Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR SEAN D. LOGAN, DIRECTOR

Division of Water

February 24, 2009

Village of Roaming Shores
Mayor, Carl Biats, Jr.
PO Box 237
Roaming Shores, OH 44084

RE: Roaming Rock Shores Lake Dam
File Number: 1506-001
Ashtabula County

Dear Mayor Biats:

Thank you for allowing Peter George and Tom Lagucki of the Division of Water to conduct a safety inspection of Roaming Rock Shores Lake Dam on October 15, 2008. This inspection was conducted by representatives of the Chief of the Division of Water under the provisions of Ohio Revised Code (ORC) Section 1521.062 to evaluate the condition of the dam and its appurtenances. The Chief has the responsibility to ensure that human life, health, and property are protected from dam failures. Conducting periodic safety inspections and working with dam owners to maintain and improve the overall condition of Ohio dams are vital aspects of achieving this purpose. A copy of the laws and administrative rules for dam safety is available on the division's web site or by request.

The enclosed inspection report was generated based on available information and is hereby provided for your use and study. Listed in the report are several repair, maintenance, and monitoring items that as dam owners you are required by law to perform. Completion of these required items will improve the safety and overall condition of the dam. The Chief must approve any plans for modifications or repairs to the dam. Following approval of the engineered plans, all necessary repairs must be implemented by the owner under the supervision of a registered professional engineer.

Please be advised that you may qualify for a loan to make required repairs from the Ohio Dam Safety Loan Program administered by the Ohio Water Development Authority (OWDA). To find out more about the program, please contact OWDA's Loan Officer at 614/466-5822.

To gain information that will help improve the inspection program, a short survey has been developed and is enclosed. Please complete the survey and return it in the self-addressed envelope provided. Your feedback is important.

Please note that ORC Section 1521.062 requires a dam owner to notify the Chief of the Division of Water in writing of a change in ownership of a dam prior to the exchange of the property.

Your cooperation in improving the overall condition of this dam is appreciated. Please contact Peter George at 614/265-6725 if you have any questions.

Sincerely,

Keith R. Banachowski, P.E.
Program Manager
Dam Safety Engineering Program
Division of Water

KRB:pmg

cc/enc: Peter George, P.E., Division of Water

Enclosures

DAM SAFETY INSPECTION REPORT

Roaming Rock Shores Lake Dam
File Number: 1506-001
Class I
Ashtabula County, Morgan Township
Inspection Date: October 15, 2008

In accordance with Ohio Revised Code Section 1521.062, the owners of dams must monitor, maintain, and operate their dams safely. Negligence of owners in fulfilling these responsibilities can lead to the development of extremely hazardous conditions to downstream residents and properties. In the event of a dam failure, owners can be subject to liability claims.

The Chief of the Division of Water has the responsibility to ensure that human life, health, and property are protected from the failure of dams. Conducting periodic safety inspections and working with dam owners to maintain and improve the overall condition of Ohio dams are vital aspects of achieving this purpose.

Representatives of the Chief conducted this inspection to evaluate the condition of the dam and its appurtenances under authority of Ohio Revised Code Section 1521.062. In accordance with Ohio Administrative Code Rule 1501:21-21-03, the owners of dams must implement all remedial measures listed in the enclosed report.

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Section 1

Required Remedial Measures

The requirements listed below are based on observations made during inspection, calculations performed, and requirements of the Ohio Administrative Code (OAC). A checklist noting all observations made during the inspection has been enclosed in Section 3. References to right and left in this report are oriented as if you were standing on the dam crest and looking downstream.

Engineer Repairs and Investigations: The owner must retain the services of a professional engineer to address the following items. Plans, specifications, investigative reports, and other supporting documentation, as necessary, must be submitted to the Division of Water for review and approval prior to construction. The owner must complete this item and implement all engineered plans for improvement within 3 years unless otherwise stated. A record of all repairs should be included in the operation, maintenance, and inspection manual.

1. The principal spillway sidewall drain system must function properly. Investigate the condition of the pipe exiting the sidewalls of the principal spillway system. As necessary, prepare plans and specifications for the repair of the drain system.

Owner Repairs: The owner must address the following items. The owner may hire a contractor or perform the work him or herself. Repair activities should be documented in the operation, maintenance, and inspection manual.

1. Repair the concrete deterioration and reapply joint sealant in the principal spillway outlet chute. Also, clean the gutter drains located behind the spillway sidewalls. See the "Open Channel Spillways (Concrete Chutes and Weirs)", "Problems with Concrete Materials", and "Concrete Repair Techniques" fact sheets and Discussion Item No. 1 included in this section for additional information.

2. Repair the rodent burrows on the upstream slope. See the "Rodent Control" fact sheet included in this section for additional information.

3. Perform routine maintenance and clean the pipe outlets of the auxiliary spillway relief drains which exit into the stilling basin. See the "Seepage Through Earthen Dams" fact sheet included in this section for additional information.

Owner Dam Safety Program: In accordance with Ohio Revised Code (ORC) Section 1521.062, the owner of a dam shall maintain a safe structure and appurtenances through inspection, maintenance, and operation. A dam, like any other part of the infrastructure, will change and deteriorate over time. Appurtenances such as gates and valves must be routinely exercised to ensure their operability. Inspection and monitoring of the dam identifies changing conditions and problems as they develop, and maintenance prevents minor problems from developing into major ones. Dams must have these procedures documented in an operation, maintenance, and inspection manual.

Despite efforts to provide sufficient structural integrity and to perform inspection and maintenance, dams can develop problems that can lead to failure. Early detection and appropriate response are crucial for maintaining the safety of the dam and downstream people and property. The ORC requires the owner to fully and promptly notify the Division of Water of any condition, which threatens the safety of the

structure. A rapidly changing condition may be an indication of a potentially dangerous problem. The Dam Safety Engineering Program can be contacted at 614/265-6731 during business hours or at 614/799-9538 after business hours. Dam owners must have emergency preparedness procedures documented in an emergency action plan.

The owner must address the following items.

1. Monitor the fabriform upstream slope protection for deterioration or undermining yearly. See the "Upstream Slope Protection", fact sheet included in this section for guidance in monitoring the condition of the riprap and for additional information.

2. Monitor the wet area on the downstream toe quarterly for any signs of increased flow, muddy flow, or instability on or adjacent to the embankment. See the "Seepage Through Earthen Dams" fact sheet included in this section for guidance in monitoring the wet area and for additional information.

3. Monitor the condition of the principal spillway and auxiliary spillway outlet areas for further erosion of the bedrock yearly. See the "open Channel Spillways (Concrete Chutes and Weirs)" fact sheet included in this section for guidance in monitoring the spillway system and for additional information.

4. Monitor the leakage from the lake drain system for sudden increases in flow. See the "Lake Drains" fact sheet included in this section for guidance in monitoring the lake drain and for additional information.

Peter George 2/19/09
Peter George, P.E. Date
Project Manager
Dam Safety Engineering Program
Division of Water

Tom Lagucki 2/19/09
Tom Lagucki Date
Construction Specialist
Dam Safety Engineering Program
Division of Water

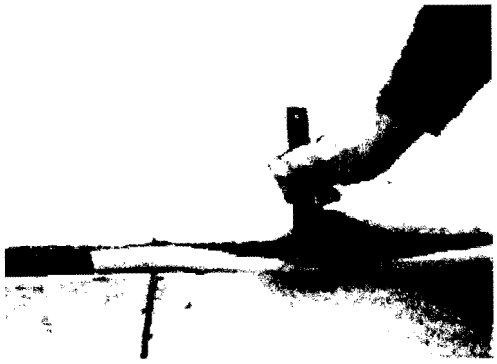
This inspection was performed pursuant to the authority granted to the Chief of the Division of Water in ORC Section 1521.062.

2-24-2009
Keith R. Banachowski, P.E. Date
Program Manager
On behalf of Cathryn N. Loucas, Deputy Director/Acting Chief
Division of Water

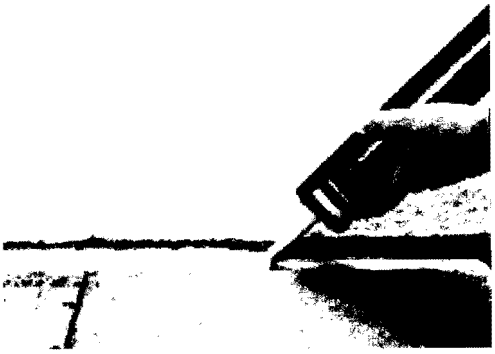
Discussion Items

1. As concrete structures age, the joint material may start to deteriorate. It is important to protect the joints from water and freeze/thaw damage. A small amount of preventive maintenance can extend the life of the concrete structure.

To repair a joint, start by removing all loose joint material and debris in the expansion joint. Clean out the joint with a wet-dry vac or compressed air. Clean the sides of the joint to clean dry concrete – grind if necessary. Do not leave any old joint adhesive, oils, greases, or other material that may prevent the new sealant from adhering. Use a putty knife to pack a strip of foam backer rod into the joint so there is firm support for the new joint sealant. Backer materials must be at a depth no greater than½ the width of the joint. Example, a joint 2 inches wide should have sealant no more than 1 inch in depth. Cover the backer rod and seal the joint with a liberal layer of self-leveling urethane sealant for horizontal joints. For vertical or sloping joints, a non-sagging sealant must be used. Follow manufacturer's directions and wear safety goggles and rubber gloves when applying the sealant.



Use a putty knife to pack a strip of foam backer rod into the joint.



Cover the backer rod and seal the joint with a liberal layer of sealant.

Ohio Department of Natural Resources
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Fact Sheet 99–59

Dam Safety: Open Channel Spillways

(Concrete Chutes and Weirs)

Concrete chutes and weirs are used for principal spillways and emergency spillways. The principal spillway is used to pass normal flows, and the emergency spillway provides additional flow capacity during large flood events. If the principal spillway for a dam is a concrete weir and/or chute, the flow capacity may be large enough that an emergency spillway is not needed. Unlike grass-lined channel spillways that should always be located on natural ground, a concrete weir or chute may be located on the dam, but must be properly designed so that the integrity of the dam is not endangered.

The main components of a concrete chute spillway are the inlet structure, control section, discharge channel, and outlet erosion control structure. The inlet structure conveys water to the control section. The control section is the highest point in the channel and regulates the outflow from the reservoir. It is usually located on or near the crest of the dam. The control section may consist of a concrete weir or may simply be the most elevated slab in the floor of the chute. The discharge channel is located downstream of the control section and conveys flow to the outlet erosion control structure. This structure is designed to dissipate most of the erosive energy of the flow before it enters the downstream channel.

Overall Design and Safety Considerations

Alignment

For good hydraulic performance, abrupt changes should be avoided. This applies to sudden changes in vertical elevation of the chute floor, abrupt widening or narrowing of the chute, and sharp turns in the chute. Anything that will abruptly disrupt or change the direction of the flow in the chute will reduce flow capacity and will place more stress on the concrete. The best performance is obtained when the distribution of flow is even across the channel.

Settlement and Movement

Abnormal settlement, heaving, deflections, and lateral movement of the sidewalls or floor slabs of the spillway can occur. Movements are usually caused by a loss of underlying material, excessive settlement of the fill, or the buildup of water pressure behind or under the structure. Any abnormal settlement, heaving, deflections or lateral movement in the concrete spillway should be immediately investigated by a registered professional engineer knowledgeable about dam safety. As necessary, plans and specifications for repair to the spillway should also be promptly developed and implemented by a registered professional engineer.

The concrete sidewalls and floor of the chute must have enough strength to withstand water loads, soil/fill loads, uplift forces, weathering, and abrasion. The forces of weathering, movement of abrasive materials by water flowing in the spillway, or cavitation may cause surface defects or more serious concrete deterioration. The freeze-thaw cycle is the most damaging weathering force acting on exposed concrete. The concrete's durability and resistance to weathering and deterioration will be determined by the concrete mix, age of the concrete, and proper sealing of the joints. Typical problems with concrete structures include scaling, spalling, honeycombing, bugholes, and popouts. Please refer to the "Problems with Concrete Materials" fact sheet for further explanation of these problems and more details about concrete durability and design. Plans and specifications for repair of structural cracks, or other structural problems, should be developed and implemented by a registered professional engineer so that the integrity of the spillway and/or embankment is not jeopardized.

Undermining

Undermining of the chute may occur at any point along its length. The chute may become undermined at the inlet and/or outlet due to an inadequate cutoff wall or erosion protection. Erosion beneath and alongside the spillway may also be caused by seepage and inadequate drainage. Undermining and erosion will lead to settlement of the undermined portions of the chute. If the concrete spillway is located on the embankment, undermining and collapse of portions of the chute will jeopardize the safety of the dam. If the spillway is located in the abutment, erosion and lowering of the lake level may result. A registered professional engineer should be hired to develop plans and specifications to repair undermining of the chute.

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Dam Safety: Problems with Concrete Materials

Visual inspection of concrete will allow for the detection of distressed or deteriorated areas. Problems with concrete include construction errors, disintegration, scaling, cracking, efflorescence, erosion, spalling, and popouts.

Construction Errors

Errors made during construction such as adding improper amounts of water to the concrete mix, inadequate consolidation, and improper curing can cause distress and deterioration of the concrete. Proper mix design, placement, and curing of the concrete, as well as an experienced contractor are essential to prevent construction errors from occurring. Construction errors can lead to some of the problems discussed later in this fact sheet such as scaling and cracking. Honeycombing and bugholes can be observed after construction.

Honeycombing can be recognized by exposed coarse aggregate on the surface without any mortar covering or surrounding the aggregate particles. The honeycombing may extend deep into the concrete. Honeycombing can be caused by a poorly graded concrete mix, by too large of a coarse aggregate, or by insufficient vibration at the time of placement. Honeycombing will result in further deterioration of the concrete due to freeze-thaw because moisture can easily work its way into the honeycombed areas. Severe honeycombing should be repaired to prevent further deterioration of the concrete surface.

Bugholes is a term used to describe small holes (less than about 0.25 inch in diameter) that are noticeable on the surface of the concrete. Bugholes are generally caused by too much sand in the mix, a mix that is too lean, or excessive amplitude of vibration during placement. Bugholes may cause durability problems with the concrete and should be monitored.

Disintegration and Scaling

Disintegration can be described as the deterioration of the concrete into small fragments and individual aggregates. Scaling is a milder form of disintegration where the surface mortar flakes off. Large areas of crumbling (rotten) concrete, areas of deterioration which are more than about 3 to 4 inches deep (depending on the wall/slab thickness), and exposed rebar indicate serious concrete deterioration. If not repaired, this type of concrete deterioration may lead to structural instability of the concrete structure. A registered professional engineer must prepare plans and specifications for repair of serious concrete deterioration. For additional information, see the "Concrete Repair Techniques" fact sheet.

Disintegration can be a result of many causes such as freezing and thawing, chemical attack, and poor construction practices. All exposed concrete is subject to freeze-thaw, but the concrete's resistance to weathering is determined by the concrete mix and the age of the concrete. Concrete with the proper amounts of air, water, and cement, and a properly sized aggregate, will be much more durable. In addition, proper drainage is essential in preventing freeze-thaw damage. When critically saturated concrete (when 90% of the pore space in the concrete is filled with water) is exposed to freezing temperatures, the water in the pore spaces within the concrete freezes and expands, damaging the concrete. Repeated cycles of freezing and thawing will result in surface scaling and can lead to disintegration of the concrete. Hydraulic structures are especially susceptible to freeze-thaw damage since they are more likely to be critically saturated. Older structures are also more susceptible to freeze-thaw damage since the concrete was not air entrained. In addition, acidic substances in the surrounding soil and water can cause disintegration of the concrete surface due to a reaction between the acid and the hydrated cement.

Cracks

Cracks in the concrete may be structural or surface cracks. Surface cracks are generally less than a few millimeters wide and deep. These are often called hairline cracks and may consist of single, thin cracks, or cracks in a craze/map-like pattern. A small number of surface or shrinkage cracks is common and does not usually cause any problems. Surface cracks can be caused by freezing and thawing, poor construction practices, and alkali-aggregate reactivity. Alkali-aggregate reactivity occurs when the aggregate reacts with the cement causing crazing or map cracks. The placement of new concrete over old may cause surface cracks to develop. This occurs

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Fact Sheet 94–32

Dam Safety: Concrete Repair Techniques

Concrete is an inexpensive, durable, strong and basic building material often used in dams for core walls, spillways, stilling basins, control towers, and slope protection. However, poor workmanship, construction procedures, and construction materials may cause imperfections that later require repair. Any long-term deterioration or damage to concrete structures caused by flowing water, ice, or other natural forces must be corrected. Neglecting to perform periodic maintenance and repairs to concrete structures as they occur could result in failure of the structure from either a structural or hydraulic standpoint. This in turn may threaten the continued safe operation and use of the dam.

Considerations

Floor or wall movement, extensive cracking, improper alignments, settlement, joint displacement, and extensive undermining are signs of major structural problems. In situations where concrete replacement solutions are required to repair deteriorated concrete, it is recommended that a registered professional engineer be retained to perform an inspection to assess the concrete's overall condition, and determine the extent of any structural damage and necessary remedial measures.

Typically, it is found that drainage systems are needed to relieve excessive water pressures under floors and behind walls. In addition, reinforcing steel must also be properly designed to handle tension zones and shear and bending forces in structural concrete produced by any external loading (including the weight of the structure). Therefore, the finished product in any concrete repair procedure should consist of a structure that is durable and able to withstand the effects of service conditions such as weathering, chemical action, and wear. Because of their complex nature, major structural repairs that require professional advice are not addressed here.

Repair Methods

Before any type of concrete repair is attempted, it is essential that all factors governing the deterioration or failure of the concrete structure are identified. This is required so that the appropriate remedial measures can be undertaken in the repair design to help correct the problem and prevent it from occurring in the future. The following techniques require expert and experienced assistance for the best results. The particular method of repair will depend on the size of the job and the type of repair required.

1. The Dry-Pack Method: The dry-pack method can be used on small holes in new concrete which have a depth equal to or greater that the surface diameter. Preparation of a dry-pack mix typically consists of about 1 part portland cement and 2 1/2 parts sand to be mixed with water. You then add enough water to produce a mortar that will stick together. Once the desired consistency is reached, the mortar is ready to be packed into the hole using thin layers.

2. Concrete Replacement: Concrete replacement is required when one-half to one square foot areas or larger extend entirely through the concrete sections or where the depth of damaged concrete exceeds 6 inches. When this occurs, normal concrete placement methods should be used. Repair will be more effective if tied in with existing reinforcing steel (rebar). This type of repair will require the assistance of a professional engineer experienced in concrete construction.

3. Replacement of Unformed Concrete: The replacement of damaged or deteriorated areas in horizontal slabs involves no special procedures other than those used in good construction practices for placement of new slabs. Repair work can be bonded to old concrete by use of a bond coat made of equal amounts of sand and cement. It should have the consistency of whipped cream and should be applied immediately ahead of concrete placement so that it will not set or dry out. Latex emulsions with portland cement and epoxy resins are also used as bonding coats.

4. Preplaced Aggregate Concrete: This special commercial technique has been used for massive repairs, particularly for underwater repairs of piers and abutments. The process consists of the following procedures: 1) Removing the deteriorated concrete, 2) forming the sections to be repaired, 3) prepacking the repair area with coarse aggregate, and 4) pressure grouting the voids between the aggregate particles with a cement or sand-cement mortar.

5. Synthetic Patches: One of the most recent developments in concrete repair has been the use of synthetic materials for bonding and patching. Epoxy-resin compounds are used extensively because of their high bonding properties and great strength. In applying epoxy-resin patching

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Fact Sheet 94–27

Dam Safety: Rodent Control

Rodents such as the groundhog (woodchuck), muskrat, and beaver are attracted to dams and reservoirs, and can be quite dangerous to the structural integrity and proper performance of the embankment and spillway. Groundhog and muskrat burrows weaken the embankment and can serve as pathways for seepage. Beavers may plug the spillway and raise the pool level. Rodent control is essential in preserving a well-maintained dam.

Groundhog

The groundhog is the largest member of the squirrel family. Its coarse fur is a grizzled grayish brown with a reddish cast. Typical foods include grasses, clover, alfalfa, soybeans, peas, lettuce, and apples. Breeding takes place during early spring (beginning at the age of one year) with an average of four or five young per litter, one litter per year. The average life expectancy is two or three years with a maximum of six years.

Occupied groundhog burrows are easily recognized in the spring due to the groundhog's habit of keeping them "cleaned out." Fresh dirt is generally found at the mouth of active burrows. Half-round mounds, paths leading from the den to nearby fields, and clawed or girdled trees and shrubs also help identify inhabited burrows and dens.

When burrowing into an embankment, groundhogs stay above the phreatic surface (upper surface of seepage or saturation) to stay dry. The burrow is rarely a single tunnel. It is usually forked, with more than one entrance and with several side passages or rooms from 1 to 12 feet long.

Groundhog Control

Control methods should be implemented during early spring when active burrows are easy to find, young groundhogs have not scattered, and there is less likelihood of damage to other wildlife. In later summer, fall, and winter, game animals will scurry into groundhog burrows for brief protection and may even take up permanent abode during the period of groundhog hibernation.

Groundhogs can be controlled by trapping or shooting. Groundhogs will be discouraged from inhabiting the embankment if the vegetal cover is kept mowed.

Muskrat

The muskrat is a stocky rodent with a broad head, short legs, small eyes, and rich dark brown fur. Muskrats are chiefly nocturnal. Their principal food includes stems, roots, bulbs, and foliage of aquatic plants. They also feed on snails, mussels, crustaceans, insects, and fish. Usually three to five litters, averaging six to eight young per litter, are produced each year. Adult muskrats average one foot in length and three pounds in weight. The life expectancy is less than two years, with a maximum of four years. Muskrats can be found wherever there are marshes, swamps, ponds, lakes and streams having calm or very slowly moving water with vegetation in the water and along the banks.

Muskrats make their homes by burrowing into the banks of lakes and streams or by building "houses" of bushes and other plants. Their burrows begin from 6 to 18 inches below the water surface and penetrate the embankment on an upward slant. At distances up to 15 feet from the entrance, a dry chamber is hollowed out above the water level. Once a muskrat den is occupied, a rise in the water level will cause the muskrat to dig farther and higher to excavate a new dry chamber. Damage (and the potential for problems) is compounded where groundhogs or other burrowing animals construct their dens in the embankment opposite muskrat dens.

Muskrat Control

Barriers to prevent burrowing offer the most practical protection to earthen structures. A properly constructed riprap and filter layer will discourage burrowing. The filter and riprap should extend at least 3 feet below the water line. As the muskrat attempts to construct a burrow, the sand and gravel of the filter layer caves in and thus discourages den building. Heavy wire fencing laid flat against the slope and extending above and below the water line can also be effective. Eliminating or reducing aquatic vegetation along the shoreline will discourage muskrat habitation. Where muskrats have inhabited the area, trapping is usually the most practical method of removing them from a pond.

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Dam Safety: Seepage Through Earthen Dams

Contrary to popular opinion, wet areas down stream from dams are not usually natural springs, but seepage areas. Even if natural springs exist, they should be treated with suspicion and carefully observed. Flows from ground-water springs in existence prior to the reservoir would probably increase due to the pressure caused by the pool of water behind the dam.

All dams have some seepage as the impounded water seeks paths of least resistance through the dam and its foundation. Seepage must, however, be controlled to prevent erosion of the embankment or foundation or damage to concrete structures.

Detection

Seepage can emerge anywhere on the downstream face, beyond the toe, or on the downstream abutments at elevations below normal pool. Seepage may vary in appearance from a "soft," wet area to a flowing "spring." It may show up first as an area where the vegetation is lush and darker green. Cattails, reeds, mosses, and other marsh vegetation often become established in a seepage area. Another indication of seepage is the presence of rust-colored iron bacteria. Due to their nature, the bacteria are found more often where water is discharging from the ground than in surface water. Seepage can make inspection and maintenance difficult. It can also saturate and weaken portions of the embankment and foundation, making the embankment susceptible to earth slides.

If the seepage forces are large enough, soil will be eroded from the foundation and be deposited in the shape of a cone around the outlet. If these "boils" appear, professional advice should be sought immediately. Seepage flow which is muddy and carrying sediment (soil particles) is evidence of "piping," and will cause failure of the dam. Piping can occur along a spillway and other conduits through the embankment, and these areas should be closely inspected. Sinkholes may develop on the surface of the embankment as internal erosion takes place. A whirlpool in the lake surface may follow and then likely a rapid and complete failure of the dam. Emergency procedures, including downstream evacuation, should be implemented if this condition is noted.

Seepage can also develop behind or beneath concrete structures such as chute spillways or headwalls. If the concrete structure does not have a means such as weep holes or relief drains to relieve the water pressure, the concrete structure may heave, rotate, or crack. The effects of the freezing and thawing can amplify these problems. It should be noted that the water pressure behind or beneath structures may also be due to infiltration of surface water or spillway discharge.

A continuous or sudden drop in the normal lake level is another indication that seepage is occurring. In this case, one or more locations of flowing water are usually noted downstream from the dam. This condition, in itself, may not be a serious problem, but will require frequent and close monitoring and professional assistance.

Control

The need for seepage control will depend on the quantity, content, and location of the seepage. Reducing the quantity of seepage that occurs after construction is difficult and expensive. It is not usually attempted unless the seepage has lowered the pool level or is endangering the embankment or appurtenant structures. Typical methods used to control the quantity of seepage are grouting or installation of an upstream blanket. Of these methods, grouting is probably the least effective and is most applicable to leakage zones in bedrock, abutments, and foundations. These methods must be designed and constructed under the supervision of a professional engineer experienced with dams.

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Dam Safety: Upstream Slope Protection

Slope protection is usually needed to protect the upstream slope against erosion due to wave action. Without proper slope protection, a serious erosion problem known as "beaching" can develop on the upstream slope.

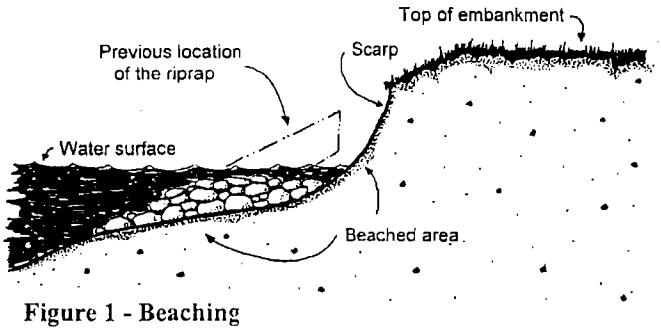

Figure 1 - Beaching

The repeated action of waves striking the embankment surface erodes fill material and displaces it farther down the slope, creating a "beach." The amount of erosion depends on the predominant wind direction, the orientation of the dam, the steepness of the slope, water level fluctuations, boating activities, and other factors. Further erosion can lead to cracking and sloughing of the slope which can extend into the crest, reducing its width. When erosion occurs and beaching develops on the upstream slope of a dam, repairs should be made as soon as possible. However, an erosion scarp less than 1 foot high may be stable and not require repair.

The upstream face of a dam is commonly protected against wave erosion by placement of a layer of rock riprap over a layer of bedding and a filter material. Other material such as concrete facing, soil-cement, fabri-form bags, slush grouted rocks, steel sheet piling, and articulated concrete blocks can also be used. Vegetative protection combined with a berm on the upstream slope can also be effective.

Rock Riprap

Rock riprap consists of a heterogeneous mixture of irregular shaped rocks placed over gravel bedding and a sand filter or geotextile fabric. The smaller rocks help to fill the spaces between the larger pieces forming an interlocking mass. The filter prevents soil particles on the embankment surface from being washed out through the spaces (or voids) between the rocks. The maximum rock size and weight must be large enough to break up the energy of the maximum anticipated wave action and hold the smaller stones in place. If the rock size is too small, it will eventually be displaced and washed away by wave action. If the riprap is sparse or if the filter or bedding material is too small, the filter material will wash out easily, allowing the embankment material to erode. Once the erosion has started, beaching will develop if remedial measures are not taken. Technical Release No. 69 developed by the USDA, Natural Resources Conservation Service can be used to help design engineers develop a preliminary or detailed design for riprap slope protection.

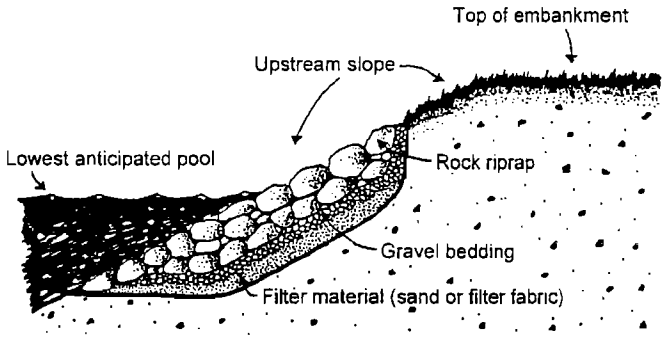

Figure 2 - Rock Riprap

The dam owner should expect some deterioration (weathering) of riprap. Freezing and thawing, wetting and drying, abrasive wave action, and other natural processes will eventually break down the riprap. Its useful life varies with the characteristics of the stone used. Stone for riprap should be rock that is dense and well cemented. In Ohio, glacial cobbles or boulders, most limestone, and a few types of sandstone are acceptable for riprap. Most sandstones and shales found in Ohio do not provide long-term protection. Due to the high initial cost of rock riprap, its durability should be determined by appropriate testing procedures prior to installation. Vegetative growth within the slope protection is undesirable because it can displace stone and disturb the filter material. Heavy undergrowth prevents an adequate inspection of the upstream slope and may hide potential problems. For additional information, see the "Trees and Brush" fact sheet.

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Fact Sheet 93-26

Dam Safety: Lake Drains

A lake drain is a device to permit draining a reservoir, lake or pond. Division of Water Administrative Rule 1501:21-13-06 requires that all Class I, Class II and Class III dams include a lake drain.

Types of Drains

Common types of drains include the following:

- A valve located in the spillway riser.
- A conduit through the dam with a valve at either the upstream or downstream end of the conduit.
- A siphon system (Often used to retrofit existing dams).
- A gate, valve or stoplogs located in a drain control tower.

Uses of Drains

The following situations make up the primary uses of lake drains:

Emergencies: Should serious problems ever occur to threaten the immediate safety of the dam, drains may be used to lower the lake level to reduce the likelihood of dam failure. Examples of such emergencies are as follows: clogging of the spillway pipe which may lead to high lake levels and eventually dam overtopping, development of slides or cracks in the dam, severe seepage through the dam which may lead to a piping failure of the dam, and partial or total collapse of the spillway system.

Maintenance: Some repair items around the lake and dam can only be completed or are much easier to perform with a lower than normal lake level. Some examples are: slope protection repair, spillway repairs, repair and/or installation of docks and other structures along the shoreline, and dredging the lake.

Winter Drawdown: Some dam owners prefer to lower the lake level during the winter months to reduce ice damage to structures along the shoreline and to provide additional flood storage for upcoming spring rains. Several repair items are often performed during this winter drawdown period. Periodic fluctuations in the lake level also discourage muskrat and beaver habitation along the shoreline. Muskrat burrows in earthen dams can lead to costly repairs.

Common Maintenance Problems

Common problems often associated with the maintenance and operation of lake drains include the following:

- Deteriorated and bent control stems and stem guides.
- Deteriorated and separated conduit joints.
- Leaky and rusted control valves and sluice gates.
- Deteriorated ladders in control towers.
- Deteriorated control towers.
- Clogging of the drain conduit inlet with sediment and debris.
- Inaccessibility of the control mechanism to operate the drain.
- Seepage along the drain conduit.
- Erosion and undermining of the conduit discharge area because the conduit outlets significantly above the elevation of the streambed.
- Vandalism.
- Development of slides along the upstream slope of the dam and the shoreline caused by lowering the lake level too quickly.

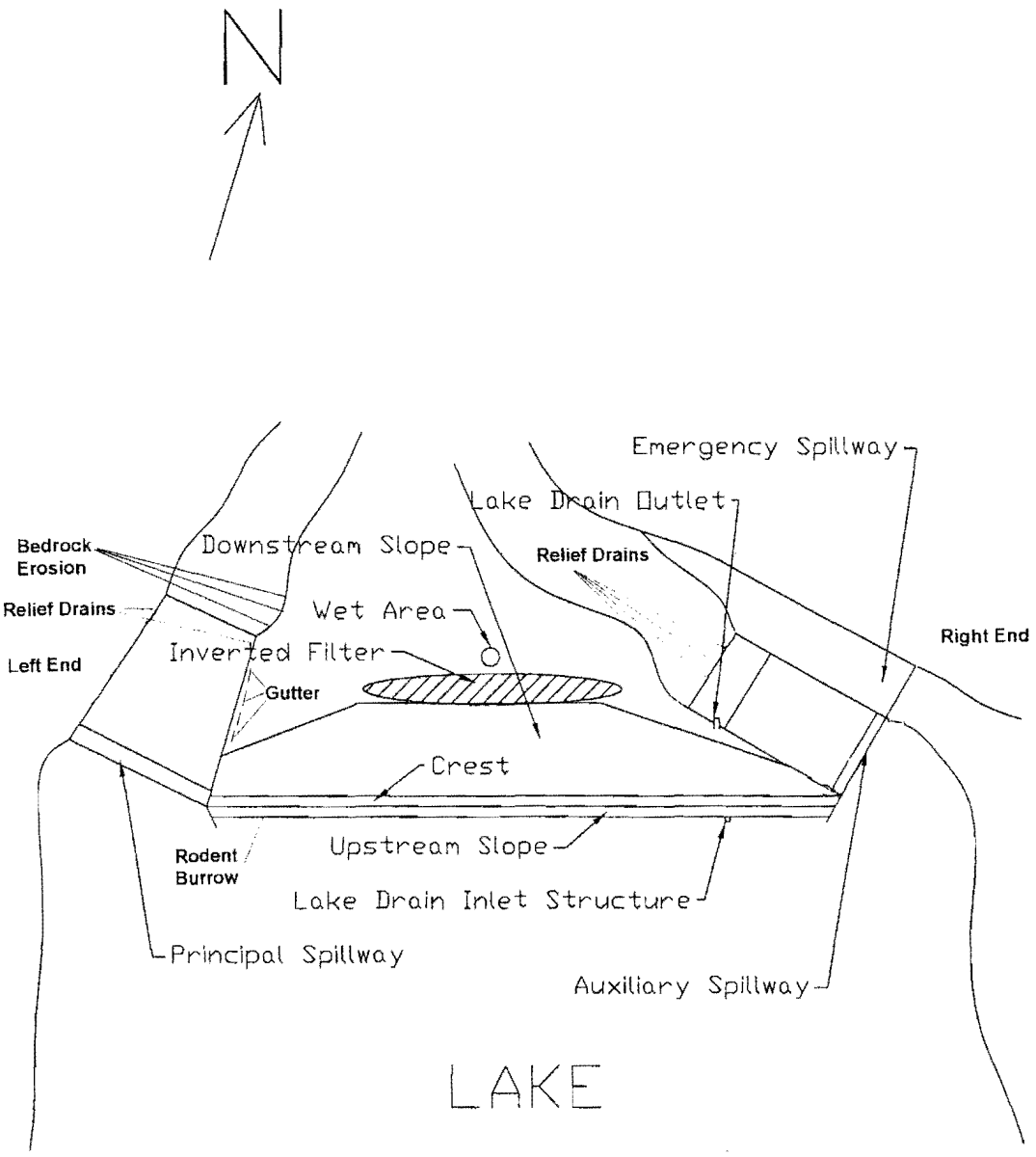
Operation and Maintenance Tips

A. All gates, valves, stems and other mechanisms should be lubricated according to the manufacturer's specifications. If you do not have a copy of the specifications and the manufacturing company can not be determined, then a local valve distributor may be able to provide assistance.

B. The lake drain should be operated at least twice a year to prevent the inlet from clogging with sediment and debris, and to keep all movable parts working easily. Most manufacturers recommend that gates and valves be operated at least four times per year. Frequent operation will help to ensure that the drain will be operable when it is needed. All valves and gates should be fully opened and closed at least twice to help flush out debris and to obtain a proper seal. If the gate gets stuck in a partially opened position, gradually work the

Continued on back!

Section 2

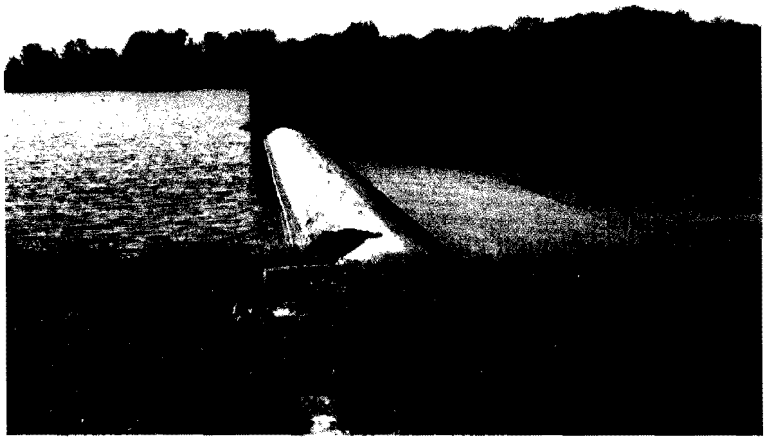


1 1

Roaming Rock Shores Lake Dam
Ashtabula County

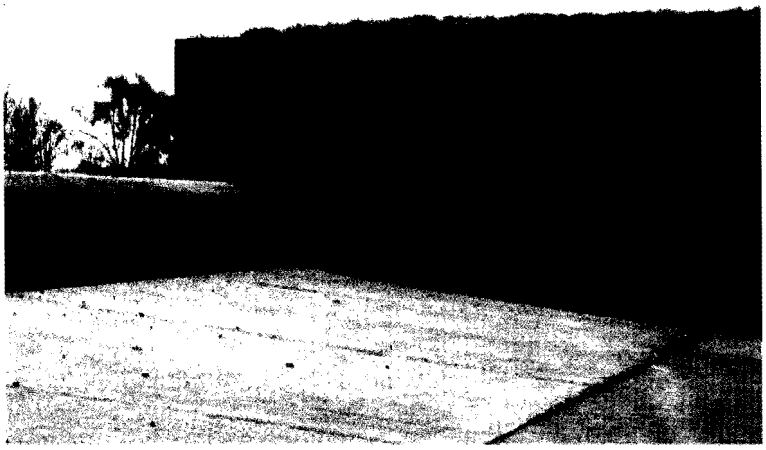
OHIO DEPARTMENT OF NATURAL RESOURCES
Division of Water
Dam Safety Engineering Program

Designed by:	N/A	File No.	1506-001
Drawn by:	MEM	Scale	NTS
Checked by:	RJT	Date	August 27, 2003
Revised by:	PMG	Revised	October 15, 2008



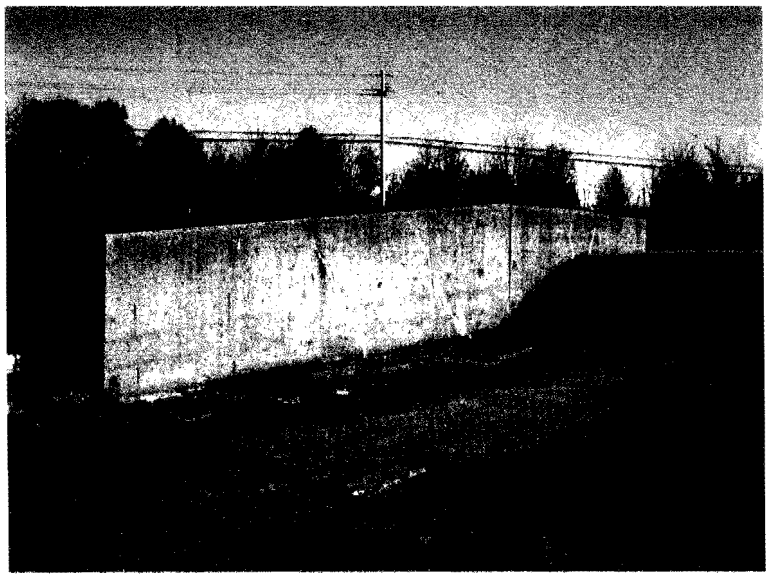
Photograph No. 1:

Upstream view of auxiliary spillway inlet from emergency spillway.



Photograph No. 2:

View of left sidewall of auxiliary spillway.

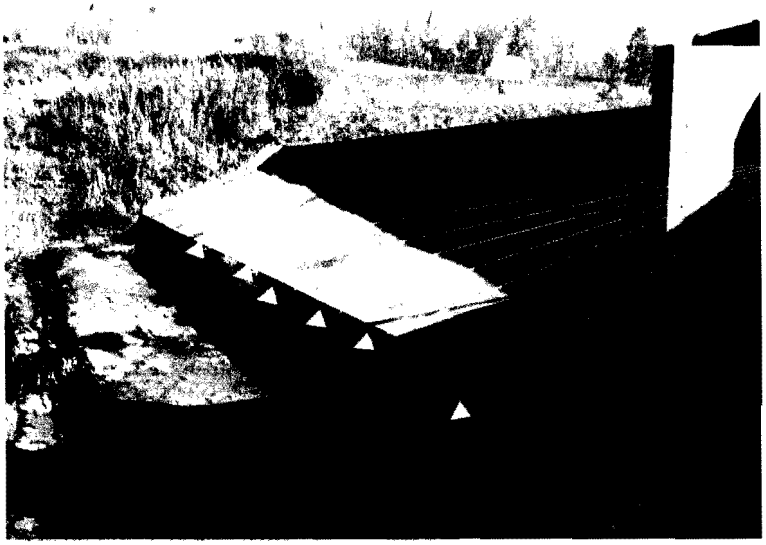


Photograph No. 3:

View of right sidewall of auxiliary spillway.

Photograph No. 4:

Facing upstream in the auxiliary spillway channel.



Photograph No. 5:

View of the auxiliary spillway chute outlet. Spillway under drainage weep holes are covered and plugged with vegetation.

Photograph No. 6:

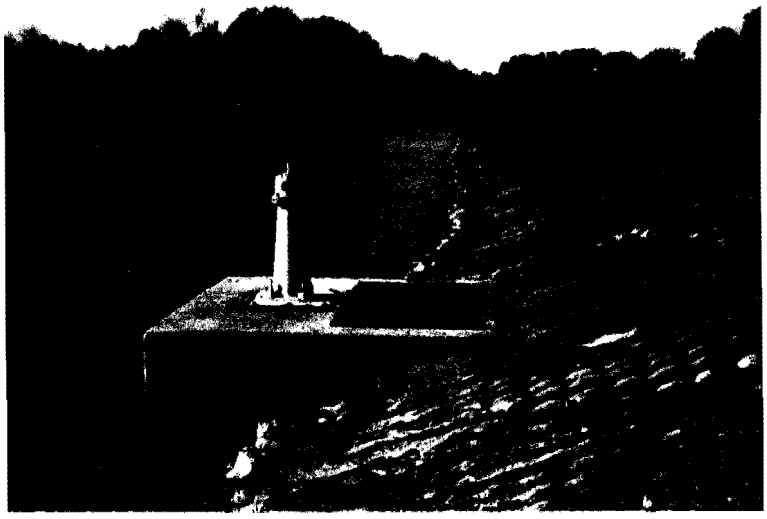
Close-up view of one of the plugged weep holes at the end of the auxiliary spillway outlet.

Photograph No. 7:

Close-up view of another of the plugged weep holes at the end of the auxiliary spillway outlet.

Photograph No. 8:

View of the upstream slope facing the emergency and auxiliary spillways.



Photograph No. 9:

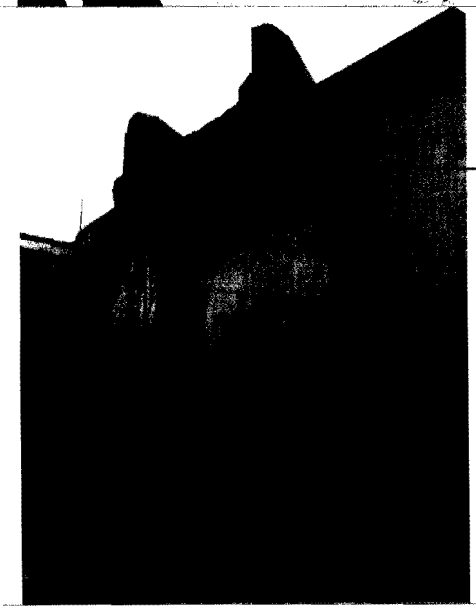
View of the upstream slope and lake drain inlet structure facing the principal spillway.

Photograph No. 10:

Close-up view of a portion of the upstream slope. Note the deterioration occurring of the fabric-form concrete slope protection.

Photograph No. 11:

Overhead view of the lake drain outlet structure at the left end of the auxiliary spillway.



Photograph No. 12:

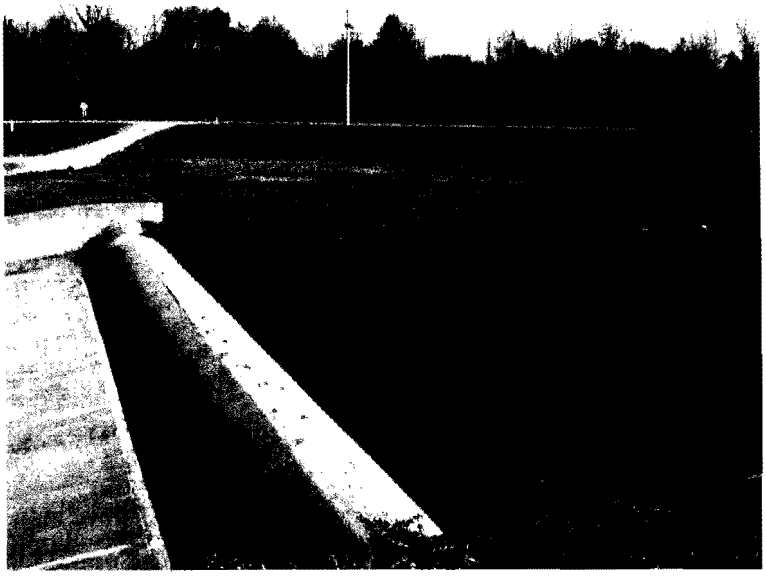
View of the lake drain outlet structure at the left end of the auxiliary spillway. Note the flow leaking from the structure.

Photograph No. 13:

View of the upstream slope, crest and principal spillway in the background.

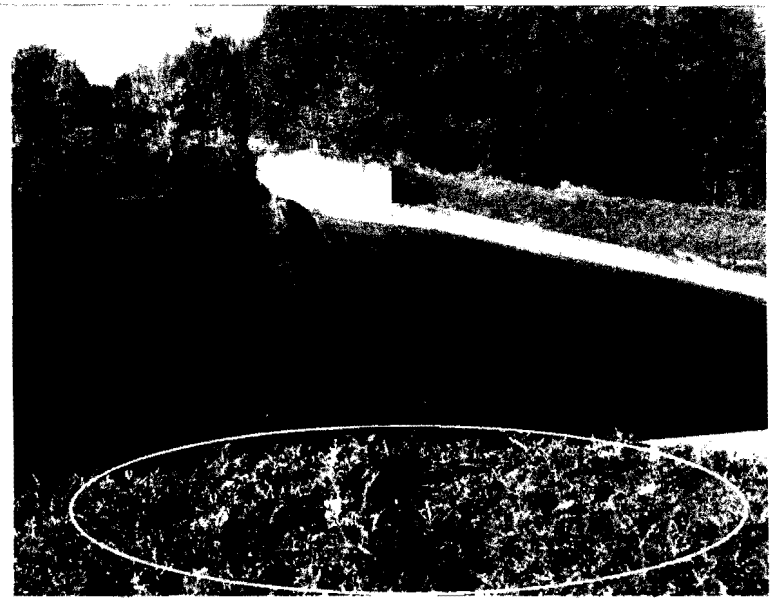
Photograph No. 14:

View of the right abutment and emergency spillway inlet.



Photograph No. 15:

View of the auxiliary spillway inlet and emergency spillway channel in the background.



Photograph No. 16:

View of the principal spillway inlet, spillway channel and left sidewall. Note the thick crown vetch growing at the crest in the foreground.

Photograph No. 17:

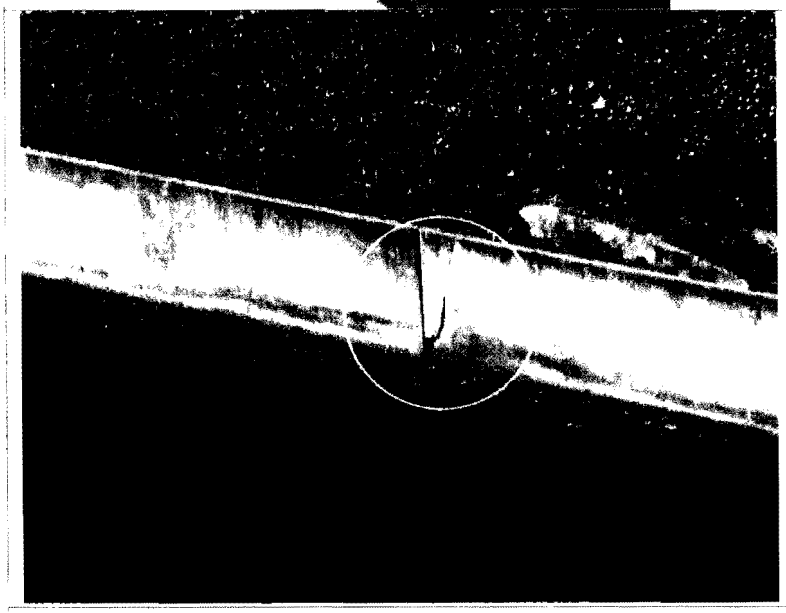
View of the right side wall of the principal spillway.

Photograph No. 18:

Note the plugged gutter drain with vegetation along much of the sidewall.

Photograph No. 19:

Note the gap (approx. 1") that exists in a section of vertical concrete in a portion of the right principal spillway sidewall.



Photograph No. 20:

View of concrete deterioration and separation in a portion of the left sidewall of the principal spillway outlet.

Photograph No. 21:

View of the corrugated outlet pipe to drain the collection of water behind the sidewall. The bottom of this pipe is rusted out. Investigate the integrity of the pipe.

Dam Classification Checklist

Name of Dam:	Roaming Rock Shores Lake Dam			File Number:	1506-001
County:	Ashtabula	Date:	October 15, 2008	Engineer:	PMG

The classification of a dam is based on three factors: the dam's height, storage capacity, and potential downstream hazard. The height of the dam is the vertical distance from the crest to the downstream toe. The storage capacity is the volume of water that the dam can impound at the top of dam (crest) elevation. The downstream hazard consists of roads, buildings, homes, and other structures that would be damaged in the event of a dam failure. Potential for loss of life is also evaluated. Various dam failure scenarios must be considered, and they include failures when the dam is at normal pool level and failures during significant flood events. Each of the three factors is evaluated, and the final classification of the dam is based on the highest individual factor. Class I is the highest and Class IV is the lowest. The classification of a dam can change based on future development along the downstream channel.

This checklist is intended to establish or verify the appropriate classification in accordance with the Ohio Administrative Code – it does not necessarily show all potential hazards or the full extent of inundation. In addition, elevations are estimated.

HEIGHT CLASSIFICATION	***STORAGE CLASSIFICATION***	***EXEMPT~NON-REGULATED***
Dam Height = 45.3 feet	Stor. Capacity (top of dam)= 12000 acre-feet	
_____ > 60' - Class I	X > 5000 acre-feet - Class I	_____ Height ≤ 6 feet
X > 40' - Class II	_____ > 500 acre-feet - Class II	_____ Storage ≤ 15 acre-feet
_____ > 25' - Class III	_____ > 50 acre-feet - Class III	_____ 6 ft. < Height < 10 ft. &
_____ ≤ 25' - Class IV	_____ ≤ 50 acre-feet - Class IV	Stor. ≤ 50 ac-ft

Height Class: II

Storage Class: I

Hazard Class (see next page): I **Estimated Population at Risk:** (none 1-5 6-15 16+)

Final Class: I

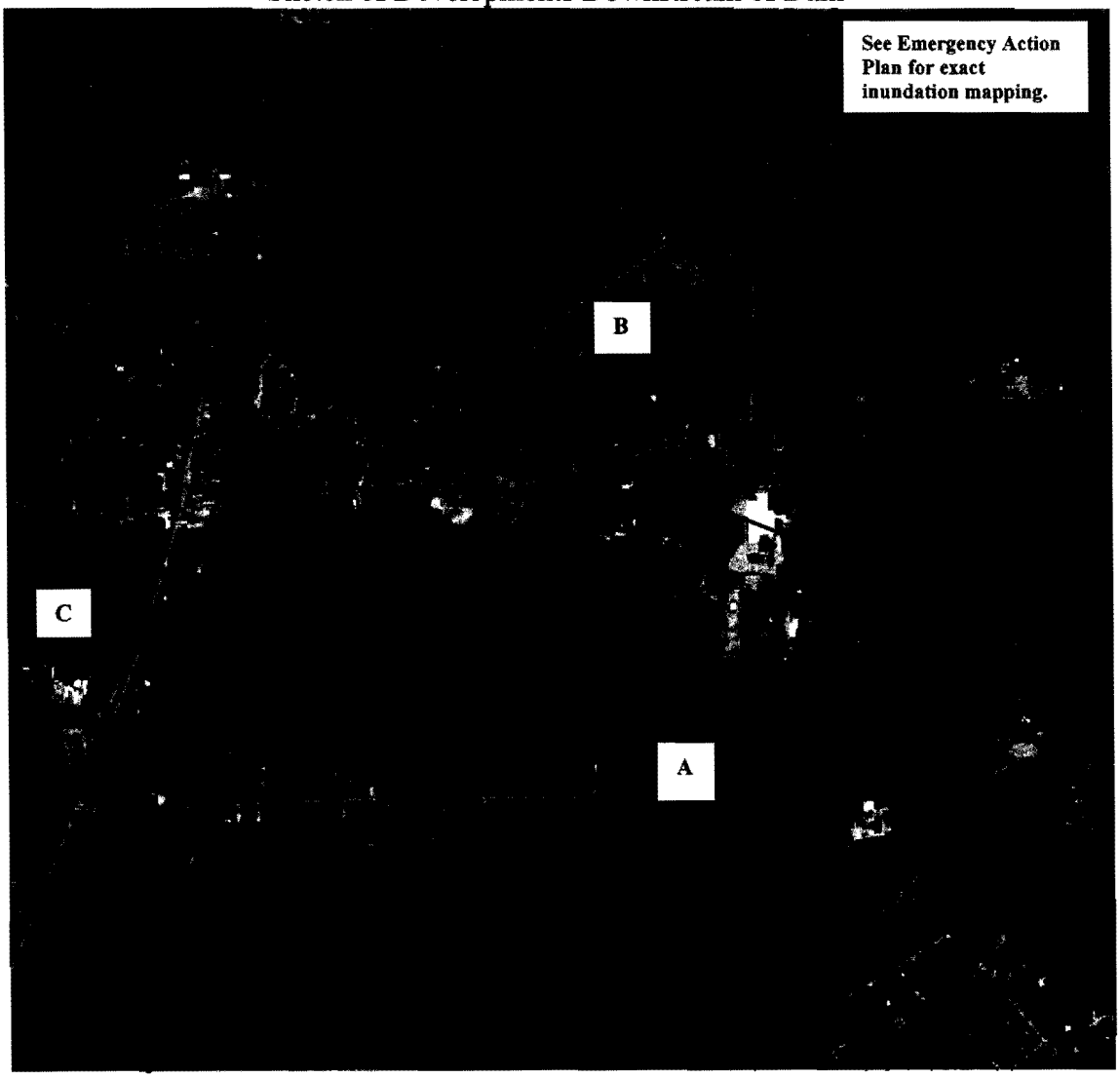
Class Changed (Yes, No)

POTENTIAL DOWNSTREAM HAZARD

I	II					III		IV	-	-				
Probable loss of human life	Loss of public water supply or wastewater treatment facility, release of health hazardous waste	Flooding of structure or high-value property	Damage to high-value or Class I, II, III dam or levee	Damage to major road (US or state route), disruption of only access to residential or critical facility area	Damage to railroad or public utility	Damage to rural building, not otherwise high-valued property, or Class IV dam or levee	Damage to local road (county and township)	Loss restricted mainly to the dam or agricultural /rural land	No hazard to structure noted	*No hazard assessment; further investigation needed*	Distance downstream of dam to affected structure (feet)	Vertical distance from streambed to base of affected structure (feet)	Horizontal distance from stream to affected structure (feet)	
							A				2700	30	0	Local Road
B											1000-7000	10 -20	100-500	Town (Rock Creek)
				C							6000	10	0	S.R 45

This checklist is intended to establish or verify the appropriate classification in accordance with the OAC – it does not necessarily show all potential hazards or the full extent of inundation.

Sketch of Developments Downstream of Dam



Flood Routing Summary

A dam must be able to safely pass severe flood events. A dam uses a combination of reservoir storage capacity and spillway discharge to prevent floodwater from overtopping the embankment crest. As part of this inspection, the Division of Water did not investigate the ability of this dam to safely pass the required design flood. In 2007, the Division of Water performed hydrologic and hydraulic calculations to estimate the size of the design flood and the total spillway discharge capacity of the dam. These calculations combined with the reservoir storage capacity were used in the flood routings to determine the maximum water surface elevation in the reservoir for various flood events (see Table I).

Roaming Rock Shores Lake Dam is a Class I dam; therefore, in accordance with OAC Rule 1501:21-13-02, the required design flood is 100% of the Probable Maximum Flood (PMF) or the critical flood. This dam and its spillway system must safely pass the design flood without overtopping the embankment crest. Flood routing calculations indicate that the dam can pass 100% of the PMF; Roaming Rock Shores Lake Dam appears to be able to safely pass the design flood.

Table I - Flood Routing Summary

Flood Event	Maximum Inflow (cubic feet per second)	Maximum WSEL[1] (feet)	Overtopping Depth[2] (feet)	Overtopping Duration (hours)
PMF	44379	861.0	0.0	0
75% PMF	33284	859.3	-1.7	0
50% PMF	22189	857.4	-3.6	0
25% PMF	11094	855	-6	0
12% PMF[3]	5325	853.2	-7.8	0

1. WSEL – water surface elevation, in feet above the mean sea level
2. A negative number indicates that the dam does not overtop and represents the elevation difference between the Maximum WSEL and the Top of Dam Elevation (freeboard)
3. 12% PMF is similar to the 100-year flood. The 100-year flood event has a 1% chance of occurring in any given year. This is only an approximation.

Top of Dam Elevation: 861.0 feet above msl
Emergency Spillway Elevation: 854.0 feet above msl
Normal Pool Elevation: 850.0 feet above msl

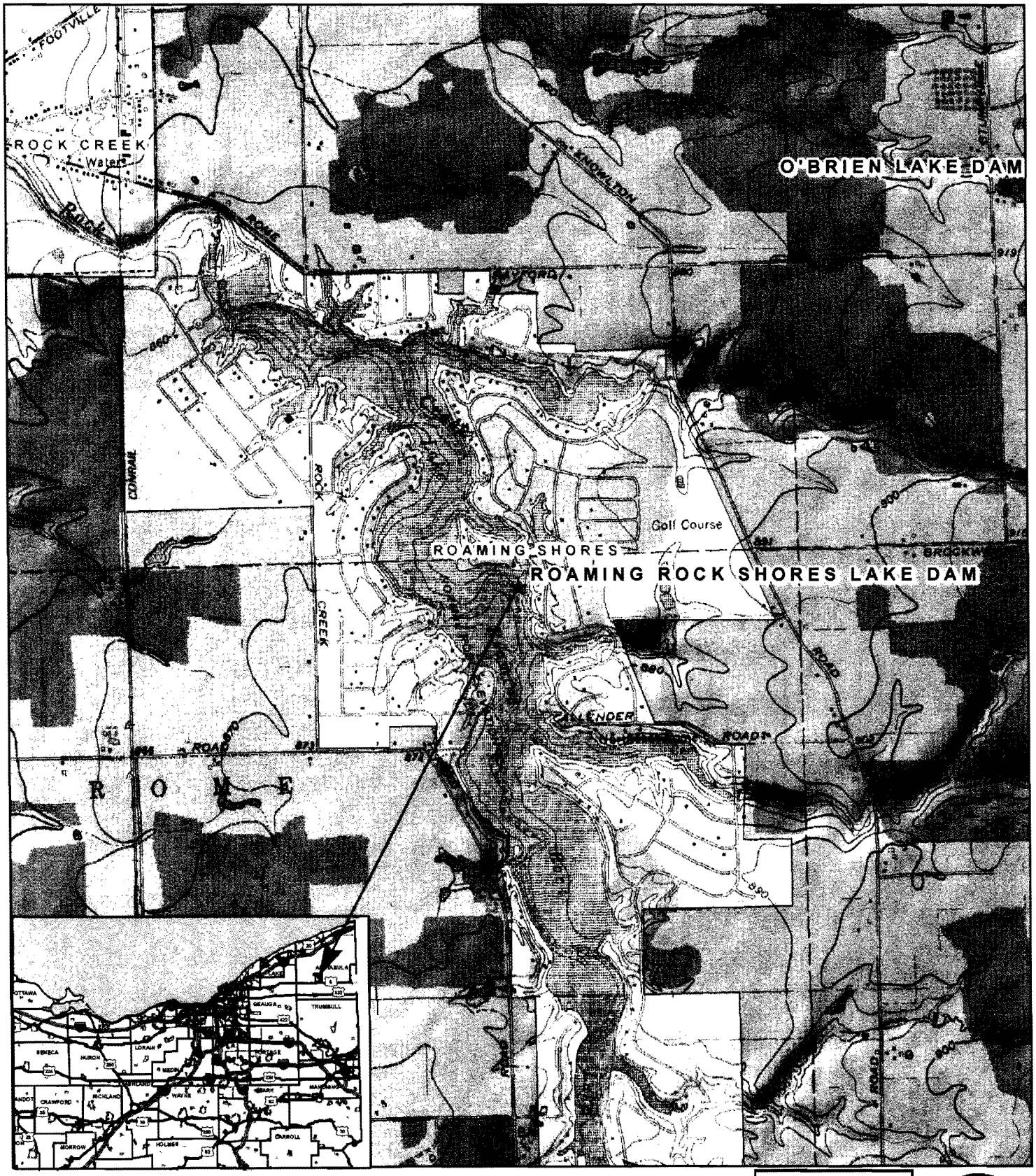
History of Roaming Rock Shores Lake Dam

Date	Event
1967	Dam constructed.
June 25, 1973	First ODNR, DOW dam safety inspection.
December 11, 1985	Second ODNR, DOW dam safety inspection.
1991	Crest leveled and emergency spillway widened
1993	Earth fill cap added under auxiliary spillway concrete
1996	Lake drain pipe sliplined
July 9, 1998	Third ODNR, DOW dam safety inspection
August 27, 2003	Fourth ODNR, DOW dam safety inspection
October 15, 2008	Fifth ODNR, DOW dam safety inspection
February 6, 2009	Approved the Emergency Action Plan and Operation, Maintenance, and Inspection Manual.

Section 3

LOCATION MAP

ROAMING ROCK SHORES LAKE DAM - 1506-001



Feb 28, 2007

Dam Inventory Sheet

Name: ROAMING ROCK SHORES LAKE DAM
Reservoir:
File No: 1506-001
National #: OH00397
Permit No.: 67-021
Class (Ht-Vol): I (II - I)

Owner Information

Owner: Village of Roaming Shores
Address: PO Box 237
City: Roaming Shores **State:** OH **Zip:** 44084
Contact: Mayor, Carl Biats, Jr. **Phone No.:** 440/563-5083
Owner Type: Public, Local
Multi-Dams: -
Parcel No.:

Location Information

County: Ashtabula
Township: Morgan
Stream Rock Creek
Latitude Deg.: 41 **Min.:** 39 **Sec.:** 16
Longitude Deg.: 80 **Min.:** 50 **Sec.:** 22
Nearest Affected Community: Rock Creek
Community's Distance from Dam (miles): 0.4
USGS Quad.: Jefferson
USGS Basin No.: 04110004

Design/Construction Information

Designed By: Research, Planning & Design Associates, St. Louis, Mo.
Constructed By: Koski Construction Company, Ashtabula, Ohio
Completed: 1967 **Plan Available:** YES **At:** ODNR, DIVISION OF WATER
Failure/Incident/Breach:

Structure Information

Purpose: Recreation, Private
Type of Impound.: Dam And Spillway
Type of Structure: Earthfill
Drainage Area (sq. miles): 73.5 **or (acres):** 47040

Embankment Data

Length (ft): 730
Height (ft): 45.3
Top Width (ft): 20
Upstream Slope: 3H:1V
Downstream Slope: 2.5H:1V
Volume of Fill (cub. yds.): 159300

Spillway Outlet Works Data

Lake Drain: 36-IN CMP & SLUICE GATE W/INVERT @ ELEV. 840
Principal: 180-FT-WIDE OGEE-SHAPED WEIR DISCHARGING INTO 250-FT LONG CONCRETE CH
Emergency: 80-FT WIDE OPEN CHANNEL @ ELEV. 854.0
Maximum Spillway Discharge (cfs) 55678 **Design Flood:** 1.0 **Flood Capacity** 1.0

Dam Reservoir Data	Elevation (ft-MSL)*	Area (acres)	Storage (acre-feet)
Top of Dam:	861	800	12000
Emergency Spillway:	854	595	8300
Principal Spillway:	850	460	6091
Streambed:	813		
Foundation:			

*Elevations are not necessarily related to a USGS benchmark

Inspection Information

Inspection History:
10/15/2008 PMG
8/27/2003 MEM
7/9/1998 EMK
12/11/1985
6/25/1973

Phase I:
Other Visits: 4/15/96
Next Planned Inspection: 2008-2009 B - Special Trip

Operation Information/Remarks

3 spillways - Data on P/S & E/S noted above; Aux spillway 110-ft-wide ogee-shaped weir discharging into asphalt & concrete chute w/elev 852.0, area 530-ac, capacity 7200-af

Emergency Action Plan: Yes **Format:** ICODS **OMI:** Yes-on file
Annual Fee: $483.00 **Last Entry:** 2/10/2009

Dam Safety Inspection Checklist

Complete All Portions of This Section (Pre-inspection)

Name of Dam: Roaming Rock Shores Lake Dam — Ashtabula County

Date of Inspection: October 15, 2008 — Required Action: None Mon. Maint. Eng.

File Number: 1506-001

Class: I — Design Flood: 1.0 — Flood Capacity: 1.0 — X

Interview with Owner (at the site):

Owner/Representative present: (Yes, No) Name(s): Bob Gregory, Jim Bentley, Bob Cook, John Bell

Owner's Name(s): Village of Roaming Shores Rock Pinkert, Joe Palumby

Address: PO Box 237, ,

City: Roaming Shores State: OH Zip (+4): 44084

Contact Person: Mayor, Carl Biats, Jr. Telephone: 440/563-5083

Email Address: Rocky Pinkert - rocky@roamingshores.org

Purpose of dam: Recreation, Private

Owner Dam Safety Program

Emergency Action Plan

EAP (document): Yes ~~OLD~~ ICODS Up-to-date? (yes, no) X

Exercised: Not exercised

Downstream development: No changes

Security: No changes

Operation, Maintenance, and Inspection

OMI (document): Yes-on fil Needs revision Up-to-date? (yes, no) X

Operation of drains/gates

All operable? (yes, no) Opened gate early in 2008

Normal rate of drawdown: 1 ft. per week (4 ft.) Emerg. rate of drawdown: NA

Accessibility for operation: No problem

Maintenance

Frequency of mowing: 2 x per week during growing season

Other maintenance: Tree + brush removal from principal spillway sidewalls

Inspection

Frequency and thoroughness of day-to-day & routine inspections: No day to day. Routine inspections by Mr. Pinkert.

Frequency and thoroughness of event-driven inspections: No problems

Problems found during inspections: Rodent burrows

Field Information

Pool Elevation (during inspection): 8 inches below Normal Pool Time: 2 30 (a.m.) p.m.)

Site Conditions(temp., weather, ground moisture): 65°, sunny, dry

Inspection Party: P. George + T. Lagucki

Maximum Height: 45.3 Feet (measured or inventory appears correct)

Normal Pool Surface Area: 460 Acres (measured or inventory appears correct)

Blanket drain (silty sand and trace gravel) into rock riprap toe with no pipe outlet; Three piezometers (crest and toe o.k., mid-slope is silted)	3 Spillways - Data On P/s & E/s Noted Above; Aux Spillway 110-ft-wide Ogee-shaped Weir Discharging Into Asphalt & Concrete Chute W/elev 852.0, Area 530-ac, Capacity 7200-af

UPSTREAM SLOPE

Gradient: Horizontal: 3 Vertical: 1 (est.) meas.)

Action: None | Monitor | Maintenance | Engineer

☒ ***VEGETATION*** [no problem]

☐ Trees: Quantity: (<5, sparse, dense) ☐ ☐ ☐ ☐
Diameter: (<6", 6-12", >12")
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes:

☐ Brush: Quantity: (sparse, dense) ☐ ☐ ☐ ☐
Location:(adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes:

☒ Ground Cover: Type: (grass) crown vetch Other: ☒ ☐ ☐ ☐
Quantity: (bare, sparse, (adequate), dense)
Appearance: (too tall, too short, (good))
Notes: Crown vetch was noted along slope

☒ ***SLOPE PROTECTION*** [no problem, could not inspect thoroughly]

☐ None ☐ ☐ ☐ ☐
☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐
(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)
Notes:

☐ Wave Berm: ☐ ☐ ☐ ☐
Vegetation: (adequate, bare, sparse, improper vegetation)
Notes:

☐ Concrete Slabs: (cracked, settlement, undermined, voids, deteriorated, vegetation) ☐ ☐ ☐ ☐
Notes:

☒ Other: FABRIFORM (GROUT BAGS) WERE IN ADEQUATE CONDITION. SOME ☐ ☒ ☐ ☐
Notes: DETERIORATION WAS NOTED AT THE NORMAL POOL WATER LINE. APPEARS UNCHANGED FROM 2005 INSPECTION REPORT

☒ ***EROSION*** [(no problem), could not inspect thoroughly]

☐ Wave Erosion (Beaching): Scarp: Length: Height: ☐ ☐ ☐ ☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes:

☐ Runoff Erosion (Gullies): Quantity: ☐ ☐ ☐ ☐
Depth: Width: Length:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

☒ ***INSTABILITIES*** [(no problem), could not inspect thoroughly]

☐ Slides: Transverse Length: Longitudinal Length: ☐ ☐ ☐ ☐
Scarp: Width: Length:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Crack: Width: Depth:
Notes/Causes

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other ☐ ☐ ☐ ☐
Quantity: Length: Width: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

Action: None | Monitor | Maintenance | Engineer

Required Action

Required Action

None | Monitor | Maintenance | Engineer

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other ☐ ☐ ☐ ☐
Quantity: Length: Width: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

☐ Bulges ☒ Depressions ☐ Hummocky ☒ ☐ ☐ ☐
Size: Height: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) NEXT TO PRINCIPAL SPILLWAY
Notes/Causes: THIS AREA HAS BEEN NOTED DURING THE DIVISION OF WATER 1998 & 2003 DAM SAFETY INSPECTION. AREA APPEARS UNCHANGED.

☐ Bulges ☐ Depressions ☐ Hummocky ☐ ☐ ☐ ☐
Size: Height: Depth:
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Notes/Causes:

☒ *OTHER* [no problem, could not inspect thoroughly]

☒ Rodent Burrows: (few, numerous) ☐ ☐ ☒ ☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg) 75 feet from Principal Spillway Inlet
Notes: Only found this one near Principal Spillway inlet

☐ Ruts: ☐ ☐ ☐ ☐
Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)
Depth: Width Length:
Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Other: ☐ ☐ ☐ ☐
Notes:

CREST

Length: 730 feet Width: 20 feet (est, meas.) Inventory appears correct.

☒ *VEGETATION* [no problem]

☐ Trees: Quantity: (<5, sparse, dense) ☐ ☐ ☐ ☐
Diameter: (<6", 6-12", >12")
Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)
Notes:

☐ Brush: Quantity: (sparse, dense) ☐ ☐ ☐ ☐
Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)
Notes:

☒ Ground Cover: Type: (grass, crown vetch) Other: ☒ ☐ ☐ ☐
Quantity: (bare, sparse, adequate, dense)
Appearance: (too tall, too short, good)
Notes: Crown vetch was noted in patches along crest

☒ *EROSION* (no problem, could not inspect thoroughly]

☐ Runoff Erosion (Gullies): Quantity: Depth: Width: Length: ☐ ☐ ☐ ☐
Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)
Notes/Causes:

None | Monitor | Maintenance | Engineer

Required Action

Action

None Monitor Maintenance Engineer

☒ *ALIGNMENT* [(no problem) could not inspect thoroughly]

☐ Vertical: ☐ Low Area: ☐ ☐ ☐ ☐

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Elevation Difference: Length:

Notes/Causes:

☐ ☐ ☐ ☐

☐ Horizontal:

Notes/Causes:

☒ *WIDTH* (no problem)

☐ Too Narrow

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg) ☐ ☐ ☐ ☐

Notes/Causes:

☒ *INSTABILITIES* [(no problem), could not inspect thoroughly]

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other ☐ ☐ ☐ ☐

Quantity: Length: Width: Depth:

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Notes/Causes:

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other ☐ ☐ ☐ ☐

Quantity: Length: Width: Depth:

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Notes/Causes:

☐ Bulges ☐ Depressions ☐ Hummocky ☐ ☐ ☐ ☐

Size: Height: Depth:

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Notes/Causes:

☐ Bulges ☐ Depressions ☐ Hummocky ☐ ☐ ☐ ☐

Size: Height: Depth:

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Notes/Causes:

☒ *OTHER* [(no problem), could not inspect thoroughly]

☐ Rodent Burrows: (few, numerous) ☐ ☐ ☐ ☐

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Notes:

☐ Ruts: ☐ ☐ ☐ ☐

Location: (adj. to structure, entire crest, lt end, rt end, middle, see dwg)

Depth: Width Length:

Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Other: ☐ ☐ ☐ ☐

Notes:

None Monitor Maintenance Engineer

Required Action

Required Action

DOWNSTREAM SLOPE Gradient: Horizontal: 2.5 Vertical: 1.0 (est.) meas.)

INVENTORY APPEARS CORRECT

None Monitor Maintenance Engineer

☒ ***VEGETATION*** [no problem]

☐ Trees: Quantity: (<5, sparse, dense) ☐ ☐ ☐ ☐

Diameter: (<6", 6-12", >12")

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes:

☐ Brush: Quantity: (sparse, dense) ☐ ☐ ☐ ☐

Location:(adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes:

☒ Ground Cover: Type: (grass) (crown vetch) Other: ☒ ☐ ☐ ☐

Quantity: (bare, sparse, (adequate) dense)

Appearance: (too tall, too short, (good))

Notes: Crown vetch was sparsely noted along the slope

☒ ***EROSION*** (no problem) could not inspect thoroughly] ☐ ☐ ☐ ☐

☐ Runoff Erosion (Gullies): Quantity: Depth: Width: Length:

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes/Causes:

☒ ***INSTABILITIES*** (no problem) could not inspect thoroughly] ☐ ☐ ☐ ☐

☐ Slides: Transverse Length: Longitudinal Length:

Scarp: Width: Length:

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Crack: Width: Depth:

Notes/Causes

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other ☐ ☐ ☐ ☐

Quantity: Length: Width: Depth:

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes/Causes:

☐ Cracks: ☐ Transverse ☐ Longitudinal ☐ Other ☐ ☐ ☐ ☐

Quantity: Length: Width: Depth:

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes/Causes:

☐ Bulges ☐ Depressions ☐ Hummocky ☐ ☐ ☐ ☐

Size: Height: Depth:

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes/Causes:

☐ Bulges ☐ Depressions ☐ Hummocky ☐ ☐ ☐ ☐

Size: Height: Depth:

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes/Causes:

None Monitor Maintenance Engineer

Required Action

Required Action

None | Monitor | Maintenance | Engineer

☒ ***OTHER*** (no problem, could not inspect thoroughly) ☐ ☐ ☐ ☐

☐ Rodent Burrows: (few, numerous)

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Notes:

☐ Ruts: ☐ ☐ ☐ ☐

Location: (adj. to structure, entire slope, lt end, rt end, middle, see dwg)

Depth: Width Length:

Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Other: ☐ ☐ ☐ ☐

Notes:

☒ ***SEEPAGE*** [no problem, could not inspect thoroughly]

☒ Wet Area ☐ Flow ☐ Boil ☐ Sinkhole ☐ ☒ ☐ ☐

Flow Rate NONE Size: 50 FEET by 25 FEET

Location: Downstream of INVERTED Filter

☐ Aquatic Vegetation ☒ None

☐ Rust Colored Deposits ☒ None

☐ Sediment in Flow ☒ None

☐ Other:

Notes/Causes: Area is WET AFTER HEAVY RAINS Area could be Seepage or trap surface runoff. (According to owner representatives)

☐ Wet Area ☐ Flow ☐ Boil ☐ Sinkhole ☐ ☐ ☐ ☐

Flow Rate Size:

Location:

☐ Aquatic Vegetation ☐ None

☐ Rust Colored Deposits ☐ None

☐ Sediment in Flow ☐ None

☐ Other:

Notes/Causes:

☒ ***EMBANKMENT DRAINS*** [none, none found, no problem, could not inspect thoroughly]

Type: ☐ Toe Drain ☐ Relief Wells ☐ Other: INVERTED GRAVEL FILTER ☒ ☐ ☐ ☐

Flow Rate: NO FLOW Size: VARIES Number: 1

Location: DOWNSTREAM TOE

Notes: INVERTED FILTER IS LOCATED AT THE DOWNSTREAM TOE OF THE EMBANKMENT.

☒ ***MONITORING INSTRUMENTATION*** [none, none found, no problem, could not inspect thoroughly]

☐ None Found ☒ Piezometers ☐ Weirs/Flumes ☐ Other ☒ ☐ ☐ ☐

☐ Periodic Inspections by:

Notes: Three piezometers were noted on the downstream slope. Currently owner is evaluating them and preparing a inspection program.

None | Monitor | Maintenance | Engineer

Required Action

Required Action

PRINCIPAL SPILLWAY LEFT ABUTMENT

☒ *GENERAL INLET* (no problem) could not inspect thoroughly]
- ☐ Anti-Vortex Plate [None] Dimensions: (adequate, too small,) ☐ ☐ ☐ ☐
  - Type: (steel, concrete, aluminum, stainless steel, corrugated metal, wood, other):
  - Deterioration: (missing sections, rusted, collapsed)
  - Notes:
- ☐ Flash Boards [None] ☐ ☐ ☐ ☐
  - Type: (metal, wood):
  - Deterioration:
  - Notes:
- ☐ Trashrack [None] Opening Size: (adequate, too small, too large) ☐ ☐ ☐ ☐
  - Type: (metal bars, fence, screen, concrete, baffle, other)
  - Deterioration: (broken bars, missing sections, rusted, collapsed)
  - Notes:

☒ *INLET OBSTRUCTION* [no problem, could not inspect thoroughly]
- ☐ Debris: (leaves, trash, logs, branches, ice) ☐ ☐ ☐ ☐
- ☐ Trees: Quantity: (<5, sparse, dense) ☐ ☐ ☐ ☐
  - Diameter: (<6", 6-12", >12")
  - Location: (entire inlet, lt side, rt side, middle, see dwg)
  - Notes:
- ☐ Brush: Quantity: (sparse, dense) ☐ ☐ ☐ ☐
  - Location: (entire inlet, lt side, rt side, middle, see dwg)
  - Notes:
- ☐ Other:(beaver activity, trashrack opening too small, partially/completely blocked, i.e.) ☐ ☐ ☐ ☐
  - Notes:

☒ *INLET MATERIALS* [no problem, could not inspect thoroughly]
- ☐ Metal
  - (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation) ☐ ☐ ☐ ☐
  - Dimensions:
  - Location:
  - Notes/Causes:
- ☒ Concrete
  - (bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐
  - (spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐
  - (isolated crack, exposed rebar, disintegration, other) ☒ ☐ ☐ ☐
  - Dimensions/Location:
  - Notes/Causes: Concrete appeared in good condition
  - (bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐
  - (spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐
  - (isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐
  - Dimensions/Location:
  - Notes/Causes:
- ☐ Plastic ☐ ☐ ☐ ☐
  - (deterioration, cracking, deformation)
  - Dimensions:
  - Location:
  - Notes/Causes:

Action

None | Monitor | Maintenance | Engineer

☐ Earthen

☐ Ground Cover: Type: (grass, crown vetch) Other:
Quantity: (bare, sparse, adequate, dense)
Appearance: (too tall, too short, good)
Notes:

☐ Erosion: (wave, surface runoff)
Description (height/depth/length/etc):
Notes:

☐ Ruts:
Location: (entire inlet, lt side, rt side, middle, see dwg)
Depth: Width Length:
Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Riprap: Average Diameter:
(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)
Notes:

☐ Rock-Cut (weathered, erosion)
Description:
Notes:

☐ Other:

☒ *OTHER INLET PROBLEMS* (no problem) could not inspect thoroughly]

☐ Mis-Alignment:(pipe, chute, sidewall, headwall) ☐ Pipe Deformation
Location/Description:
Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material
Location/Description:
Notes/Causes:

☐ Undermining:
Location/Description:
Notes/Causes:

☐ Other:

☒ *OPEN CHANNEL CONTROL SECTION* (no problem, could not inspect) Width 150 Ft. (est.) ms.) Brdth 25 ft. (est.) ms.)
Notes: Concrete ogee shaped weir appeared in good condition

☒ *OUTLET OBSTRUCTION* (no problem) could not inspect thoroughly]

☐ Debris: (leaves, trash, logs, branches, ice)
☐ Trees: Quantity: (<5, sparse, dense)
Diameter: (<6", 6-12", >12")
Location: (entire outlet, lt side, rt side, middle, see dwg)
Notes:

☐ Brush: Quantity: (sparse, dense)
Location:(entire outlet, lt side, rt side, middle, see dwg)
Notes:

☐ Other:(beaver activity, partially/completely blocked, i.e.)
Notes:

Required Action

None | Monitor | Maintenance | Engineer

(Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway-Inlet/Outlet, Emergency Spillway, Lake Drain)

Action

☒ *OUTLET MATERIALS* [no problem, could not inspect thoroughly]

☐ Metal (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation) ☐ None ☐ Monitor ☐ Maintenance ☐ Engineer

Dimensions:

Location:

Notes/Causes:

☒ Concrete

(bug holes, hairline crack, efflorescence) ☐ None ☐ Monitor ☒ Maintenance ☐ Engineer

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☒ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location: APPEARS UNCHANGED FROM LAST INSPECTION. LONGITUDINAL

Notes/Causes: CRACKS ALONG BOTTOM OF CHUTE, DETERIORATED JOINTS ON SIDE WALLS / JOINTS, AND CHALKING MISSING IN JOINT ALONG BOTTOM OF CHUTE

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

☐ Plastic (deterioration, cracking, deformation) ☐ ☐ ☐ ☐

Dimensions:

Location:

Notes/Causes:

☐ Earthen

☐ Ground Cover: Type: (grass, crown vetch) Other: ☐ ☐ ☐ ☐

Quantity: (bare, sparse, adequate, dense)

Appearance: (too tall, too short, good)

Notes:

☐ Erosion: (other, surface runoff) ☐ ☐ ☐ ☐

Description (width/depth/length/etc):

Notes:

☐ Ruts: ☐ ☐ ☐ ☐

Location: (entire inlet, lt side, rt side, middle, see dwg)

Depth: Width: Length:

Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):

☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☐ Rock-Cut (weathered, erosion)

Description/Notes: ☐ ☐ ☐ ☐

☒ Other: Gutter drains along outside of the spillways sidewalls of the outlet were plugged with vegetation. ☐ ☐ ☒ ☐

☒ *OTHER OUTLET PROBLEMS* (no problem, could not inspect thoroughly)

☐ Mis-Alignment: (pipe, chute, sidewall, headwall) ☐ Pipe Deformation ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material ☐ None ☐ Monitor ☐ Maintenance ☐ Engineer

Location/Description:

Notes/Causes:

☐ Undermining: ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Other: ☐ ☐ ☐ ☐

(Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway-Outlet, Emergency Spillway, Lake Drain)

Required Action

Required Action

None | Monitor | Maintenance | Engineer

OUTLET EROSION CONTROL STRUCTURE (Stilling Basins)

☐ None

☒ (endwall/headwall, plunge pool, impact basin, flip bucket, USBR, baffled chute, rock lined channel)

Notes:

Components (baffle blocks, chute blocks, endsill)

☒ *MATERIAL* [no problem, could not inspect thoroughly]

☐ Riprap: Average Diameter:

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☒ Concrete

(bug holes, hairline crack, efflorescence)

(spalling, popouts, honeycombing, scaling, craze/map cracks)

(isolated crack, exposed rebar, disintegration, other)

Dimensions/Location:

Notes/Causes: Could not inspect because it was under water

(bug holes, hairline crack, efflorescence)

(spalling, popouts, honeycombing, scaling, craze/map cracks)

(isolated crack, exposed rebar, disintegration, other)

Dimensions/Location:

Notes/Causes:

☒ *OTHER* [no problem, could not inspect thoroughly]

☐ Mis-Alignment: (sidewall, headwall, entire struct.)

Location:

Description:

Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material

Location:

Description:

Notes/Causes:

☐ Undermining:

Location:

Description:

Notes/Causes:

☒ Other: Bedrock erosion noted at the outlet area of the concrete chute appeared unchanged from 1998 and 2003 Division of water inspection

☒ *DRAINS* [none, none found, no problem, could not inspect thoroughly] (See *SEEPAGE* Section for Toe Drains & Relief Wells)

Type: ☐ Weep Holes ☒ Relief Drains ☐ Other:

Flow Rate: 1 gpm each Size: 6" CMP Number: 2 (one per wall)

Location: Spillway sidewalls

Notes: CMP is rusted out at the invert. Pipe condition appears to have worsened since the last inspection.

Type: ☐ Weep Holes ☐ Relief Drains ☐ Other:

Flow Rate: Size: Number:

Location:

Notes:

Required Action

None | Monitor | Maintenance | Engineer

AUXILIARY SPILLWAY – 110 foot concrete ogee spillway (REMEND)

☐ None Found ☐ ☐ ☐ ☐

☒ *GENERAL INLET* [no problem, could not inspect thoroughly]
- ☐ Anti-Vortex Plate [None] Dimensions: (adequate, too small,) ☐ ☐ ☐ ☐
  - Type: (steel, concrete, aluminum, stainless steel, corrugated metal, wood, other):
  - Deterioration: (missing sections, rusted, collapsed)
  - Notes:
- ☐ Flash Boards [None] ☐ ☐ ☐ ☐
  - Type: (metal, wood):
  - Deterioration:
  - Notes:
- ☐ Trashrack [None] Opening Size: (adequate, too small, too large) ☐ ☐ ☐ ☐
  - Type: (metal bars, fence, screen, concrete, baffle, other):
  - Deterioration: (broken bars, missing sections, rusted, collapsed)
  - Notes:

☒ *INLET OBSTRUCTION* [no problem, could not inspect thoroughly]
- ☐ Debris: (leaves, trash, logs, branches, ice) ☐ ☐ ☐ ☐
- ☐ Trees: Quantity: (<5, sparse, dense) ☐ ☐ ☐ ☐
  - Diameter: (<6", 6-12", >12")
  - Location: (entire inlet, lt side, rt side, middle, see dwg)
  - Notes:
- ☐ Brush: Quantity: (sparse, dense) ☐ ☐ ☐ ☐
  - Location: (entire inlet, lt side, rt side, middle, see dwg)
  - Notes:
- ☐ Other:(beaver activity, trashrack opening too small, partially/completely blocked, i.e.) ☐ ☐ ☐ ☐
  - Notes:

☒ *INLET MATERIALS* [no problem, could not inspect thoroughly]
- ☐ Metal
  - (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation) ☐ ☐ ☐ ☐
  - Dimensions/Location:
  - Notes/Causes:
- ☒ Concrete
  - (bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐
  - (spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐
  - (isolated crack, exposed rebar, disintegration, other) ☒ ☐ ☐ ☐
  - Dimensions/Location:
  - Notes/Causes: Good Condition
  - (bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐
  - (spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐
  - (isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐
  - Dimensions/Location:
  - Notes/Causes:
- ☐ Plastic
  - (deterioration, cracking, deformation) ☐ ☐ ☐ ☐
  - Dimensions/Location:
  - Notes/Causes:

Required Action

None Monitor Maintenance Engineer

☐ Earthen

☐ Ground Cover: Type: (grass, crown vetch) Other: ☐ ☐ ☐ ☐

Quantity: (bare, sparse, adequate, dense)

Appearance: (too tall, too short, good)

Notes:

☐ Erosion: (wave, surface runoff) ☐ ☐ ☐ ☐

Description (height/depth/length/etc):

Notes:

☐ Ruts: ☐ ☐ ☐ ☐

Location: (entire inlet, lt side, rt side, middle, see dwg)

Depth: Width Length:

Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☐ Rock-Cut (weathered, erosion) ☐ ☐ ☐ ☐

Description:

Notes:

☐ Other: ☐ ☐ ☐ ☐

☒ *OTHER INLET PROBLEMS* (no problem) could not inspect thoroughly]

☐ Mis-Alignment:(channel, chute, sidewall, headwall) ☐ Pipe Deformation ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Undermining: ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Other: ☐ ☐ ☐ ☐

☒ *OPEN CHANNEL CONTROL SECTION* [no problem, could not inspect] **Width** 110 ft (est.) ms.) **Brdth** 2 ft. (est.) ms.)

Notes: Good Condition ☒ ☐ ☐ ☐

☒ *OUTLET OBSTRUCTION* (no problem) could not inspect thoroughly]

☐ Debris: (leaves, trash, logs, branches, ice) ☐ ☐ ☐ ☐

☐ Trees: Quantity: (<5, sparse, dense) ☐ ☐ ☐ ☐

Diameter: (<6", 6-12", >12")

Location: (entire outlet, lt side, rt side, middle, see dwg)

Notes:

☐ Brush: Quantity: (sparse, dense) ☐ ☐ ☐ ☐

Location:(entire outlet, lt side, rt side, middle, see dwg)

Notes:

Required Action

None Monitor Maintenance Engineer

☐ Other:(beaver activity, partially/completely blocked, i.e.) ☐ ☐ ☐ ☐

Notes:

{Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway, ~~Emergency~~ Spillway-Inlet/Outlet, Lake Drain}

Action: None | Monitor | Maint. | Engineer

☒ **OUTLET MATERIALS** [no problem, could not inspect thoroughly]

☐ Metal (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation) ☐ ☐ ☐ ☐
Dimensions:
Location:
Notes/Causes:

☒ Concrete (bug holes, hairline crack, efflorescence) ☒ ☐ ☐ ☐
(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐
(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐
Dimensions/Location:
Notes/Causes: Some hairline cracking was noted in the bottom of the chute.

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐
(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐
(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐
Dimensions/Location:
Notes/Causes:

☐ Plastic (deterioration, cracking, deformation) ☐ ☐ ☐ ☐
Dimensions:
Location:
Notes/Causes:

☒ Earthen
☒ Ground Cover: Type: (grass, crown vetch) Other: ☒ ☐ ☐ ☐
Quantity: (bare, sparse, adequate, dense)
Appearance: (too tall, too short, good)
Notes: Right side + left side are earthen.

☐ Erosion: (other, surface runoff) ☐ ☐ ☐ ☐
Description (width/depth/length/etc):
Notes:

☐ Ruts: ☐ ☐ ☐ ☐
Location: (entire inlet, lt side, rt side, middle, see dwg)
Depth: Width Length:
Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐
(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)
Notes:

☐ Rock-Cut (weathered, erosion)
Description: ☐ ☐ ☐ ☐
Notes:

☐ Other: ☐ ☐ ☐ ☐

☒ **OTHER OUTLET PROBLEMS** [no problem, could not inspect thoroughly]

☐ Mis-Alignment: (channel, chute, sidewall, headwall) ☐ Pipe Deformation ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

Action: None | Monitor | Maintenance | Engineer

☐ Separated Joint ☐ Loss of Joint Material ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

☐ Undermining: ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

☒ Other: Weepholes located at the outlet were plugged with MOSS AND WEEDS ☐ ☐ ☒ ☐
(Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway, ~~Emergency~~ Spillway-Outlet, Lake Drain)

Required Action

Required Action

None | Monitor | Maint. | Engineer

OUTLET EROSION CONTROL STRUCTURE (Stilling Basins)

☒ None ☐ ☒ ☐ ☐

☐ (endwall/headwall, plunge pool, impact basin, flip bucket, USBR, baffled chute, rock lined channel) ☐ ☐ ☐ ☐

Notes: Spillway outlet onto bedrock. Some erosion of the rocks has occurred over the years.

Components (baffle blocks, chute blocks, endsill)

☒ *MATERIAL* (no problem) could not inspect thoroughly]

☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☐ Concrete

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

☒ *OTHER* (no problem) could not inspect thoroughly] ☐ ☐ ☐ ☐

☐ Mis-Alignment: (sidewall, headwall)

Location:

Description:

Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material ☐ ☐ ☐ ☐

Location:

Description:

Notes/Causes:

☐ Undermining: ☐ ☐ ☐ ☐

Location:

Description:

Notes/Causes:

☐ Other: ☐ ☐ ☐ ☐

☒ *DRAINS* (none) none found, no problem, could not inspect thoroughly] (See *SEEPAGE* Section for Toe Drains & Relief Wells)

Type: ☐ Weep Holes ☐ Relief Drains ☐ Other: ☐ ☐ ☐ ☐

Flow Rate: Size: Number:

Location:

Notes:

Type: ☐ Weep Holes ☐ Relief Drains ☐ Other: ☐ ☐ ☐ ☐

Flow Rate: Size: Number:

Location:

Notes:

None | Monitor | Maintenance | Engineer

Required Action

EMERGENCY SPILLWAY - 80 Foot wide EARTHEN CHANNEL IN(RIGHT ABUTMENT)

☐ None Found

☒ *GENERAL INLET* (no problem) could not inspect thoroughly]
- ☐ Anti-Vortex Plate [None] Dimensions: (adequate, too small,)
  - Type: (steel, concrete, aluminum, stainless steel, corrugated metal, wood, other):
  - Deterioration: (missing sections, rusted, collapsed)
  - Notes:
- ☐ Flash Boards [None]
  - Type: (metal, wood):
  - Deterioration:
  - Notes:
- ☐ Trashrack [None] Opening Size: (adequate, too small, too large)
  - Type: (metal bars, fence, screen, concrete, baffle, other):
  - Deterioration: (broken bars, missing sections, rusted, collapsed)
  - Notes:

☒ *INLET OBSTRUCTION* (no problem, could not inspect thoroughly]
- ☐ Debris: (leaves, trash, logs, branches, ice)
- ☐ Trees: Quantity: (<5, ars , dense)
  - Diameter: (<6", -12 >12")
  - Location: (entire inlet, side rt side middle, see dwg)
  - Notes:
- ☐ Brush: Quantity: (sparse, dense)
  - Location: (entire inlet, lt side, rt side, middle, see dwg)
  - Notes:
- ☐ Other:(beaver activity, trashrack opening too small, partially/completely blocked, i.e.)

  Notes:

☒ *INLET MATERIALS* [no problem, could not inspect thoroughly]
- ☐ Metal

  (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation)

  Dimensions/Location:
  Notes/Causes:

- ☐ Concrete

  (bug holes, hairline crack, efflorescence)
  (spalling, popouts, honeycombing, scaling, craze/map cracks)
  (isolated crack, exposed rebar, disintegration, other)
  Dimensions/Location:
  Notes/Causes:

  (bug holes, hairline crack, efflorescence)
  (spalling, popouts, honeycombing, scaling, craze/map cracks)
  (isolated crack, exposed rebar, disintegration, other)
  Dimensions/Location:
  Notes/Causes:

- ☐ Plastic

  (deterioration, cracking, deformation)
  Dimensions/Location:
  Notes/Causes:

Required Action

None ☒ | Monitor ☐ | Maintenance ☐ | Engineer ☐

☒ Earthen

☒ Ground Cover: Type: (grass, crown vetch) Other:

Quantity: (bare, sparse, adequate, dense)

Appearance: (too tall, too short, good)

Notes:

☐ Erosion: (wave, surface runoff) ☐☐☐☐

Description (height/depth/length/etc):

Notes:

☐ Ruts: ☐☐☐☐

Location: (entire inlet, lt side, rt side, middle, see dwg)

Depth: Width Length:

Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian)

☐ Riprap: Average Diameter: ☐☐☐☐

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☐ Rock-Cut (weathered, erosion) ☐☐☐☐

Description:

Notes:

☐ Other: ☐☐☐☐

☒ ***OTHER INLET PROBLEMS*** (no problem) could not inspect thoroughly]

☐ Mis-Alignment:(channel, chute, sidewall, headwall) ☐ Pipe Deformation ☐☐☐☐

Location/Description:

Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material ☐☐☐☐

Location/Description:

Notes/Causes:

☐ Undermining: ☐☐☐☐

Location/Description:

Notes/Causes:

☐ Other: ☐☐☐☐

☒ ***OPEN CHANNEL CONTROL SECTION*** [no problem, could not inspect] **Width** 80 Ft (est.) ms.) **Brdth** 20 Ft. (est.) ms.) ☒☐☐☐

Notes:

☒ ***OUTLET OBSTRUCTION*** (no problem,) could not inspect thoroughly]

☐ Debris: (leaves, trash, logs, branches, ice) ☐☐☐☐

☐ Trees: Quantity: (<5, sparse, dense) ☐☐☐☐

Diameter: (<6", 6-12", >12")

Location: (entire outlet, lt side, rt side, middle, see dwg)

Notes:

☐ Brush: Quantity: (sparse, dense) ☐☐☐☐

Location:(entire outlet, lt side, rt side, middle, see dwg)

Notes:

Required Action

None | Monitor | Maintenance | Engineer

☐ Other:(beaver activity, partially/completely blocked, i.e.) ☐☐☐☐

Notes:

Required Action — None / Monitor / Maint. / Engineer

☒ ***OUTLET MATERIALS*** [no problem, could not inspect thoroughly]

☐ Metal (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out, pipe deformation) ☐ ☐ ☐ ☐

Dimensions:

Location:

Notes/Causes:

☐ Concrete (bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

☐ Plastic (deterioration, cracking, deformation) ☐ ☐ ☐ ☐

Dimensions:

Location:

Notes/Causes:

☒ Earthen

☒ Ground Cover: Type (grass) crown vetch) Other: ☒ ☐ ☐ ☐

Quantity: (bare, sparse, adequate, dense)

Appearance: (too tall, too short, good)

Notes:

☐ Erosion: (other, surface runoff) ☐ ☐ ☐ ☐

Description (width/depth/length/etc):

Notes:

☐ Ruts: ☐ ☐ ☐ ☐

Location: (entire inlet, lt side, rt side, middle, see dwg)

Depth: Width Length:

Notes/Causes: (truck/auto, motorcycle, ATV, animals, pedestrian):

☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☐ Rock-Cut (weathered, erosion)

Description: ☐ ☐ ☐ ☐

Notes:

☐ Other: ☐ ☐ ☐ ☐

☒ ***OTHER OUTLET PROBLEMS*** (no problem,) could not inspect thoroughly]

☐ Mis-Alignment:(channel, chute, sidewall, headwall) ☐ Pipe Deformation ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

Required Action — None / Monitor / Maintenance / Engineer

☐ Separated Joint ☐ Loss of Joint Material ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Undermining: ☐ ☐ ☐ ☐

Location/Description:

Notes/Causes:

☐ Other: ☐ ☐ ☐ ☐

(Upstream Slope, Crest, Downstream Slope, Seepage, Principal Spillway, Emergency Spillway-Outlet, Lake Drain)

Required Action

Required Action

None Monitor Maint. Engineer

OUTLET EROSION CONTROL STRUCTURE (Stilling Basins)

☒ None ☒ ☐ ☐ ☐

☐ (endwall/headwall, plunge pool, impact basin, flip bucket, USBR, baffled chute, rock lined channel) ☐ ☐ ☐ ☐

Notes: OUTLET FLOWS INTO A BEDROCK CHANNEL OF THE AUXILIARY SPILLWAY.

Components (baffle blocks, chute blocks, endsill)

☐ ***MATERIAL*** [no problem, could not inspect thoroughly]

☐ Riprap: Average Diameter: ☐ ☐ ☐ ☐

(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no)

Notes:

☐ Concrete

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

(bug holes, hairline crack, efflorescence) ☐ ☐ ☐ ☐

(spalling, popouts, honeycombing, scaling, craze/map cracks) ☐ ☐ ☐ ☐

(isolated crack, exposed rebar, disintegration, other) ☐ ☐ ☐ ☐

Dimensions/Location:

Notes/Causes:

☒ ***OTHER*** [no problem, could not inspect thoroughly] ☐ ☐ ☐ ☐

☐ Mis-Alignment: (sidewall, headwall)

Location:

Description:

Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material ☐ ☐ ☐ ☐

Location:

Description:

Notes/Causes:

☐ Undermining: ☐ ☐ ☐ ☐

Location:

Description:

Notes/Causes:

☐ Other: ☐ ☐ ☐ ☐

☒ ***DRAINS*** [none, none found, no problem, could not inspect thoroughly] (See ***SEEPAGE*** Section for Toe Drains & Relief Wells)

Type: ☐ Weep Holes ☐ Relief Drains ☐ Other: ☐ ☐ ☐ ☐

Flow Rate: Size: Number:

Location:

Notes:

Type: ☐ Weep Holes ☐ Relief Drains ☐ Other: ☐ ☐ ☐ ☐

Flow Rate: Size: Number:

Location:

Notes:

None Monitor Maintenance Engineer

Required Action

LAKE DRAIN

Action: None | Monitor | Maint. | Engineer

☒ *GENERAL*

☐ None Found ☐ Does not have one — ☐ ☐ ☐ ☐

☒ Type of Lake Drain (isolated control/intake tower, valve vault w/ outlet conduit, valve in riser/drop inlet, siphon) — ☒ ☐ ☐ ☐

Notes:

☒ Operated During Inspection (yes, no) — ☒ ☐ ☐ ☐

Notes:

☒ *ACCESS TO VALVE/SLUICE GATE* (no problem, could not inspect thoroughly) — ☒ ☐ ☐ ☐

☒ Type (not accessible, from shore, boat, walkway, other)

Notes:

☐ Walkway/Platform:

☐ Concrete Deterioration ☐ Cracks (platform, piers, end supports, railing) — ☐ ☐ ☐ ☐

Location:

Notes:

☐ Wood Deterioration — ☐ ☐ ☐ ☐

Notes:

☐ Metal Deterioration — ☐ ☐ ☐ ☐

(minor, moderate, extensive, other)

Notes:

☒ *LAKE DRAIN COMPONENTS* [no problem, could not inspect thoroughly]

☒ Concrete Structure — ☒ ☐ ☐ ☐

Location:

Description: (deterioration, misalignment, cracks):

Notes/Causes: Good Condition

☒ Valve Control (Operating Device)

☒ No Operating Device ☐ No Stem ☐ Bent/Broken Stem ☐ Other — ☒ ☐ ☐ ☐

Notes/Operability: OPERATING DEVICE NOT KEPT AT LAKE

☒ Valve / Sluice Gate — ☐ ☐ ☐ ☐

☐ Metal Deterioration: (surface rust, minor, moderate, extensive, other)

Location:

Flow Rate:

Notes/Causes:

☐ Misalignment — ☐ ☐ ☐ ☐

Notes/Causes:

☒ Leakage - Flow Rate: 1 gallon per minute (Same as 1998 & 2003 DOW Inspection) — ☐ ☒ ☐ ☐

Notes/Causes:

☐ Valve / Sluice Gate — ☐ ☐ ☐ ☐

☐ Metal Deterioration: (surface rust, minor, moderate, extensive, other)

Location:

Flow Rate:

Notes/Causes:

☐ Misalignment - Notes/Causes: — ☐ ☐ ☐ ☐

Required Action: None | Monitor | Maintenance | Engineer

☐ Leakage - Flow Rate: — ☐ ☐ ☐ ☐

Notes/Causes:

Action: None | Monitor | Maintenance | Engineer

☒ Outlet Conduit

☐ Metal: (loss of coating/paint, surface rust, corrosion (pitting, scaling), rusted out) — ☐ ☐ ☐ ☐
Location:
Notes/Causes:

☒ Concrete (bug holes, hairline crack, efflorescence) — ☒ ☐ ☐ ☐
(spalling, popouts, honeycombing, scaling, craze/map cracks) — ☐ ☐ ☐ ☐
(isolated crack, exposed rebar, disintegration, other) — ☐ ☐ ☐ ☐
Dimensions/Location:
Notes/Causes: Appeared in good condition

☐ Plastic: (deterioration, cracking) — ☐ ☐ ☐ ☐
Location:
Notes/Causes:

☐ Conduit Deformation ☐ Mis-Alignment: — ☐ ☐ ☐ ☐
Location:
Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material — ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

☐ Undermining: — ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

☐ Vegetation (trees, brush) — ☐ ☐ ☐ ☐
Notes:

☐ Other: — ☐ ☐ ☐ ☐
Notes:

☒ Energy Dissipator

☒ Type (endwall, plunge pool, impact basin, stilling basin, rock-lined channel, (none)) — ☒ ☐ ☐ ☐
Notes: OUTLET FROM LAKE DRAIN FLOW ONTO BEDROCK IN AUXILIARY SPILLWAY

☐ Riprap: Average Diameter: — ☐ ☐ ☐ ☐
(adequate, sparse, displaced, weathered, vegetation) (bedding/fabric noted - yes, no))
Notes:

☐ Concrete (bug holes, hairline crack, efflorescence) — ☐ ☐ ☐ ☐
(spalling, popouts, honeycombing, scaling, craze/map cracks) — ☐ ☐ ☐ ☐
(isolated crack, exposed rebar, disintegration, other) — ☐ ☐ ☐ ☐
Dimensions/Location:
Notes/Causes:

☐ Mis-Alignment: — ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

☐ Separated Joint ☐ Loss of Joint Material — ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

☐ Undermining: — ☐ ☐ ☐ ☐
Location/Description:
Notes/Causes:

Required Action: None | Monitor | Maintenance | Engineer

☐ Other: — ☐ ☐ ☐ ☐
Notes: