A. J. Jolly Lake Emergency Action Plan

MONITORING

EMERGENCY ACTION PLAN

MAINTENANCE PLAN

A. J. Jolly LAKE

Located at or near
A.J. Jolly Park

Owned by
Campbell County Fiscal Court
Kentucky Department of Natural Resources

Purpose of Emergency Action Planning

The purpose of this document is to provide for monitoring of the A. J. Jolly Lake Dam under various conditions so that an emergency situation at the dam will be observed promptly and reported to agencies and persons who may be affected. An Emergency Action Plan is prepared for each high hazard dam. The plans are prepared in accordance with Emergency Action Planning Guidelines For Dams (Federal Emergency Management Agency, Publication 64); Guide For Preparation of Standing Operating Procedures for Dams and Reservoirs, Appendix D, (Department of the Interior, Bureau of Reclamation); and guidance provided by the Chief, Division of Engineering. According to these guidelines,

Emergency Action Plans include, at a minimum, names, addresses, and telephone numbers of personnel and public officials responsible for public safety, and media contacts; actions required under specific hydrologic situations and dam conditions; and actions required to address other emergencies, as appropriate, such as fire, vandalism, equipment failure, sabotage, drowning or major accidents, oil spills, etc. This document also provides a plan for the orderly notification and evacuation of downstream residents to a place of safety in the event of a potential or actual dam failure. A maintenance plan is included.

Brief Overview of A. J. Jolly Lake Dam and Observed Problems

A. J. Jolly Lake is on Phillips Creek in Campbell County, Kentucky and is used for recreation purposes. Construction was completed in 1962. Its normal surface area is 204 acres. A. J. Jolly Lake Dam is of earthen construction. Its height is 48 feet with a length of 535 feet. Normal storage is 2260 acre feet. It drains an area of 6.4 square miles.

Dam Introductions

Internal erosion of soil particles from within the dam by water that seeps through the dam (called piping by dam engineers) is one of the most common causes of dam failure. Internal erosion is especially dangerous because there may be no external evidence, or only subtle evidence, that it taking place. A dam may breach within a few hours after evidence of the internal erosion becomes obvious.

Internal erosion may develop the first time water is impounded behind a dam, or it may develop over many years. You cannot assume that your dam is safe against internal erosion just because it has performed satisfactory for many years. Internal-erosion failures are often associated with penetrations of dams, such as outlet pipes buried in the embankment and concrete spillways that cross the embankment.

Internal erosion of an earth dam takes place when water that seeps through the dam carries soil particles away from the embankment of the dam. If seepage that discharges at the down-stream side of the dam carries particles of soil, an elongated cavity or pipe may be eroded backward toward the reservoir through the embankment, foundation, or an abutment.

When a backward-eroding pipe reaches the reservoir, a catastrophic breaching of the dam will almost certainly occur. Internal erosion unusually takes place in episodes and discharge of muddy water interspersed with periods of clear-water discharge or no discharge at all. Internal erosions may be taking place even if there is no visible discharge from the soil on the down-stream side of the dam is muddy.

Causes of Internal Erosion

- Poor Design
- Deterioration of outlet pipes and other penetrations through the dam, especially rusting of corrugated-metal pipes and opening of joints or poor sealing of joints in concrete pipes.
- Poor construction; for example, inadequate compaction of the embankment around pipes and other penetrations of the embankment; placement of unsuitable materials in the embankment.
- Seepage from the downstream side of the dam and failure to inspect the dam and to construct remedial measures if needed
- In cold climates, freezing and thawing of embankment soil next to outlet pipes, behind retaining walls, or beneath the floor slabs of spillways (similar to frost heaving in highways), which may open cracks in the soil that, in turn, become avenues of internal erosion in dams.
- Trees on the embankment blowing over, followed by the development of springs where the roots of the trees have been pulled out of the ground
- Rotting of roots of dead trees on the downstream side of the dam. The holes left by rotting of the roots become potential avenues for internal erosion
- Animal burrows on the upstream or downstream slopes of an embankment dam.

Signs of Imminent Danger

- ✓ Muddy water discharging from the downstream side of the dam or from a drain or low-level outlet pipe, which may indicate that the dam is failing.
- ✓ Sinkholes or subsidence anywhere on the embankment or an abutment.
- ✓ Water flowing into a sinkhole below the reservoir surface on the upstream slope of a dam is especially dangerous.

Signs of Potential Danger

- ✓ Water discharging on the downstream slope of an earthen dam or within a few hundred feet downstream from the dam. Look for any accumulation of sediment downstream from the discharge.

- ✓ Water flowing along the outside of a pipe, concrete spillway, or other structure that penetrates the embankment
- ✓ Trees that are up rooted on the embankment or abutments or in the valley bottom immediately downstream from the dam.
- ✓ Dead trees (the rotting roots of which may become avenues of internal erosion) on the embankment or abutments or in the valley bottom immediately downstream from the embankment.
- ✓ Animal burrows on the embankment

If You See Signs of Imminent Danger

Immediately, Call 911, call emergency number of your state safety office, and implement your emergency action plan if you see:

- ❑ Muddy water or a large flow of clear water discharging: From soil anywhere on the downstream side of the dam

- ❑ Next to a spillway, pipe, or other structure that penetrates the embankment or abutments, or
- ❑ From drain pipes in the embankment
- ❑ A large sinkhole (more than (8") in diameter or new subsidence anywhere on the embankment or abutments
- ❑ Kentucky Emergency Response Team (24) hour for indications of potential or imminent danger signs: **1-800-928-2380**

Non-emergency routine questions State of Kentucky Dam Safety and Flood Plain Compliance: Art Clay, P.E. (502) 564-3410, ext. 583

- ❑ Inspect dams and high-hazard impoundments
- ❑ Drain and breach unsafe dams
- ❑ Review and provide technical assistance in dam permitting
- ❑ Monitor and inspect

If You See Signs of Potential Danger

As soon as possible, contact your local state dam safety engineer or other qualified professional dam engineer to inspect the dam it you see:

- ✓ Springs that discharge a small quantity of clear water on the downstream slope of the embankment or in the valley bottom within a few hundred feet downstream from the dam.
- ✓ A small quantity of clear water flowing next to pipe, spillway, other structure that penetrates the embankment.
- ✓ Water discharging near roots, of a living, or dead tree.
- ✓ Corrosion or deterioration of a visible portion of a low-level outlet pipe or other structure that penetrates the embankment.

