments, observations, and conclusions based upon the collected data should be attached.)

RESERVOIR

Slopes:

Sedimentation:

Unusual Conditions Which Affect Dam:

Unusual Conditions:

APPURTENANT STRUCTURES (Power House, Gatehouse, Penstocks, Water Supply, Other)

Description and Condition of each:

FORMAL INSPECTION CHECKLIST

ENGINEERING STUDIES

Hydrology & Hydraulics:

Description and date of document(s) reviewed:

What is the SDF and how was it established?

Is study appropriate? If no previous studies, is study needed?

Dam Breach Analysis:

Description and date of document(s) reviewed:

Downstream development since approval of study? If yes, please provide comparison/mapping. Is re-evaluation necessary?

Is study appropriate? If no previous studies, is study needed?

Geotechnical/Seepage Analysis:

Description and date of document(s) reviewed:

Is study appropriate? If no previous studies, is study needed?

Structural Stability Analysis:

Description and date of document(s) reviewed:

Is study appropriate? If no previous studies, is study needed?

HISTORICAL DOCUMENTATION OF INSTRUMENTATION

Evaluate recorded instrument readings, changes in instrumentation, condition of instruments, observations, and conclusions from past 10 years or previous formal inspection.

UNDERWATER INSPECTIONS

Date of last underwater inspection:

Underwater inspection needed?

SIGNIFICANT DAM EVENTS/EMERGENCIES (Overtopping Events, Damage, Failure, Other)

Description of each event within past 10 years or since previous formal inspection, including any repairs completed.

CONCLUSION

DAM INSPECTION PROGRAM GUIDELINES

The following new guidelines have been established by the NJDEP Division of Dam Safety & Flood Control to help meet the requirements of the National Inventory of Dams condition assessment of existing dam structures. Please follow the guidelines/definitions below and select the appropriate checkbox.

SATISFACTORY
No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria. Minor maintenance items may be required.

FAIR
Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR
A dam safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY
Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

I certify that the dam structure referenced herein was personally inspected by me and was found to be in the following condition **(select one only):**

- ☐ SATISFACTORY
- ☐ FAIR
- ☐ POOR
- ☐ UNSATISFACTORY

CONCLUSION (continued)

I recommend the following repairs be made immediately:

The following long term improvements should also be undertaken:

The following studies are recommended:	☐ Hydrologic and Hydraulic analysis ☐ Stability analysis ☐ Failure/Inundation analysis ☐ Other _____ ☐ None

Have the recommendations above included those from the Phase I Inspection Report or previous Regular or Formal Inspection Reports? If not, indicate why.

EMERGENCY ACTION PLAN (This section must be completed for all Class I & II dams)

Date of Approved Plan:

Date of Last Plan Revision:

Is the notification flowchart complete and current? (If the notification flow chart is not complete and current, all modifications, corrections, and additions must be made and replacement pages submitted with this report)

Is the inundation mapping complete and current? If not, why?

Has the plan been exercised? List date and type of exercise(s). If not, why?

NJ Dam Safety Compliance Schedule Form (attached). This form must be completed or the Inspection Report will be deemed incomplete.

Name of Professional Engineering Company/Consultant Representing the Owner:

Company/Consultant Address:

Company/Consultant Telephone Number:

New Jersey Licensed Professional Engineer representing the dam owner in responsible charge of the inspection:

Sign _____ Date _____

New Jersey Professional Engineer License Number_____

New Jersey Dam Safety Compliance Schedule Form

Dam Name: _____ **File No:** _____	**Owner:** _____ **Address:** _____ **Address:** _____ **Address:** _____ **Phone:** _____ **Email:** _____	**Owner's Engineering Firm:** **Name:** _____ **Address:** _____ **Address:** _____ **Address:** _____ **Phone:** _____

The purpose of this form is to allow the dam owner, through consultation with their engineer, to establish a time line for addressing the deficiencies identified in the inspection report for the dam and bringing the dam into compliance with the New Jersey Dam Safety Standards, N.J.A.C. 7:20-1.1 et seq.

Proposed time frame for submission of required information and implementation of recommended repairs:
(Engineer should check required sections and propose appropriate time frames. However, the Bureau of Dam Safety reserves the right to require additional dates and/or information as needed.)

❑ **Performance of maintenance and repairs not requiring approval from the Bureau of Dam Safety** (Such work includes grass mowing, brush removal, debris removal, filling of animal burrows, minor concrete repairs, minor gate repairs, filling of areas of minor surface erosion, etc. The Bureau of Dam Safety must be notified upon completion of these activities.)

Work to be completed no later than: _____

❑ **Engineering Report / Studies** (This work includes any required hydrologic and hydraulic analysis, structural analysis, alternative analysis, geotechnical investigations or dam breach analysis that may be recommended by your engineer and/or required by the Bureau of Dam Safety.)

Studies to be submitted for review no later than: _____

❑ **Permit Application:** (A permit application must be submitted for any construction activity at the dam. The permit application must address all deficiencies as identified in the inspection report and the subsequent engineering report / studies.)

Permit application to be submitted no later than _____ months after the date of the Bureau of Dam Safety's approval of any required studies. (Please provide date if no studies are required.)

❑ **Construction to start no later than _____ months after the date of issuance of the permit by the Bureau of Dam Safety.**

❑ **Operation and Maintenance Plan (O&M):** (An O&M is required for all dams. O&M's should be submitted with the permit application or sooner if possible. Existing O&M's may need to be updated if a dam is being rehabilitated. Please indicate date a new or revised O&M will be submitted if there is not an existing and approved Manual on file with this office.)

O&M to be submitted no later than: _____

❑ **Emergency Action Plan (EAP):** (EAPs are required for all high and significant hazard dams and should be submitted as soon as possible. Existing EAPs should be reviewed on a yearly basis and revised as necessary. Please indicate date a new or updated EAP will be submitted if there is not an existing and approved Plan on file with this office.)

EAP to be submitted no later than: _____

The dates provided above will be reviewed by the Bureau of Dam Safety to determine if the schedule is acceptable to achieve compliance with the Dam Safety Standards. Requests for extensions to the accepted time frames outlined above must be submitted to this office in writing along with appropriate justification and will be considered on its merits on a case by case basis.

_____	_____	_____	_____
Signed: Dam Owner	**Date**	**Signed: Owner's Engineer**	**Date**

Additional information including the Bureau of Dam Safety forms, standards and inspection guidelines as well and EAP guidelines and a sample O&M is available at http://www.nj.gov/dep/damsafety/ or contact the office via e-mail at Damsafety@dep.nj.gov or telephone at (609) 984-0859. Please submit the completed form to: NJDEP, Bureau of Dam Safety, Mail Code 501-01A, P.O. Box 420, Trenton, NJ 08625.