	Lake Manitou Association **Process & Procedure Documentation** **Dam/Spillway Maintenance, Operations, and Emergency Response Plan**		
Process 5	**The electronic version of this document is controlled; all other versions are uncontrolled (for reference only)**		
Process Owner:		Date Updated:	Version Number:
Lake Manitou President		9/21/2016	

1. OBJECTIVE/PURPOSE:

The purpose of developing and maintaining the Dam/Spillway Maintenance, Operations and Emergency Response Plan is to:

(1) Document the key critical success factors to successfully maintain the Lake Manitou dam and spillway and provide a convenient vehicle to convey that knowledge to the Lake Association.

(2) Document the annual maintenance activities that are to be conducted in and around the dam and spillway areas.

(3) Define any Lake Manitou Association or Lake Manitou resident restrictions regarding the use of the dam and spillway including intentional and unintentional uses.

(4) Document the action items, recommendations, and status of implementation from each dam survey.

(5) Establish annual budget requirements for dam maintenance and inspection frequency.

(6) Document the steps and process in responding to potential dam and spillway failures including whom to notify and what specific actions to take during the onset of the event.

2. RESPONSIBILITIES:

Lake Manitou President – Lake Manitou Officer responsible to prepare and present the budget for dam and spillway maintenance, responsible for the initial execution of the Emergency Response Plan and for review/update of this document annually.

Lake Manitou Board – responsible to approve the annual dam and spillway maintenance budget and for approving any additional funds as required to remediate findings from an official dam or spillway inspection.

Employment Committee Chair – responsible for directing the daily work activities of the Lake Manitou maintenance personnel including performing routine maintenance (mowing, brush removal) of the dam and spillway and for performing formal observations of the dam and spillway condition including checking for seepage flow through the embankments. The Employment Committee Chair will keep a log of personal observations and observations from other Lake Manitou Association members, stop log operation (installation and removal), and Lake level measurements.

Secretary – responsible to provide the notification mailings when directed by the Lake Manitou President.

3. DEFINITIONS:

Board – Lake Manitou Board of Directors & Officers

4. PROCEDURE / DESCRIPTION:

The following are the procedures and guidelines used in Operating and Maintaining the Lake Manitou dam and spillway:

Stop Log Operation:

The water level in Lake Manitou is controlled by the installation or removal of wooden boards in the spillway located on the north side of the lake. The spillway has three sections of boards that control the volume of

water leaving the lake. The lowest installed board will control the level of the lake as water will seek it's own level and, over time, will not be higher than the lowest board.

A Lake Manitou Board Member is assigned the responsibility of installation and removal of the boards in the spillway. The Lake Manitou Board of Directors approved an addition to the Lake Manitou Special Record in 2002 stating that only a Lake Manitou Officer, Board Member, or someone working at the direction of the Lake Manitou Board of Directors is authorized to install or remove boards from the spillway. All others are not authorized to install or remove the boards and violations of this restriction would likely result in litigation.

There are several landmarks that have been used to measure Lake level: The culvert under Waugh Road, the Spillway itself, the seawall installed by Dave Acton, and the stump in Waugh channel. The use of the shoreline is not a good indication of water level as continual erosion of the shoreline typically occurs and shoreline landmarks cannot adequately define lake levels.

The flushing rate for Lake Manitou is 2.12 times per year… this means that the total water volume of Lake Manitou flows in and out of Lake Manitou an equivalent of 2.12 times each year. With that level of flushing, the water level is closely monitored to ensure we are effectively managing the lake level. The strategy for Lake Manitou is to remove two six inch boards from the center of the spillway in the fall, lowering the lake level to allow aquatic shore vegetation to be removed, provide additional shore protection during the icy periods, and to reduce the damage of ice on seawalls, docks, the spillway, the dam, etc.

The boards are kept out until after the spring rains, usually late May, and the lake level is increased to allow sufficient depth for boating and to provide water for lawn irrigation. During the summer months and especially through periods of low rain, the lake level naturally drops due to evaporation and irrigation and will quite often stop flowing over the spillway boards due to the lack of water input. Once the summer boating season has concluded, several boards are usually removed in October and the lake level management cycle completes. There are special situations where additional board adjustments are made throughout the year. These adjustments are typically in response to inordinate rainfalls where additional boards must be quickly removed to lower the lake level that invariably encroaches on the homeowner properties on the west side of the lake.

During the 2004 Lake Association summer annual meeting, the Lake Board and membership approved a new policy in the event of a high moisture year as follows:

1. Leave the spillway boards out in April thru late May.
2. Install all the spillway boards in either very late May or early June depending on conditions.
   - In a normal year, evaporation will draw down the lake level naturally in June and July.
3. There are 3 rows of boards, any time water goes over the top of the 3rd board we will pull a board.
4. In an abnormally wet year, we will install a 4" board July 1 lowering the lake level down 2", replace the 4" board with a 2" board July 15th lowering the lake level another 2", and remove the board on August 1st to simulate a normal evaporative draw down.

We will remove a total of two full 6" boards from the center row of the spillway between Oct 1st and Oct 15th depending on continued warm weather to support the boating season.

Stop Log Operation Log:

The operation of the stop logs will be recorded in a separate document, however, will adhere to the following format:

Date:	Activity authorized by:	Activity performed by:	Water Level	Description of Activity

The Lake Manitou web site may be a convenient medium to use to post and record these observations.

Routine Maintenance:

The routine maintenance tasks of mowing, brush removal will be performed 2-3 times per year depending on conditions and at the direction of the Employment Committee Chair. Brush removal includes all bushes and small trees growing on the face or back side of the dam and sides or immediately downstream of the spillway to a distance of 10 foot from the toe of the dam or end of the spillway. The dam and spillway are to be inspected by the Employment Committee Chair upon completion of the maintenance activity. Any seepage or other anomalous dam and spillway observations are to be reported immediately by the maintenance workers to the Employment Committee Chair or the Lake President.

Observation Log:

The Employment Committee Chair will keep a log of personal observations and observations from other Lake Manitou Association members regarding the condition of the dam and spillway including:

- Monthly checks for seepage flow through the dam embankment
- Monthly checks for seepage around the spillway channel
- Monitoring of soil erosion underneath the concrete slabs of the spillway channel
- Monitoring of off road vehicular traffic crossing the downstream outlet channel, which has been restricted in the Lake Manitou Special Record.

The log will be kept as a separate document, however, it will adhere to the following format:

Date:	Reported by:	Recorded by:	Dam or Spillway	Observation

The Lake Manitou web site may be a convenient medium to use to post and record these observations.

Tree / Brush Removal:

Any trees and brush that may develop on the earth embankment, both upstream and downstream slopes, to a point 10 feet downstream of the toe of the dam embankment are to continue to be removed as well as trees and brush in the outlet channel downstream of the spillway.

Plan Maintenance:

The Dam/Spillway Operations and Maintenance Plan will be formally reviewed annually and updated as changes are identified or needed. The action items resulting from a dam or spillway inspection will be documented in the Dam/Spillway Action Item Log.

Dam/Spillway Action Item Log:

The action items resulting from a dam or spillway inspection will be documented in the Dam/Spillway Action Item Log and will adhere to the following format:

Observation Date:	Reported by:	Description:	Comment/Status:	Due Date:	Person Responsible

The Lake Manitou web site may be a convenient medium to use to post and record these observations.

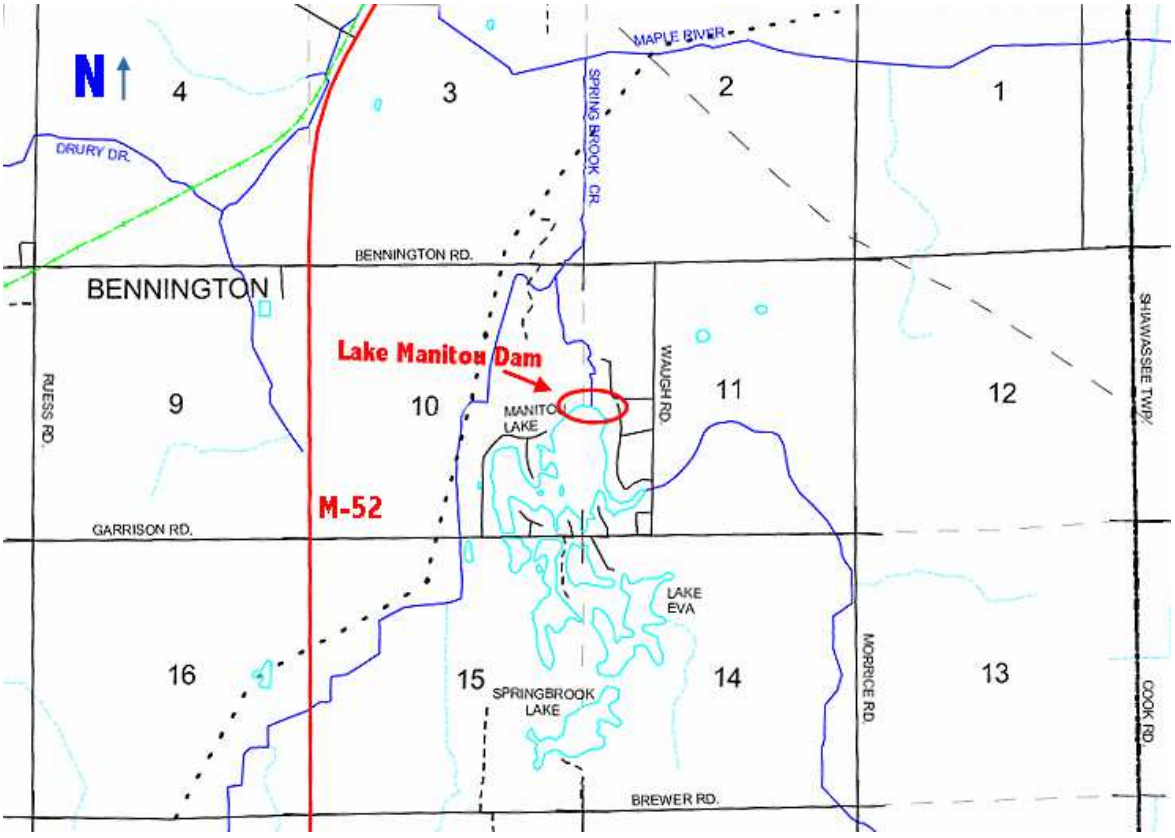
(See the next page for the Emergency Action Plan)

5. EMERGENCY ACTION PLAN:

Lake Manitou Dam
EMERGENCY ACTION PLAN

The purpose of the Emergency Action Plan (EAP) is to safeguard lives and reduce damage to the property of the citizens living around Lake Manitou in Shiawassee County in the event of a dam or spillway failure.

DAM ID # 0401
LOCATION:
SOUTHEAST QUARTER OF SECTION 10 AND SOUTHWEST QUARTER OF SECTION 11, TOWN 6 NORTH, RANGE 2 EAST (T6N-R2E), BENNINGTON TOWNSHIP, SHIAWASSEE COUNTY, MI



This dam consists of a 385-foot earth embankment and a 17-foot wide, 18-foot high metal pile spillway. All DEQ recommendations have been carried out and the dam is in good condition.

EMERGENCY CONTACT LIST			
LAKE MANITOU PRESIDENT	Chris Hannah	(989) 413-0395	
LAKE MANITOU VICE-PRESIDENT	Laurie Bateman	(989) 723-7642	(989) 277-7539
LAKE MANITOU TREASURER	Patti Sidebottom	(734) 516-8142	
LAKE MANITOU SECRETARY	Sandy Morrill	(989) 729-8558	
LAKE MANITOU BOARD OF DIRECTORS	Brian George	(989) 413-9140	
	David Hedges	(989) 723-8633	(989) 277-6973
	Ed Franks	(989) 723-5966	
	Kathy Landes	(989) 277-1287	
	Fred Farkas	(734) 417-1276	
	Dave Gagnier	(989) 413-9295	
SHIAWASSEE COUNTY DRAIN OFFICE	Tony Newman *Drain Commissioner*	(989) 743-2398 Fax: (989) 743-2474	
AMBULANCE SERVICE	Owosso Township Rescue	911	
FIRE DEPARTMENT	Owosso Township Fire Department	911	
POLICE / SHERIFF DEPARTMENT	Shiawassee County Sheriff Dept.	911	
EMERGENCY MANAGEMENT DEPARTMENT	Director	(989) 743-5841	
MDEQ DAM SAFETY UNIT		(800) 292-4706	
SHIAWASSEE COUNTY ROAD COMMISSION	Don Nichols	(989) 743-2228 Ext 213	
NATIONAL WEATHER SERVICE	Amos Dodson or Rachel Kulik	Office: (248) 625-3309	
POTENTIAL CONTRACTORS	Jeff Bartz Excavating Tim Cordier Excavating	(989) 429-2243 (517) 749-2595 (989) 723-4322 (989) 274-1063	
LOCAL TV	WILX-Lansing	(517) 393-0110	
	WJRT- Flint	(810) 257-2800	
LOCAL RADIO	WKAR-Lansing	(517) 432-9527	
	WFUM-Flint	(743) 764-9210	

GENERAL INFORMATION	
Location of Dam (see site location map):	Southeast quarter of Section 10 and southwest quarter of Section 11, Town 6 North, Range 2 East (T6N-R2E), Bennington Township, Shiawassee County, MI
Impounded Water Body:	Lake Manitou
Drainage Basin:	Spring Brook to the Maple River, part of the Grand River basin
Drainage Area:	2448 acres or 3.8 square miles
Height of Dam:	18 feet
Impoundment Size:	80 acres
Normal Storage:	810 acre-feet or 263,921,328 gallons
Hazard Potential Classification:	Low
Dam ID #:	0401

Person/Organization responsible for operation of the dam (owner):

Lake Manitou Association and the Lake Manitou Officers and Board of Directors
PO Box 61, Owosso, MI 48867
Represented by Chris Hannah, President (989) 413-0395
4929 Ottawa Ct, Owosso, MI 48867

Local Emergency Management Coordinator:

Director
Emergency Services
149 E. Corunna Avenue, Corunna, MI 48817
(989) 743-5841

EMERGENCY ACTION PLAN (EAP) ACTIVATION:

This EAP shall be activated if there is a potential for failure in the dam or spillway, including:

- An observation of significant or increasing seepage through the earth embankment at the dam or through the embankment at the spillway
- An increase in the impoundment level of at least 2-3 feet (i.e. within 2-3 feet of the top of the dam) and the impoundment level is continuing to increase.

This EAP shall be activated if failure of the dam or spillway is occurring, failure will include:

- Overtopping of the dam
- Seepage through the embankment of the dam and/or the spillway that has increased to a state where the embankment is collapsing and is considered to be in an irreversible situation.

ACTIONS THAT SHALL BE TAKEN:

The Lake Manitou Board Shall:

1) Maintain continuous observation of the structure until situation stabilizes and is considered to be safe.
2) Contact 911 Emergency Response.

   911 Emergency Response will then:

   - Contact Emergency Management Coordinator Director or Desginee
   - Alert ambulance service (Owosso Township Rescue)
   - Alert fire department (Owosso Township Fire Dept.)
   - Alert Police/Sheriff Departments
     - Shiawassee County Sheriffs Department
     - Michigan State Police

3) Alert MDEQ Dam Safety Unit: (800) 292-4706.
4) Alert County Road Commission.
5) Contact contractors to begin disaster mitigation.

The Owosso Township Fire Department and/or Shiawassee County Sheriffs Department Will:

1) Contact, in person, all downstream residents of a failure or potential failure of the dam or spillway.
2) Contact local media.

The Shiawassee County Road Commission Will:

1) Monitor and/or close necessary road crossings.

The Lake Manitou Board (or designee) along with the Contractors shall:

1) Remove stop logs at the spillway to draw the impoundment down to a safe level, provided this can be accomplished in a safe manner.
2) Backfill any breach in the dam with clay material provided this can be done in a safe manner.

BUILDINGS, STRUCTURES, AND RESIDENTS THAT MAY BE THREATENED BY FLOODING:

In general, the system of streams and county drainage ditches located directly downstream from the Lake Manitou dam and spillway would reduce the flood wave peak produced by a significant failure of either feature. Estimated damage to any downstream buildings, structures, residents, etc. would be minimal.

Some residents and structures that may be susceptible to flooding include the following:

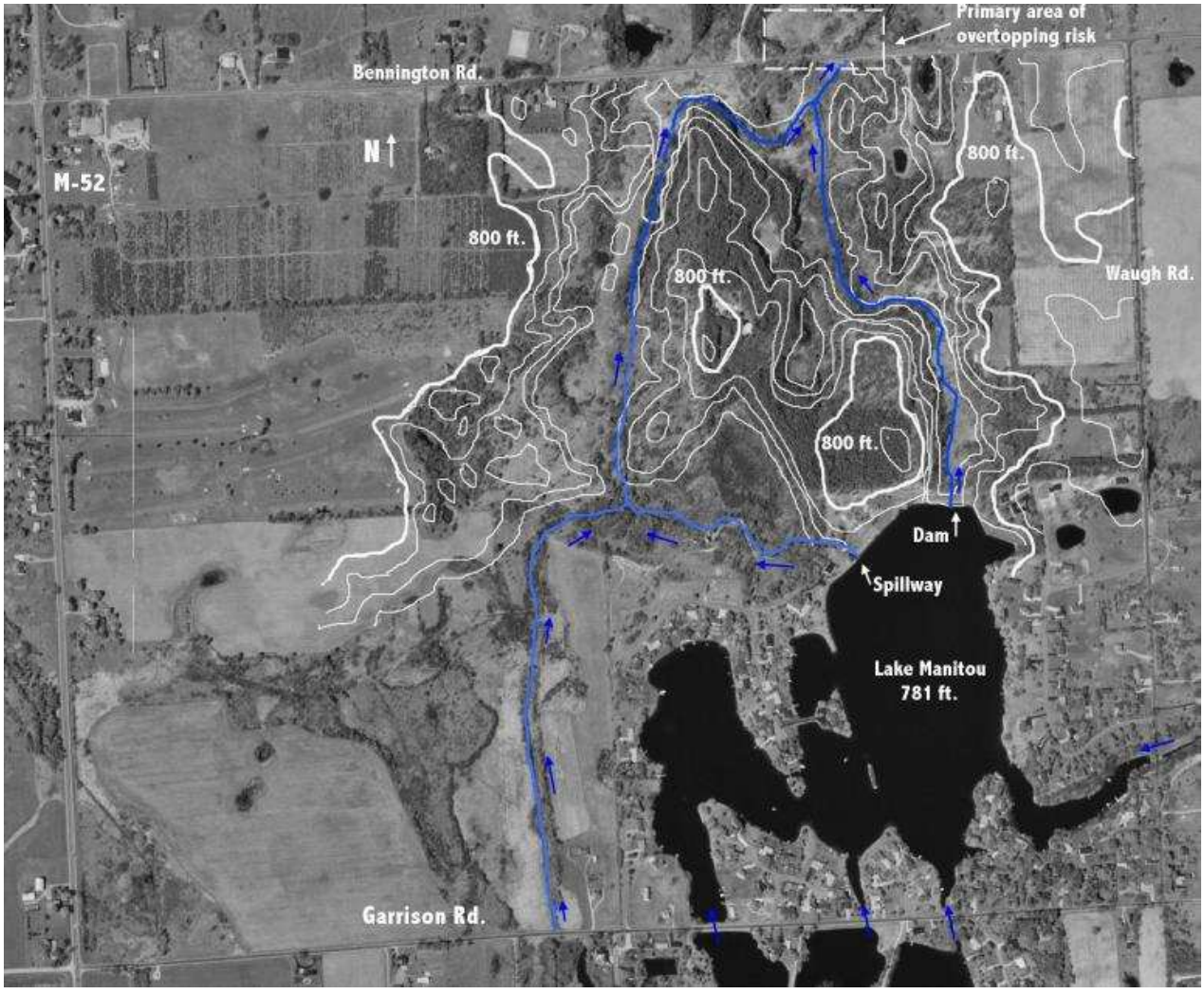
Residents North of Lake Manitou:

There are no residences that are built on the low-lying property immediately north of the Lake Manitou dam. As such, there is little to no risk of damage to any residence on the south side of Bennington Road between M-52 and Waugh Road and immediately north of the Lake Manitou dam. If future building is undertaken in this area, the property owner's name and contact information should be listed below.

Address	Current Resident	Contact Number
None at this time	None at this time	None at this time

Overtopping of Bennington Road

It is estimated that a significant failure of the Lake Manitou dam or spillway may result in an overtopping of Bennington Road between M-52 and Waugh road. See the following image for an estimate of the location where the roadway overtopping may occur.



GENERAL RESPONSIBILITIES UNDER THE EAP:

Dam Owner Responsibilities:

The Lake Manitou Association is responsible for maintaining, updating, and distributing the EAP. The Lake Manitou Association is also responsible for conducting a yearly review of the procedures, updating the property owner list in flood prone areas, and executing a paper walk-through of the EAP. The Lake Manitou Association President will be primarily responsible for initiating the EAP and keeping it current. In the event that the President is not available to initiate the plan, the Lake Manitou Association Vice-President or the other Lake Board members are authorized to initiate the EAP response.

Responsibility for Notification Once the EAP is Initiated:

The Lake Manitou Association President or a designated representative will be on site to monitor the situation once the EAP has been initiated. The President or representative is responsible for coordinating with the Fire Department and Sheriff's Office for site security and for coordinating with the Road Commission to block Bennington Road if necessary. The President or representative is responsible for coordinating with the Shiawassee County Emergency Management Department to initiate the disaster response activities.

The Lake Manitou Association President will be ultimately responsible for declaring the emergency at the dam or spillway "over" when the situation has been contained and addressed. The Emergency Management Coordinator is responsible for declaring disaster response activities "over".

In the event the EAP is initiated, the Lake Manitou Association President is advised to conduct a follow-up meeting with all participating groups to discuss the effectiveness of the EAP and solicit suggestions on how the EAP can be improved. This feedback will be used as input to the annual EAP review/update.

MONITORING THE DAM:

The Lake Manitou dam and spillway will be periodically monitored for conditions that that could lead to a breach. This monitoring will be accomplished at least once per month. During periods of heavy rainfall and/or extended periods of rainfall, the dam and spillway will be checked regularly. The Lake Vice-President typically performs this check and any observations will be entered into the Dam/Spillway observation log.

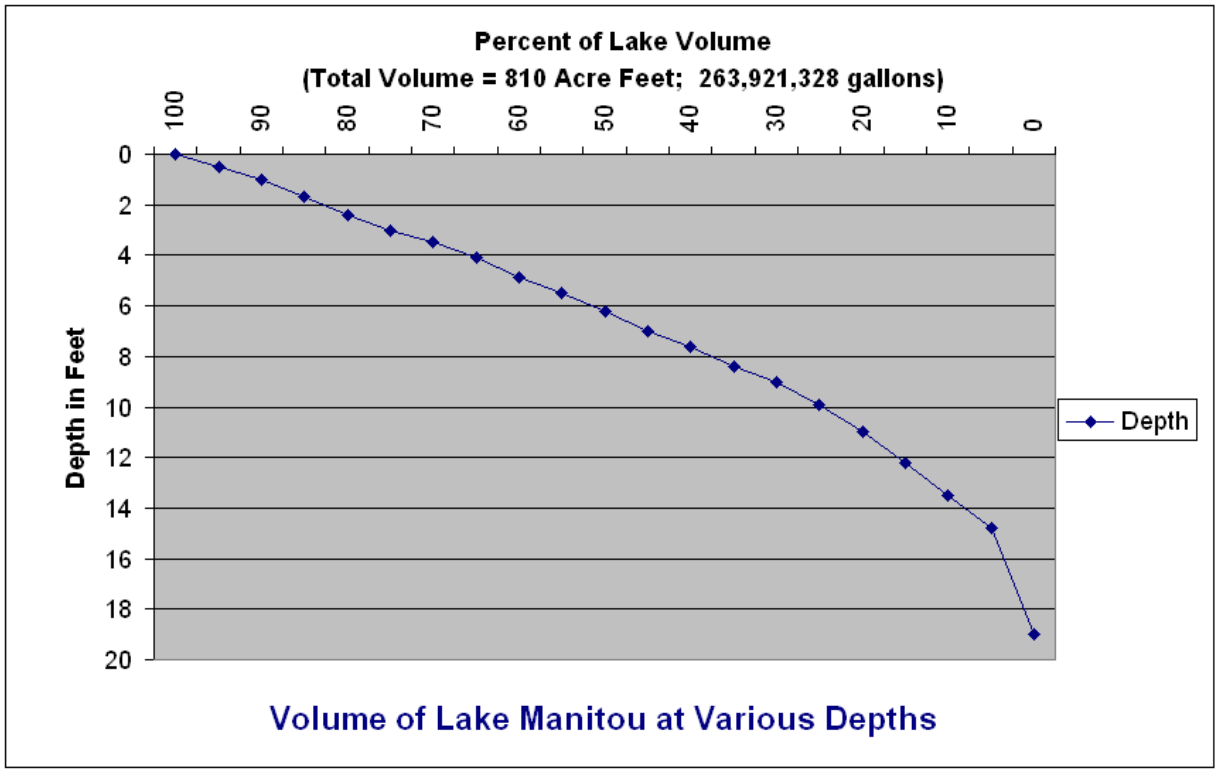
DAM BREACH ANALYSIS:

No hydrologic, hydraulic, or dam breach analysis were conducted for preparation of this EAP.

WATER VOLUME CALCULATIONS:

The average depth of Lake Manitou is 11.1 feet and is 781 feet above sea level. The deepest part of the lake is 19 feet and the lake discharges into the Maple River about 6,000 feet north of Lake Manitou.

The following chart is to be used to estimate the volume of water that would leave the lake from a dam or spillway breach. The calculation assumes the breach depth is measured from where the normal lake level would be to the lowest point of the breach. The lake contains approximately 264 million gallons of water.



6. REQUIREMENTS / NOTIFICATION:

The Lake Manitou dam and spillway are to be inspected every five (5) years by a certified dam inspector and the findings of this report is submitted to the Michigan Department of Environmental Quality. The last inspection was conducted in 2016. The next dam inspection is due by 12/31/2021.

No Lake Manitou resident is permitted to perform any maintenance on the dam or spillway without first consulting with the Lake Manitou President or Employment Committee Chair. All Lake Manitou residents were notified in 2004 and again in 2005 about the restriction of off road vehicular traffic crossing the downstream outlet channel of the spillway, which has been totally restricted in the Lake Manitou Special Record.

7. REFERENCES, SUPPORTING PROCESSES, AND TOOLS:

- Observation Log
- Stop Log Operation Log
- Dam/Spillway Action Item Log
- Special Record
- RASIC Chart
- Process 2 - Lake Association Equipment Usage
- Lake Manitou Website

8. KEY CRITICAL SUCCESS FACTORS:

- Timely and regular observations of the spillway and dam operations including seepage
- Trained conscientious employees who will report anomalous dam and spillway observations
- Funding to carry out the planned activities

9. CHANGE CONTROL:

Changed By	Date	Description
F. Farkas	9/21/2016	Review/Update and Disseminate
F. Farkas	03/19/2014	Review/Update and Disseminate
J. Forsythe	11/20/2011	Updated with current contact information
J. Forsythe	01/08/2006	Modified Disaster Response section
J. Forsythe	03/10/2002	Initial Release

Sample Budget Schedule (for reference only):

Expenditures ($000)				
	Planned	***Actual***	***Variance***	***Explanation***
Internal Staff Labor				
Services				
Software Tools				
Hardware				
Materials and Supplies				
Facilities				
Telecommunications				
Training				
Contingency (Risk)				
Total				

Funding Source ($000)				
	Planned	***Actual***	***Variance***	***Explanation***
Fund				
Fund				
Total				