- ✓ A tree uprooted on the embankment or in the valley bottom within a few hundred feet downstream from the dam.
- ✓ A small new sinkhole (less that 8 inches in diameter) or animal burrow or an old sinkhole or subsidence anywhere on the embankment or abutments.

Dam Failures (Earthen)

Hydraulic Failure: Hydraulic failures result from the uncontrolled flow of water over the dam, around the dam, and adjacent to the dam, plus the erosive action of water on the dam and its foundation. Earth dams are particularly susceptible to hydraulic failure since earth erodes at relatively small velocities.

Seepage failure: All dams exhibit some seepage, which must be controlled in velocity and amount. Seepage occurs both through the dam and the foundation. If uncontrolled, it can erode material from the foundation of an earth dam to form a conduit through which water can pass, which often leads to a complete failure of the structure. Known as piping.

Structural Failure: Involve the rupture of the dam and/or its foundation. This is particularly a hazard for large dams and for dams built of low strength materials such as silt, slag, fly ash.

Classifications

Dams are generally classified in three categories which identify the potential hazard to life and property should failure occur:

- **High Hazard:** Where a dam's failure would most probably result in loss of lives and extensive property damage.
- **Moderate Hazard:** Where failure could possibly result in the loss of life and appreciable property damage.
- **Low Hazard:** Where failure results in only minimal property damage.

In an Emergency

- Listen to local radio or television stations for emergency instructions and latest information
- Follow the instructions and advice of your local authorities. If advised to evacuate, do so promptly
- Use evacuation routes that are specified or recommended by local authorities rather than trying to find short cuts on your own.

Definitions Dam

A dam is defined as any artificial barrier, including appurtenant works, which impounds or diverts water and which:

- ✓ Is twenty (25') or more feet in height from the natural bed of the stream or watercourse measured at the downstream toe of the barrier, or from the lowest elevation of the outside limit of the barrier - if it is not across a stream channel or watercourse-to the maximum water storage elevation.

- ✓ On the other hand, has an impounding capacity at maximum water storage elevation of Tow-hundred fifty acre or more.

Inspection Guidelines

An effective inspection program is essential to identify problems and to provide for safe maintenance of a dam. The inspection program should involve three types of inspections:

(1) Periodic technical inspections,

(2) Periodic maintenance inspections,

(3) Informal observations by project personnel as they operate the dam.

Technical inspections involve specialists familiar with the design and construction of dams and include assessments of structure safety. Maintenance inspections are performed more frequently than technical inspections in order to detect, at an early stage, any detrimental developments in the dam. These inspections involve assessment of operational capability as well as structural stability. The third type of inspection is actually a continuing effort by on- site project personnel (dam tenders, powerhouse operators, maintenance personnel) performed in the course of their normal duties.

Maintenance Guidelines

Vegetation:

A prominent danger sign is the appearance of undesirable types of vegetation such as cattails, reeds, mosses, and other wet types vegetation. The wet environment types of vegetation can be sign of seepage. Prominent areas for undesirable vegetation are the toe of the dam, the area downstream, and abutments. Look closely in these areas for signs of seepage and take appropriate action.

- A good cover of grass should be established and maintained
- Cutting of vegetation on embankments and below the toe of the dam, checking the dam's appurtenances and operating valves, plus timely repairs when needed

Maintenance:

On these areas should involve the mowing and clearing necessary to maintain regular inspection of changes in seepage.

- Seed, fertilize, and mulch areas, which are refilled, barren, or thinly vegetated. Apply fertilizer applications at regular intervals. Watering may be necessary in dry seasons.
- Mow the vegetation as needed. Mowing allows the grasses to establish a thick erosion-resistant sod, and makes it easier to detect any potentially dangerous situations such as seepage, erosion channels, cracks, and burrowing animals.

Trees and Brush:

Removal and prevent the growth of tress and brush. These develop large roots systems, which can provide seepage paths. Topping of these can leave large holes, which can weaken the embankment. Brush, vines, and kudzu obscure surface, limit inspections, and provide a haven for animals.

Erosion, Control, and Repair:

It is essential to refill and compact all erosion channels on the dam. Erosion channels occur on all areas of the dam, but are frequently most severe along the line of contact at abutments.

Slumps and Slides:

On the dam is important. A slump occurs for many reasons such as improper compaction, side slopes being too steep, and because of seepage. Determine the cause of the slump before repair. Correcting the underlying causes will save you time, labor, and expenses over the life of the structure.

Wave protection:

Slope protection is susceptible to weathering. The action of the waves, rain, freezing, and mechanical impacts can cause the movement, settlement, and/or destruction of slope protection. Repair or replace all settlement, movement, or destruction to conform to the original section of the embankment.

Animals:

The dam and surrounding area should be free of animal traffic and habitation. Domesticated animals can damage the sod covering, especially if the cover in thin or the dam is wet from rainfall. Overgrazing can reduce the erosion resistance of the vegetation. Keep burrowing animals off the dam by whatever means is necessary. If dens are found, promptly repair them.

Principal Spillway:

The primary purpose of the spillway is to pass normal flows of water in a safe manner. If this is not being accomplished, then actions must be taken to accomplish it.

- The conduit or pipe must be sound and watertight. The conduit must have the strength to support the external loads of the embankment and lake. When the pipe is composed of jointed sections, those sections must be properly designed to remain watertight.
- Immediately repair a collapsed or separated of any portion of the pipe; this will usually involve drawing down the lake, and probably reconstructing part of the embankment.
- All concrete structures should be sound and on firm foundations. Back fill with any undermining and tightly seal with mastic joint filler. Any weep holes or drains associated with concrete structures should be open and functional. Failure to keep drains operative can cause damage to concrete structures and major costs in repairs.
- The principal spillway must pass flows in a manner, which is not erosive to the dam, foundation or the spillway. Erosion at the principal spillway outlet is caused by the high velocity of the flow. Unchecked erosion can cause failure of the structure. Use measures such as stilling basins to minimize erosion. Stilling basins are generally constructed of riprap or concrete.
- Obstruction of the principal spillway caused a reduction of flow-carrying capacity and consequent increase in use of the emergency spillway with increased possibility of hydraulic failure of the structure. Principal spillways should be equipped with trash racks and these racks must be cleaned as a part of regular maintenance.

Emergency Spillway:

The function of the emergency spillway is to convey flood flows past the dam so the dam is not overtopped. This function must be accomplished.

- The earth portion of the spillway will require vegetation like that on the embankment. Grasses should be thick, well-bedded sod that is mown and fertilized regularly. Barren areas and thinly vegetated areas reseed and fertilize. Keep the spillway area free of trees and brush.
- Repair and vegetate all erosion gullies, slides and slumps as soon as they occur. Erosion repair in earth spillways is of particular importance after any period of flow in the spillway. The outlet channel and control section of spillways are prime erosion areas and their repair is crucial because erosion can expand very rapidly in the spillway.
- On dams with combined principal and emergency spillways, concrete structures are prominent. The concrete must be kept sound by filling joints and cracks with mastic filler. Keep drains in concrete structures open and functional. In earth spillways, concrete is used to form control sections and chutes.
- Keep this concrete sound and functional. Keep the emergency spillway area clear of trash, debris, and undesirable vegetation such as trees and brush. Other obstacles are buildings, fences, fish screens, and guardrails. If left in place, all these obstructions can catch trash and reduce the capacity of the spillway, which can cause hydraulic failure of the embankment.

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- Inspecting Your Dam Regularly: The regular inspection of dams is the heart of your care and maintenance program.
- Only by regular inspections can problems be detected at early stages.
- Early detection and remedy are essential to preserve the integrity of your structure.
- Inspections should include areas other than the dam and spillway. The scope of the inspection should include areas downstream, on the abutments, and a general overview of the pool area. The dam and lake area have to be viewed in the proper perspective with the surrounding terrain. Failure to do so ignores the possibility of unseen problems in the valley and abutments, which can be influenced by the dam and lake.
- During an inspection, the owner should be aware of various signs of danger. These danger signs are often not detected unless the inspection is thorough and the dam has been properly maintained. Driving by at 30 miles per hour and seeing if the dam is there cannot adequately perform an inspection. Signs of danger which should be searched for are the following:

Seepage:

The appearance of seepage on the downstream slope, abutments, or downstream area is cause for concern. The type and quantity of seepage should be studied. If the water is muddy murky and is coming from a well-defined hole, material is probably being eroded from inside the embankment and a potentially dangerous situation can develop. This type of problem requires immediate attention to stop the removal of material and control the seepage. Failures due to piping are examples of this type of seepage problem.

- If the water is clear, it may be coming from an older hole and should be monitored closely for any changes in color and quantity.
- Seepage can also occur on abutments, under spillways, and through the foundation and may at times exit some distance from the dam. Generally speaking, the further seepage

exits from the dam, the less the probability of danger. However, it is important that all areas of seepage related to the dam be watched for changes.

Erosion:

The dam and spillway is one of the most evident signs of danger. The size of erosion channels and gullies can increase greatly with slight amounts of rainfall. Early detection of erosion channels can greatly facilitate necessary repairs of refilling, regrading, and re-vegetation. Left unattended, erosion can reach proportions, which damage the integrity of the dam.

- Erosion along the water line due to wave action is another visible danger sign easily detected. Remedies usually involve refilling the area with rock or earth and the necessary re-vegetation.
- Erosion from seepage through the dam, foundations, and abutments is a danger signal. This is more difficult to repair due to the seepage water. Repair generally involves the refilling of the areas, along with measures to collect and filter the seepage water. Repairs usually require the services of an engineer.

Cracks:

The entire embankment should be closely inspected for cracks. Short isolated cracks are not usually significant, but larger, well-defined cracks indicate a problem is developing. Cracks are of two types: traverse and longitudinal.

- Traverse cracks appear perpendicular to the axis of the dam and indicate settlement of the dam. Such cracks are an available avenue for seepage water and piping could develop very quickly.
- Longitudinal cracks run parallel to the axis of the dam and may be the signal for a slide or slump on either face of the dam.
- Cracks usually call for lowering the lake and taking reconstruction measures. They generally require the consultation of an engineer for remedy.
- Cracks may be evident in other areas such as spillway cuts and landslides around the pool area.

Slides and Slumps:

Slides and slumps are usually the most detectable danger signal. A massive slide can mean catastrophic failure of the dam. Slides occur for many reasons, and their occurrence can mean a major reconstruction effort.

- Slides and slumps are normally preceded by cracks and regular inspection can prevent sudden failure. Repair will usually involve the lowering of the pool, but this can cause slides on the dam and around the pool in saturated material if the draw down if too rapid.
- Minor slides from heavy rainfalls or spring thaws can be repaired with minimal effort. Do not undertake repair of major slides or slumps without knowing the cause or causes. These repairs usually require the services of an engineer.

- Remove slides in the spillway areas immediately since their presence reduces hydraulic capacities. Slides into the lake area can cause the sudden displacement of lake volume and overtopping of the embankment.

Subsidence:

Subsidence is vertical movement of the foundation materials due to failure of consolidation. Rate of subsidence may be so slow that its detection can go unnoticed without proper inspection procedures.

- Foundation settlement is the result of placing the dam and reservoir on an area not having suitable strength or over collapsed caves or mines. At its onset, subsidence refers to movement over and beyond that anticipated. Subsidence may not have any well-defined cracks or seepage associated with it.
- Danger signals of subsidence include conduit displacements or separations at joints, conduit ruptures or collapses, and structure movements.
- Conduit separations or ruptures can result in water leaking into the embankment a subsequent weakening of the dam. Pipe collapse can result in hydraulic failures due to diminished capacity. It should be noted that rigid pipes, such as concrete pipes, are most likely to separate and crack, while flexible pipes, such as metal pipe conduits, are more subject to collapse.
- Structure movements can be noticeable signs of subsidence. Listing or tilting of structures, set in foundation material is signs of distress. Movements of intake or discharge structures can cause loss of function or conduits and diminished hydraulic capacities as well as endangering the stability of the dam due to introduction of water at conduit rupture points.
- Subsidence is measured on embankments by the referencing of some permanent type of markers on the dam and associated structures to points off the dams. Check elevations regularly for readings, which can give indications of subsidence.

Boils:

Boils are a serious danger signal and indicate seepage water exiting under some pressure. Boils typically, occur in areas downstream of the dam. In boils, material is being removed and measures must be taken to filter and discharge the seepage in a controlled manner. To determine the cause and provide a permanent remedy, you will usually need to consult an engineer.

Animal Burrows:

Animal burrows are a potential danger area. Inspection should include a careful search for dens on the dam and abutments. Remedies should include the removal of the animals and the refilling of dens made by the animals.

Debris:

The collection of debris on the dam and spillways has a potential for danger. Remove debris as

soon as possible so it cannot reduce the function of spillways, damage structures and valves, and destroy vegetative cover.

Part I - Monitoring Plan and Inspection Schedule

Part II - Emergency Action and Evacuation Plan

Part III - Post Evacuation Notification Procedure

Part IV - Administrative and Record Keeping

Appendices

Part I - Monitoring Plan and Inspection Schedule

Section A:

Normal Conditions:

Dry weather or occasional light rainfall.

- ✓ Inspection of trash racks, spillways, seepage zones
- ✓ Check for embankment cracking, slumps, sinkholes, bulges;
- ✓ Gate or equipment failure, concrete alignment, and vandalism.

Action	**Responsibility**
Inspect weekly/bimonthly/monthly as appropriate to condition of dam	Engineering, Collection Systems
If a serious problem is found proceed to Section B-C	Engineering, Collection Systems Safety

Section B:

Adverse Conditions:

Heavy or extended rainfall, flash flood warnings, snow-melt or serious new problems found under normal conditions such as slips, sinkholes or piping.

- ✓ Inspection of trash racks, spillways, spillway discharge levels, reservoir elevation and freeboard, seepage zones, embankment cracking or piping, slumps, sinkholes, bulges, gate or equipment failure, and concrete alignment.

Action	**Responsibility**
Inspect daily or more often as necessary Decrease reservoir level, if possible.	Engineering, Collection Systems
If a problem is observed which could lead to failure, proceed immediately to Section C.	Engineering, Collection Systems Safety

Section C:

Standby Alert

Condition of dam has deteriorated or water rises to predetermined and critical level of more than **4'** feet above the normal reservoir elevation and the top of the dam, near the crest of the embankment. This will include the following: excessive overflow from spillways, high spillway discharge levels, excessive freeboard, seepage, embankment cracking or piping, slumps, sinkholes, bulges, failure of gate, or equipment failure, and concrete alignment.

Standby Alert Notifications:

The responsible person shall phone or contact each agency listed below in sequence and covers the following items:

Check when completed:

____ Identify yourself
____ Refer to the dam by name, location and ID number (on title page)
____ Advise the person contacted that you are calling as required by the monitoring and emergency action plan
____ State the condition of the dam
____ State that a standby alert is declared
____ Advise the person contacted of any requested assistance or action
____ Answer any questions

Check when notified: Phone

- ____ KDOW Dam Safety Section **(24) hour 1-800-928-2380**
- ____County Office of Emergency Services **911**

Section D: Evacuation Conditions

The condition of the dam has deteriorated to the point where failure is likely to occur. Possible evacuation conditions the plan could list include overtopping of earthen dams, cracking, piping, spillway failure or obstruction, obvious deformation of the dam, etc.

Part II: Emergency Action and Evacuation Plan

Section A: Notification of Agencies

Action

1. Notify agencies not on-site using the checklists below name, home and work addresses-phones.

Check when completed:

____ Identify yourself
____ Refer to the dam by name, location and ID number (on title page)
____ Advise the person contacted that you are calling as required by the monitoring and emergency action plan.
____ State the condition of the dam
____ State that an evacuation notice is declared
____ Advise the person contacted of any requested assistance or action
____ Answer any questions

Section B: Evacuation notification of Downstream Persons

Part IV: Administrative and Record Keeping

Section A - Signature and Distribution List

Signature:

The undersigned states he/she will distribute a copy of the Monitoring and Emergency Action Plan for the _____

Dam Safety Section approval to the persons named in the Distribution List below:

Name	Title	Date

Distribution

- Kentucky Department of Dam Safety
- Campbell County Fire Departments
- Campbell County Law Enforcement Agencies

Appendix A:
Maintenance Plan

- The example maintenance plan format on the next two pages is strongly recommended in order to streamline approval of the plans. Dam Safety recognizes that some dams may require a different and more detailed plan. Alternate formats will be accepted, provided an equal or greater level of information is provided. The example plan aims for the simplicity of a vehicle maintenance chart with "X" in the month when maintenance items are to be performed. The owner may propose a different schedule on the blank chart pages provided after the example plan.

- The owner should submit the maintenance plan with any new or updated EAP submittal. The approved plan should be provided to engineers performing periodic inspections for the owner. The owner should consider alteration of an approved maintenance plan following each periodic inspection by the owner's engineer. Dam Safety may also require new or updated maintenance plans as a result of a state inspection.

APPENDIX A – EXAMPLE MAINTENANCE PLAN

MAINTENANCE PLAN FOR A. J. JOLLY LAKE DAM ID# 41

Type of Maintenance	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Monitoring Plan Inspection	X	X	X	X	X	X	X	X	X	X	X	X
Annual Engineer Inspection					X							
Embankment												
Mow Embankment			X				X			X		
Repair Erosion Gullies				X								
Revegetate Bare Areas				X					X			
Clean Embankment Outlet Pipe	X			X			X			X		
Repair All Animal Burrows			X		X		X		X			
Remove Trees/Brush				X					X			
Pipes and Conduits												
Inspect PSW Pipe Interior					X							
Repair/Replace Animal Guards				X						X		
Clear Subdrain Outlets					X							
Clear Debris from Stilling Basin				X								
Clear Brush/Trees from Outlet Channel				X								
Rock Rip-Rap												
Replace Missing/Moved Rock				X					X			
Remove Vegetation from Rocks				X					X			

EXAMPLE MAINTENANCE PLAN FOR SAMPLE DAM ID# 41 Date

Type of Maintenance	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Mechanical												
Exercise Gates/Machinery					X							
Lubricate Fittings/Bearings				X								
Remove Rust				X								
Repaint Metal Parts				X								
Concrete												
Remove Vegetation from Joints				X			X			X		
Reseal Joints/Cracks				X					X			
Repair Spalls/Cracks				X					X			
Clear Weep Holes				X						X		
Earth Spillways												
Repair Grass/Reseed				X					X			
Remove Obstructions				X			X			X		
Clear Side Slope Slides			X									
Clear Trees/Brush			X									
Repair Vehicle/Cattle Traffic Damage			X									
Repair/Replace Access Gates			X									

MAINTENANCE PLAN FOR A. J. Jolly Lake Dam DAM ID# 41 DATE

Type of Maintenance	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Monitoring Plan Inspection												
Annual Engineer Inspection												
Embankment												
Mow Embankment												
Repair Erosion Gullies												
Revegetate Bare Areas												
Clean Embankment Outlet Pipe												
Repair All Animal Burrows												
Remove Trees/Brush												
Pipes and Conduits												
Inspect PSW Pipe Interior												
Repair/Replace Animal Guards												
Clear Subdrain Outlets												
Clear Debris from Stilling Basin												
Clear Brush/Trees from Outlet Channel												
Rock Rip-Rap												
Replace Missing/Moved Rock												
Remove Vegetation from Rocks												

MAINTENANCE PLAN FOR A. J. Jolly Lake Dam DAM ID# 41 2002

Type of Maintenance	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Mechanical												
Exercise Gates/Machinery												
Lubricate Fittings/Bearings												
Remove Rust												
Repaint Metal Parts												
Concrete												
Remove Vegetation from Joints												
Reseal Joints/Cracks												
Repair Spalls/Cracks												
Clear Weep Holes												
Earth Spillways												
Repair Grass/Reseed												
Remove Obstructions												
Clear Side Slope Slides												
Clear Trees/Brush												
Repair Vehicle/Cattle Traffic Damage												
Repair/Replace Access Gates												

MAINTENANCE PLAN FOR A. J. Jolly Lake Dam DAM ID# 41 2002

Type of Maintenance	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

STANDBY ALERT CONDITION
(REQUEST FOR PUBLIC SERVICE ANNOUNCEMENT BY DAM MONITOR)

The standby alert condition is declared when a dam's condition has deteriorated to the point that continuous observation of the dam is necessary. The declaration of standby alert allows all of the people and agencies that would be involved in the evacuation notification process to mobilize their resources to act promptly should the situation deteriorate further.

MEDIA CONTACT:(STANDBY ALERT CONDITION*)*

"This is (callers name), calling to inform your station that a Standby Alert condition has been declared for the A. J. Jolly Lake Dam, ID# _____, at _____, [perhaps giving local name of dam or lake might increase recognition rather than a ID number] in _____ County. A standby alert means that authorized personnel will continuously monitor the dam until further notice and will take additional action if the situation worsens. NOTE TO CALLER: STATE THE CONDITIONS FOR WHICH A STANDBY ALERT IS BEING DECLARED, IF APPLICABLE). A standby alert condition is being declared in accordance with the Monitoring and Emergency Action Plan for this structure. Persons living immediately below the dam should be advised to remain alert and to be prepared to evacuate the area if notified. Individuals should seek high ground if the sound of rushing water is heard or rapidly rising stream levels are observed. They should be advised to stay tuned for further information."

EVACUATION NOTIFICATION CONDITION
(MEDIA CONTACT BY EMERGENCY PERSONNEL)

The evacuation notification condition is declared when the responsible person or agency personnel at the site decides a dam's condition has deteriorated to the extent where persons living downstream may be endangered. Upon declaration of this phase of the emergency action plan, evacuation notification of downstream residents is required. The example monitoring and emergency action plan lists structural deterioration conditions and events such as overtopping of earthen embankments, obvious deformation of the dam, etc. as possible evacuation conditions. The person in charge at the dam must use his/her judgement to decide if evacuation of downstream persons is advisable. When the EVACUATION NOTIFICATION CONDITION is declared, authorized emergency officials suggest the following statement for media contact:

MEDIA CONTACT: (EVACUATION CONDITION)

"This is (name of caller), calling to inform you that an Evacuation notification condition has been declared for the _____ Dam, near _____, in _____ County. (Note to caller: Describe the potentially affected area to the extent possible.) Persons in the affected area should seek high ground immediately and follow all orders given by emergency officials on site. The lives of all persons who remain in the evacuation area may be at risk. Emergency shelters are being established at (Note to Caller: Give location of shelter(s) as identified in the EAP). Persons should not return to the evacuated area until emergency officials have advised them to do so."

Statutory Authority

Kentucky Revised Statues

(KRS) 151.125, 151.230

NECESSITY, FUNCTION, AND CONFORMITY:

This administrative regulation provides minimum standards necessary to ensure the wise use of the Commonwealth's flood prone areas while protecting the safety and welfare of the public and preventing both flood damages and increased flood levels. These aims are addressed through provisions, which require that all development in the base floodplain be in a manner, which precludes flood damages. In addition, there are provisions, which ensure that flood levels are not unduly increased. The provisions of this administrative regulation will be implemented through the permitting authority in KRS 151.250.

Section 1. Definitions. Terms used in this administrative regulation shall have the meanings given them in KRS 151.100 or this section.

(1) "Backwater effect" means the rise in water surface elevation caused by obstruction of a stream's flow, such as by a narrow bridge opening, buildings or fill material that limits the area through which the stream's flow must pass.

(2) "Base flood" means the flood having a one (1) percent chance of being equaled or exceeded in any given year, also called the 100-year frequency flood.

(3) "Base floodplain" means the area along, adjacent to, and including a stream, which is inundated by the base flood on that stream.

(4) "Basement" means any area of the building having its floor below ground level on all sides.

(5) "Conveyance" means a measure of the flow-carrying capability of a stream cross section and is equal to the flow rate at a given depth in cubic feet per second divided by the square root of the slope of the energy grade line in feet per foot.

(6) "Cross section" means a graph or plot of ground elevation across a stream valley or portion of it along a line perpendicular to the direction of stream flow.

(7) "Designated floodway" means the stream and that portion of the adjacent base floodplain specified by a local ordinance or indicated on National Flood Insurance Program maps to be kept free of obstructions to the passage of flood flows.

(8) "Energy grade line" means a representation of the total energy possessed by flowing water. The value at any point on the line can be expressed as an elevation in feet above mean sea level equal to the elevation of the water surface plus the hydraulic head. Hydraulic head is approximately equal to the quotient of the square of the average velocity over the cross section divided by twice the acceleration of gravity ($V^2/2g$).

(9) "Flood crest" means the maximum stage or elevation reached or expected to be reached by waters of a specific flood at a given location.

(10) "Flood frequency" means a statistical expression of the average time period between floods equaling or exceeding a given magnitude.

(11) "Flood proofing" means structural changes or adjustments to new or existing structures and facilities, their contents, or their sites for the purpose of reducing or eliminating flood damages by protecting against structural failure, keeping water out, or reducing the effect of water entry.

(12) "Flood warning" means the issuance and dissemination of information about an imminent or current flood.

(13) "Historic structure" means any structure that is:

(a) Listed individually in the National Register of Historic Places or preliminarily determined by the Secretary of the Interior as meeting the requirements for listing;

(b) Certified or preliminarily determined as contributing to the historical significance of a registered historic district;

(c) Listed on the state inventory of historic places; or

(d) Listed on a local inventory of historic places in communities with historic preservation programs approved by the state or the Secretary of the Interior.

(14) "Lowest floor" means the lowest floor of the lowest enclosed area, including any basement. An unfinished or flood resistant enclosure usable solely for parking of vehicles, building access, or storage of mobile equipment or of property that is not flood damageable in an area other than a basement is not considered a building's lowest floor.

(15) "Manufactured home" means a structure, transportable in one (1) or more sections that is built on a permanent chassis and designed for use with or without a permanent foundation when connected to utilities. The term includes park trailers and similar vehicles placed on a site for greater than 180 consecutive days.

(16) "National Flood Insurance Program", or "NFIP", means a federal program, which makes available flood insurance protection to property owners in flood prone areas. To qualify for the sale of this federally-subsidized flood insurance, this program requires a

community to adopt and submit to the Federal Emergency Management Agency (FEMA) base floodplain management regulations which satisfy FEMA's minimum requirements designed to reduce or avoid future flood or flood related damages.

(17) "100-year flood" means a flood of a magnitude having a one (1) percent chance of occurring in any given year and which, over a very long period of time, can be expected to be equaled or exceeded on the average of once every 100 years.

(18) "Permit" means a permit for construction across, along, or adjacent to a stream subject to the provisions of KRS 151.250 but does not mean permits for the construction of dams.

(19) "Profile" means a graph or plot elevation of the water surface or channel bottom against distance along the stream.

(20) "Regulatory floodway" means the stream channel and that portion of adjacent land area that is required to pass flood flows without raising the base flood crest elevation by more than one (1) foot. In areas where three (3) or more houses or commercial or industrial buildings may be affected, backwater effect used to determine the regulatory floodway may be limited to less than one (1) foot.

(21) "Stream" means any river, creek or channel, having well-defined banks, in which water flows for substantial periods of the year to drain a given area, or any lake or other body of water in the Commonwealth.

(22) "Substantial improvement" means any combination of repairs, reconstruction, alteration, or improvements to a structure, taking place during a five (5) year period, in which the cumulative cost equals or exceeds fifty (50) percent of the market value of the structure. The market value of the structure shall be:

(a) The appraised value of the structure prior to the start of the initial repair or improvement; or

(b) If damage has occurred, the value of the structure prior to the damage. Substantial improvement is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include any project for improvement of a structure required to comply with existing health, sanitary, or safety code specifications, which are solely necessary to assure safe living conditions.

Section 2. Applicability. This administrative regulation shall apply to all construction across, along, or adjacent to a stream (i.e., the base floodplain) or in the floodway of a stream for which a construction permit is required pursuant to KRS 151.250, except for the construction of dams as defined in KRS 151.100.

Section 3. General Provisions. (1) This administrative regulation shall constitute minimum criteria for the issuance of permits for stream construction pursuant to KRS 151.250. If the cabinet determines that additional information is pertinent or best engineering practice is required, it may apply more stringent considerations.

(2) The permittee shall provide the cabinet with written notification that construction was completed in accordance with approved plans and specifications not later than ninety (90) days after completion of construction.

(3) Any construction limits specified in the permit shall be plainly staked or otherwise marked on the site.

(4) Public notification.

(a) As part of the stream construction permit issuance procedure, each applicant shall provide notice to all parties who might incur additional flood-related damages as a result of the construction that a permit has been requested, except as provided in subparagraph 3 of this paragraph.

1. For those projects that the cabinet determines may have flooding impacts beyond the local area of the construction, the applicant shall publish a notice in the newspaper having greatest circulation in the area of the proposed construction. This notice shall provide:

a. The name of the applicant;

b. The location, nature, and extent of the proposed construction; and

c. The address and telephone number of the Division of Water and stating the comments and objections shall be directed to the division. The notice shall be run for period of three (3) consecutive days or printings of the newspaper; however, for weekly newspapers the cabinet may reduce this requirement to two (2) consecutive printings upon written request of the applicant.

2. Where the cabinet determines that flood impacts will be localized, the applicant may obtain and submit affidavits from all parties who reside, own property, or have other legitimate property interests in the affected areas. This affidavit will contain a complete description of the proposed construction, a place for concerned parties to sign indicating that they have read the statement and that they understand that a permit application is being submitted to the cabinet, and the name and address of the cabinet representative to whom statements of concern or request for hearing may be addressed.

3. For construction projects that the cabinet determines will have negligible flood impacts (e.g. placement of electrical utility power poles or transmission towers where no fill is included or minor stream-bank restoration), the cabinet may waive the public notification requirement after receipt of a written request from the applicant to do so.

4. The cabinet will notify all persons filing comments or objections to the issuance of any permit of their right to be heard pursuant to the provisions of KRS 151.182(2).

(b) Proof that the notice was published or the original of the completed affidavit, as applicable, shall be provided to the cabinet before the application will be considered complete; however, technical review of the application by the cabinet may proceed before proof is provided. Issuance of the permit shall not proceed until sufficient proof of notice is submitted.

(c) The public notice required in paragraph (a)1 of this subsection shall be at least three (3) column inches in size, and shall be large enough that all of the information required in paragraph (a)1 of this subsection is easily readable.

(d) If the cabinet determines any of the conditions of paragraph (a) of this subsection are not met by the initial notice or affidavit, it may require that the applicant place another notice or provide another affidavit which does so. The application will not be considered complete until the applicable public notification provisions of this subsection are satisfied.

Section 4. Uses of Regulatory Floodway. (1) Except as provided below, no fill, deposit, obstruction, excavation, storage of materials, or structure, either alone or in combination with existing or future similar works, which may adversely affect the efficiency or the capacity of the regulatory floodway, existing streams, or drainage facilities shall be placed in the regulatory floodway. The determination of adverse effects shall be based on the assumption that all allowable encroachment will occur above and below the project site and on both sides of the stream and shall be made in the manner described in Section 5 of this administrative regulation. Structures that are:

(a) Designed for human habitation;

(b) Associated with high flood damage potential;

(c) Not connected with permitted open space uses; or

(d) Structures consistent with open space uses, but that could themselves obstruct flood flows, shall not be located in the regulatory floodways. No person shall store materials that are buoyant, flammable, explosive, or injurious to human, animal or plant life within regulatory floodway limits.

(2) The following activities or structures are allowed for land within the regulatory floodway limits of a stream if they are not of such nature as to result in increases in flood elevations:

(a) Open space uses having no appreciable flood damage potential such as those associated with agriculture, civilculture, recreation, parking, storage yards, and certain sand and gravel operation;

(b) Certain structures that are related to allowable open space uses if the structures are designed, constructed and placed on the lot to offer the minimum obstruction to flood flows;

(c) Structures necessary for navigation and waterborne freight handling, for transportation or utility crossings, if the cabinet determines that every effort has been made to reduce the impact of all such facilities on flooding and if the facilities considered alone or in conjunction with permissible development above and below it and on the opposite side of the stream do not create an increase in flood elevations in excess of that which is appropriate for determination of the floodway boundaries at that site as discussed in Section 5 of this administrative regulation;

(d) Dredging or other removal of material from between the stream banks, if disposal of the dredged material is outside of the regulatory floodway; and

(e) Other activities exempted by 401 KAR 4:020 and 4:050.

Section 5. Determining Regulatory Floodway Boundaries. (1) The regulatory floodway boundaries shall include the stream channel and that portion of the adjacent land areas required to pass the base flood discharge without increasing the water surface elevation at any point more than one (1) foot. Where the stream flow is supercritical, or where velocity is so high that backwater considerations are not possible or appropriate, the determination of regulatory floodway boundaries shall be based on a one (1) foot maximum allowable rise in the energy grade line. When making these calculations, the cabinet will use methods, which consider equal conveyance losses on, opposite sides of the stream.

(2) For stream segments for which a local government has used methods comparable to those specified in this section to define floodway boundaries and has adopted these boundaries by ordinance or for which the Federal Emergency Management Agency (FEMA) has determined and mapped floodway boundaries, the cabinet will consider these designated floodway boundaries to define the regulatory floodway. If both locally-determined floodway boundaries and FEMA maps are available, the more stringent shall apply for purposes of this administrative regulation.

(3) Notwithstanding any other provisions of this administrative regulation, in areas where three (3) or more houses or commercial or industrial buildings may be affected by flooding or at other locations where, on a case-by-case basis, the cabinet determines that the one (1) foot increase in base flood elevation allowable in determining regulatory floodway boundaries would create an undue increase in flood damages, the cabinet may impose a more stringent limitation on the floodway determination.

(4) Base flood flow information shall be determined by one (1) of the following methods, which are listed in descending order of preference:

(a) The base flood flow frequency curve for gauged sites on unregulated streams shall be obtained from the district office of the U.S. Geological Survey, Water Resources Division or the appropriate U.S. Army Corps of Engineers district office. These data shall be applied so as to provide the best discharge estimates for the site under consideration. Peak discharges for ungauged sites on a gauged stream may consider both the gauged site information and information from an appropriate regional estimate, where available. The transfer technique for establishing discharges at the ungauged location shall be by interpolation or extrapolation methods in keeping with best engineering practices. For gauged streams with regulated flows, peak discharges shall be obtained from the agency responsible for the regulation.

(b) For ungauged streams one (1) of the following shall be used:

1. Where the watershed area is greater than ten (10) square miles, the source of information shall be "Techniques for Estimating Magnitude, Frequency, and Duration of Flows in Kentucky," U.S. Army Corps of Engineers, incorporated by reference in 401 KAR 4:200;

2. Where the watershed area is greater than three (3) square miles but less than 100 square miles, base flood flow shall be based on the U.S. Soil Conservation Service's "National Engineering Handbook, Section 4: Hydrology," incorporated by reference in 401 KAR 4:200; or

3. Where drainage areas are less than ten (10) square miles, the cabinet may approve the use of other generally accepted methods in keeping with best engineering practices.

(5) In performing the calculations for regulatory floodway boundaries, the cabinet will use standard engineering practices.

(a) The applicant shall provide cross sections for determining floodway boundaries at any proposed construction site where FEMA maps are not available. All cross sections shall be referenced to mean sea level and shall have vertical error tolerances of no more than + five-tenths (0.5) foot. Cross sections elevations shall be taken at those points which represent significant breaks in slope and at points where hydraulic characteristics of the base floodplain change. Each cross section shall extend across the entire base floodplain and shall be in the number and at the locations specified by the cabinet. If necessary to ensure that significant flood damage will not occur, the cabinet may require additional cross sections or specific site elevations, which extend beyond those needed for making routine regulatory floodway boundary calculations.

(b) Roughness values for use in regulatory floodway computations shall be calibrated from existing flood information, where possible. If the information is not available, the

cabinet shall base these values on the professional judgment of the cabinet's staff in keeping with best engineering practices. The cabinet may require the applicant to provide photographs or other information, which may be helpful in making this determination.

(c) Slope values used for regulatory floodway boundary calculations shall be based on flood profiles where available.

(d) Conveyance loss shall be calculated through an equal loss method.

Section 6. Placement of Flood-damageable Property in Floodplain. (1) To minimize or prevent the harmful effects of stream flooding, the cabinet shall not issue permits for the placement or construction of flood-damageable property in the base floodplains of streams, unless the placement or construction conforms to the requirements of the following subsection.

(2) In issuing construction permits pursuant to KRS 151.250 for the placement of flood-damageable property within the base flood inundation area the cabinet shall require the following:

(a) All new construction and substantial improvements of residential structures within the base floodplain shall have the lowest floor (including basement) elevated to at least the base flood level or to higher level if the local government has a more stringent requirement, unless granted an exception by the cabinet for the allowance of basements or storm cellars which shall be properly flood proofed;

(b) All new construction and substantial improvements of nonresidential structures within the base floodplain shall meet the following conditions:

1. The lowest floor (including basement) shall be elevated to the base flood level or above; or

2. Together with attendant utility and sanitary facilities, shall be designed so that below the base flood level the structure is properly flood proofed with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

(c) The floor elevation or the flood proofing certification shall be provided by the permittee after the lowest floor is completed. Upon placement of the lowest floor, or flood proofing by whatever construction means, the permit holder or owners shall submit to the Division of Water a certification of the elevation of the lowest floor or flood proofed elevation, whichever is applicable, as built, in relation to mean sea level. The certification shall be prepared by or under the direct supervision of a registered land surveyor or professional engineer and certified by same. If flood proofing is used for a particular building, the certification shall be prepared by or under the direct supervision of a professional engineer and certified by same. Any work undertaken prior to submission of the certification shall be at the permit holder's or owner's risk. The

Division of Water shall review the floor elevation survey data submitted. The permit holder or owner shall correct deficiencies detected by the cabinet's review immediately and prior to further progressive work being performed. Failure to submit the survey or failure to make said corrections required hereby, shall be cause to issue a stop-work order for the project; and

(d) All manufactured homes, except in an existing manufactured home park or subdivision, shall be elevated to the base flood elevation and properly anchored to resist flotation, collapse, or lateral movement. If placed in an existing manufactured home park or subdivision the home shall be elevated no less than three (3) feet above grade, and properly anchored. Any manufactured home in an existing manufactured home park that has incurred damage equal to or exceeding fifty (50) percent of its predamaged market value as a result of a flood shall be elevated to the base flood elevation and properly anchored. The expansion of an existing manufactured home park or subdivision constitutes new construction and placement in that newly developed area shall conform to both base flood elevation and anchoring requirements.

Section 7. Construction Materials. To avoid secondary adverse impacts from stream construction projects, all materials used in projects shall be stable and inert, shall be free from pollutants and floatable objects, and shall meet all appropriate engineering standards applicable to the construction project.

Section 8. Variances and Exceptions. (1) Encroachments which cause a backwater effect of more than one (1) foot may be allowed by the cabinet if the applicant owns the entire affected property on both sides of the stream, the amount of backwater at the nearest upstream property line is no more than considerations in Section 5 of this administrative regulation would allow, and the cabinet has reasonable assurances that none of the applicant's property within the area of the excessive backwater will be subdivided and sold. Reasonable assurances shall include zoning considerations that would preclude subdivision of the property or deed restrictions or easements that create such a binding condition. All structures built in these areas shall have their lowest floor elevation at or above the altered elevation or be flood proofed to that elevation.

(2) The cabinet may allow regulatory floodway boundaries to be shifted by changing allocation of conveyance losses. In doing this, the cabinet may redesignate the regulatory floodway boundary on one (1) side of a stream to be closer to the stream channel if a permanent flooding easement is provided for a compensating area on the opposite side. This easement shall include that area extending from the top of the opposite stream bank to whatever distance away from the stream that is required to compensate for the proposed streamward shift of the floodway boundary. The easement shall specify the Commonwealth as owner of the easement rights and shall prohibit the placement of any obstruction on the property. The easement shall be filed of record in the county where the county is located and the grantor shall provide proof to the cabinet that the easement has been recorded. In addition, the cabinet may impose any other conditions it determines to be necessary to offset potential adverse flooding impacts. If regulatory floodway

boundary changes are approved by the cabinet, the applicant shall be responsible for having changes made to the appropriate FEMA boundary maps.

(3) Areas along streams may be incorrectly indicated as being within the designated floodway on FEMA maps. If an error is suspected, an applicant may request the cabinet to perform an independent analysis of the situation. The applicant shall be responsible for obtaining all site-specific information for the analysis including, if necessary, the information used for the initial FEMA study. The cabinet will perform the analysis and, if the mapped information is indeed incorrect, it will assist the local community, as resources allow, in getting the maps revised. The cabinet's permit will reflect the boundaries determined by the corrected analysis.

(4) Exceptions to Section 6 of this administrative regulation may be allowed for the reconstruction, rehabilitation, or restoration of historic structures upon the cabinet's determination that the proposed repair, rehabilitation, or restoration will not preclude the structure's continued designation as a historic structure and that the exception is the minimum necessary to preserve historic character and design of the structure.

(5) Exceptions may be allowed for the requirement of a hydraulic or hydrologic study for the replacement or reconstruction of county or city bridges, if it is demonstrated to the satisfaction of the cabinet that: