



ALAMOOSOOK LAKE DAM (#110)



PREPARED FOR:

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PREPARED BY:

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**October 2024 – Revision 1
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REVISION SHEET
OPERATION AND MAINTENANCE MANUAL

FOR
ALAMOOSOOK LAKE DAM NO. 110

NO.	DESCRIPTION OF REVISION MADE	BY	DATE
0	O&M Manual	Haley Ward, Inc.	2024
1	Ownership update	Haley Ward, Inc.	2024

DISTRIBUTION LIST
OPERATION AND MAINTENANCE MANUAL

FOR
ALAMOOSOOK LAKE DAM NO. 110

COPY NO.	LOCATION
1	Dam Owner/Operator
2	MEMA



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ALAMOOSOOK LAKE DAM PROJECT DATA SHEET

General

Dam Name:	Alamoosook Lake Dam
NID ID No.:	110
Owner & Operator:	Bucksport Mill LLC
Location:	Lat 44°35'32"N.; Long 68°43'17"W Soper Road, Town of Orland, Hancock County, Maine
Purpose of Project:	Regulate lake levels in Alamoosook Lake
Construction History:	Original construction in 1930, initially for paper mill
Downstream Hazard Class:	High Hazard
Project Datum:	National Geodetic Vertical Datum of 1929 (NGVD_29 Approx.) Note: Elevations are based on mill datum and may not correspond with other recognized or published elevations, per 1984 repair plans.

Reservoir

Watershed:	Located downstream of Alamoosook Lake, on Narramissic River			
Drainage Area:	94.0 square miles			
	ELEVATION (FT)	SURFACE AREA (AC)	TOTAL STORAGE (AF)	ACTIVE STORAGE (AF)
Normal Full Pool:	21.3	1,133.0	6,100	6,100 (Est.)
Maximum Flood Pool:	23.0	Unknown	9,500	9,500 (Est.)

Dam

Dam Type:	Concrete mass gravity dam with concrete fishway		
Height:	Structural: 18.0 ft		Hydraulic: 17 ft (est.) at normal pool
Crest Elevation:	23.0 ft (Left Abutment) 26.0 ft (Right Abutment)		
Crest Length:	165.0 ft	Crest Width: 2 FT (right and left concrete walls)	
Upstream Slope:	Vertical (Refer Figure 2)		
Downstream Slope:	Approximately 1.0H:1.3 (Refer to Figure 2)		

Outlet Works

Aside from the spillway (described below), the dam is outfitted with three outlets:

Low-Level Outlet (a/k/a Waste Gate)	5.5 FT wide wooden sluice gate with sill elevation of 13.5 feet
Pump Station Intake	Three- chambered concrete opening with screens – Overtopping elev. 25.0
Fishway	Concrete fish ladder

Spillway

The dam has one uncontrolled ogee-shape spillway located between the waste gate and the left abutment. The spillway crest elevation is 20.0 FT. The spillway is 70.0 FT long. A 1.3 FT high weir-board is normally in place on top of the spillway, resulting in a normal-pool elevation of 21.3 feet.
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1.0 GENERAL INFORMATION

1.1 Operation and Maintenance Manual

This document is the Operation and Maintenance (O&M) Manual for Alamoosook Lake Dam. The O&M Manual provides procedures and guidance for the normal operation and maintenance of the Alamoosook Lake Dam. The purpose of the O&M Manual is to ensure adherence to approved operating procedures over long periods of time and through changes in operating personnel. The O&M Manual will also permit personnel, knowledgeable in dam/reservoir operations, but unfamiliar with the conditions at a particular dam, to operate the dam and reservoir at times when regular operating personnel cannot perform their normal duties.

NOTE: For unusual and emergency conditions, the procedures set forth in the Toddy Pond Dam Emergency Action Plan (EAP) should be followed.

1.2 Purpose and Description of Project

The Alamoosook Lake Dam (ID No. 110) is a high potential hazard, concrete mass gravity dam with fishway, located at the outlet of Alamoosook Lake in the Town of Orland, Maine, at the head of the Narramissic River, south of Soper Road. The dam is a concrete mass-gravity structure equipped with a sluice gate, pump intake, spillway, fish ladder, and abutment sections. The structure is used to regulate the water level of Alamoosook Lake and to transfer water to Silver Lake, which serves as the supply reservoir for the Town of Bucksport and Ironclad Energy Partners, LLC. A pump station, approximately 250 feet downstream of the Alamoosook Lake Dam, is used to pipe water overland from Alamoosook Lake to Silver Lake in the Town of Bucksport. A fish ladder in the dam provides passage for the seasonal migration of alewives. Photographs of the dam are included in **Appendix A**. Location Map, Schematic Plans, and Aerial Map are included in **Appendix D**.

The Alamoosook Lake Dam is owned by Bucksport Mill LLC. The dam was built in 1930 as a mill dam to store water to supply downstream mills along the downstream Narramissic River. Since the downstream mills were closed, the lake is used primarily for recreation. However, occasionally water may be pumped from this dam's pump station to Silver Lake.

In the center of the structure is a five-foot wide wooden sluice gate with a sill elevation of 13.5 feet (USGS), approximately 7.8 feet below the normal lake elevation of 21.3 feet. The concrete gate structure is abutted to the north by the concrete intake structure, which has an overtopping elevation of 25.0 feet. A concrete ogee spillway approximately 70.0 feet long abuts the gate structure on its south side and has a permanent crest elevation of 20.0 feet. Flashboards 1.3 feet in height bring the normal pond elevation to 21.3 feet. The bottom of the spillway is at elevation 6.5 feet. The left (south) abutment of the dam is two feet wide and has an elevation of 23.0 feet. This abutment is approximately 15.0 feet long and is tied into bedrock. North of the intake is a fish ladder and concrete abutment. The north abutment, at elevation 26.0 feet, is approximately 30.0 feet long with a width of two feet. The dam has no other controllable outlets.



This O&M Manual provides the necessary information and procedures for successful operation and maintenance of the Alamoosook Lake Dam. Implementation of the O&M Manual will address public safety for residents and properties located both upstream and downstream of the dam, monitor existing deterioration, and extend the useful life of the dam and associated structures. Implementation of the O&M Manual also enhances the function of Alamoosook Lake Dam, the local ecosystem including fisheries, wildlife, and water quality, provides a stable water level, protects the lake waterfront properties, and reduces the risk and liability associated with dam ownership.

The O&M Manual includes background information, a description of the dam, associated hydrology and hydraulics inspection guidelines, and operation and maintenance procedures, including lake water level management.

1.3 Location and Access to the Dam and Facilities

The Alamoosook Lake Dam is located at the outlet of Alamoosook Lake in the Town of Orland, Maine, at the head of the Narramissic River, south of Soper Road. The dam is accessed via Soper Road from the north.

1.4 Assignment of Responsibility

Bucksport Mill LLC maintains ownership of the Alamoosook Lake Dam, and has final authority and responsibility for the safety, operation, and maintenance of Alamoosook Lake Dam.

1.5 Attendance and Communications

1.5.1 Attendance

The Alamoosook Lake Dam is unattended with site visits and site inspections performed on behalf of Bucksport Mill LLC by contracted personnel. The dam is an approximately five-to-ten-minute drive from where the contracted personnel who operate the water system for Bucksport Mill LLC are located.

1.5.2 Communication

There is no phone or radio at the Alamoosook Lake Dam. Contact Bucksport Mill LLC for questions or to arrange access. Bucksport Mill LLC may be reached by phone at (630) 986-1972.

1.6 Public Safety and Health

The safety of the public and all personnel is a primary concern. Access to the dam is to be coordinated with the Owner. Access to the dam is restricted. The outlet gate is locked and gated.

1.7 Restricted Areas

Access to the dam is to be coordinated with the Owner. Access to the dam is restricted. The outlet gate valves are locked and gated.



2.0 OPERATION PROCEDURES

2.1 Reservoir Operations

Bucksport Mill LLC uses contracted personnel to maintain water levels in the lake in accordance with an established rule curve. Typically, flows out of the lake vary.

Little information exists about watershed hydrology, lake levels, and historic flows at the Alamoosook Lake Dam. From lake level records provided by Verso Paper for the period January 1960 through August 1998, a peak lake level of 25.0 feet (estimated USGS datum) occurred in December 1969. The flow in the Narramissic River was unknown. For the present dam configuration, a lake level of 25.0 feet would result in a calculated 3,089 cubic feet per second (cfs) of overtopping flow (5.0 feet over the permanent crest of the spillway and 2.0 feet over the north abutment) with an unknown amount of gate flow. Assuming a maximum gate opening of 8.0 feet, the gate could contribute as much as 580 cfs of additional flow. Typically, Alamoosook Lake levels are between elevations 20.0 feet and 22.0 feet, with the lowest levels occurring during September and October.

The Alamoosook Lake has drainage area of approximately 94.0 square miles. Maine watersheds average annual flows are approximately 2.0 cubic feet per second per square mile (cfs/mi²) according to gauged basin records. The average annual flow for the Alamoosook Lake drainage is, therefore, estimated to be 188.0 cfs.

The Narramissic River flows from Alamoosook Lake to the Orland Village Dam, approximately 2.5 miles to the southwest of the Alamoosook Lake Dam. The Orland Village Dam, which has a crest elevation of 7.8 feet United States Geological Survey (USGS), backwaters the Narramissic River to within several hundred feet of the Alamoosook Dam. The Orland Village Dam separates the Narramissic River from the Orland River estuary.

Due to the backwater influence of the Orland Village Dam, the Narramissic River is wide and sluggish. A single small tributary, Whites Brook, enters the river about one mile downstream of Alamoosook Lake. On the west side of the Narramissic River, approximately 0.5 miles downstream of the Alamoosook Dam, is the confluence of Whites Brook and the Narramissic River. Bridges spanning the Narramissic River include the Upper Falls Road Bridge which includes four culverts approximately 12.5 feet in diameter, the Route 1 Bridge, and the Route 175 Bridge.

2.2 Filling Schedule

There is no filling schedule for Alamoosook Lake.

2.3 Release Schedule

There is no release schedule for Alamoosook Lake. A decision is made to release water based on the rainfall, moisture conditions, and water demand. The outlet structure is inspected and cleaned of debris and sediment if present, and the gate is adjusted based on demand. When the lake elevation is below elevation 21.3 feet (20.0 feet when the flashboards are out), the principal means of releasing water is through the sluice gate. A small volume of the total flow is supplemented by the fish ladder.



2.4 Flood Operation

Refer to the Emergency Action Plan (EAP).

2.5 Control Gates

In the center of the structure is a 4.0-foot-wide wooden sluice gate. Flashboards 1.3 feet in height bring the normal pond elevation to 21.3 feet.

2.6 Spring Startup Procedure

Each spring (April – May), an inspection of the dam will be performed by the Owner or Owner's representative.

2.7 Fall Shutdown Procedure

Each fall (October – November), an inspection of the dam will be performed by the Owner or Owner's representative.



3.0 MONITORING AND INSPECTION

3.1 General

This section describes the methods and frequency of data collection, transmittal of data, and procedures to evaluate the data.

Bucksport Mill LLC is primarily responsible for collecting and reporting readings which consist of monitoring lake water levels at the dam. Periodic Owner Inspections should be performed by Bucksport Mill LLC. Bucksport Mill LLC contracts to have these functions performed but maintains responsibility for them and is responsible for reviewing and filing the inspection records.

Twice a year, in the spring (April – May) and the fall (October – November), an inspection of the following areas will be performed by the Owner or Owner's representative. Each item has one or more specific items to observe and note. The specific items are listed on the dam Inspection Checklist, which must be filled out completely at the time of each inspection, and include:

1. Access
2. Crest
3. Upstream/Downstream Slopes
4. Abutment Contact
5. Appurtenances/Structures
6. Reservoir
7. Downstream Channel
8. Level
9. Gate

Additional dam and water level inspections will be performed as needed and after critical events including severe rain or windstorms, earthquakes, or periods of extremely high storage. During inspections, debris will be removed as needed from in and around the weirs to prevent clogging.

3.2 Monitoring Wells

There are no monitoring wells at or associated with the Alamoosook Lake Dam.

3.3 Drains and Seepage

Find all toe drains and sumps and monitor and record their flows and the lake elevation twice a year during the semi-annual inspections.

Locate and map all leaks. Monitor and record leakage twice per year in May and November. Correlate seepage rates to lake elevation and document. Monitor settlement of the embankments.

Map, photo document, and monitor efflorescence and loss of material and strength in the spillway channel walls which retain the embankments and other concrete work in the dam.



3.4 Operational Inspections

Bucksport Mill LLC will assign or contract for personnel to conduct the inspections as needed. Inspections should include the use of the Inspection Checklist. Any unusual conditions should be reported to Bucksport Mill LLC immediately for further investigation or repair.

3.5 Periodic Owner Inspections

A formal Owner Inspection should be performed twice each year (fall and spring). The inspection should include a systematic review of the conditions of the dam and its associated features, including the outlet works as outlined on the forms included in **Appendix B**. The inspection forms should be completed and maintained in the project record files. Digital photographic records of project features should be included with the inspection files.

3.6 Periodic Engineer Inspections

A high hazard dam is required by the Maine Emergency Management Agency (MEMA) Dam Safety Program, per State Law [Title 37B MRSA , Chapter 24](http://mainelegislature.org) (mainelegislature.org), to have a periodic inspection completed by a qualified engineer every six years. Inspections by a qualified engineer should also be performed if unusual conditions occur or after critical events, such as earthquakes or extremely high reservoir storage levels.

3.7 Critical Event Inspections

The dam should be inspected during or immediately following the occurrence of critical events which raise the water level more than one foot, such as severe rain or earthquakes. If emergency conditions are observed, the responses outlined in the EAP should be implemented. Emergency conditions include erosion threatening the integrity of the dam, seepage that is cloudy or excessive, and/or extremely high-water surfaces. Inspection by a qualified engineer should be performed to evaluate the impact of critical events on the dam.

This dam is susceptible to overtopping due to inadequate spillway capacity. Following any flood event which overtops the dam, it is suggested to have an inspection by a Maine licensed Professional Engineer.

Even if the water surface level is not at a high elevation at the time of an earthquake, it is possible that the dam could suffer negative effects from the earthquake (associated with seepage performance) that may not become evident until higher reservoir elevations are reached. Therefore, heightened awareness and possible monitoring would be appropriate following an earthquake whenever the reservoir is rising to elevations that have not been previously experienced since the occurrence of the earthquake. Specific changes to monitoring schedules would need to be established on a case-by-case basis in light of the magnitude of the earthquake, reservoir elevation at the time of the earthquake, and apparent damage sustained by the dam as a result of the earthquake.



4.0 MAINTENANCE

4.1 Critical Conditions

The following conditions are considered to be critical and require immediate repair or maintenance to be completed under the direction of a qualified engineer. The critical repairs or maintenance needed to address the specific conditions encountered are not covered in this O&M Manual. Critical conditions should also trigger a response as outlined in the EAP.

- Overtopping event.
- Erosion, slope failure, or other conditions which are endangering the integrity of the dam.
- Piping or internal erosion as evidenced by increasingly cloudy seepage or other symptoms.
- Spillway blockage or restriction.
- Excessive or rapidly increasing seepage appearing anywhere near the dam site.

4.2 Periodic Maintenance

The following items should be noted in the operations log and added to the work schedule whenever they are noted during Operation Inspections or Periodic Inspections. The following maintenance items should be completed as soon as possible after identification (at least annually):

- Removal of trees and other woody vegetation from the embankment and abutments (see **Section 4.3**).
- Repair erosion gullies.
- Repair defective gates.
- Repair deteriorated concrete or metal components.
- Maintenance of riprap or other erosion protection.

Continued maintenance should also be performed for the following items:

- Testing and cleaning gates.
- Inspecting and maintaining gaging equipment.
- Removal of debris from embankment face and from areas around the intake structures.

4.3 Embankment Maintenance

1. Fill erosion gullies with properly compacted cohesive soil material. Seed or riprap repaired area to stabilize from future erosion.
2. Fill rodent burrows with a slurry of soil, cement, and water. Remove the rodents.
3. Maintain grass cover by spraying weeds, fertilizing, and watering as needed.
4. Remove trees and other woody vegetation from embankment and from within 25.0 feet of the groins and 50.0 feet of the toe of the embankment. Remove tree roots and fill resultant depressions with compacted soil and re-seed area.
5. Mow embankment at least twice per year.
6. Add or repair riprap where displacement or other damage occurs or has occurred.



7. Maintain grading of the embankment crests to prevent potholes, rutting, or other potential for standing water to accumulate.
8. Maintain fences to provide site security and to exclude wildlife from the embankments. Repair and re-vegetate damaged embankment surfaces.
9. Perform regular inspections of the embankments and abutments to identify potential maintenance items.

4.4 Outlet Maintenance

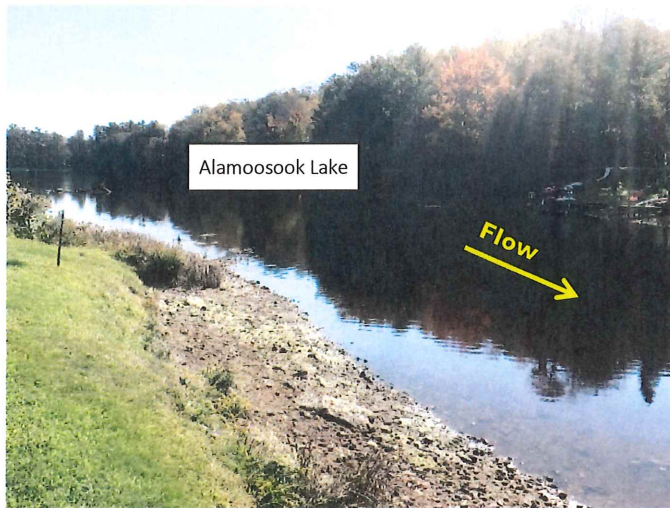
1. Test gates semi-annually or as needed.
2. Lubricate gates annually or as recommended by the manufacturer.
3. Repair defective gates to ensure smooth operation and prevent leakage.
4. Repair deteriorated concrete or metalwork.
5. Remove debris from the outlet channels and fishway annually and inspect and repair erosion protection.

Maintenance Log and Schedule forms are located in **Appendix C**.



APPENDIX A

PHOTO LOG



1. Alamoosook Lake drawn down about 30". Little new development seen in the basin or along the lake shore. Convention, "left" means left looking downstream.



3. Right abutment. Typical surface concrete deterioration. Main body of concrete shows no movement. Fence & poles corroding. Gate locked. Warning signs posted



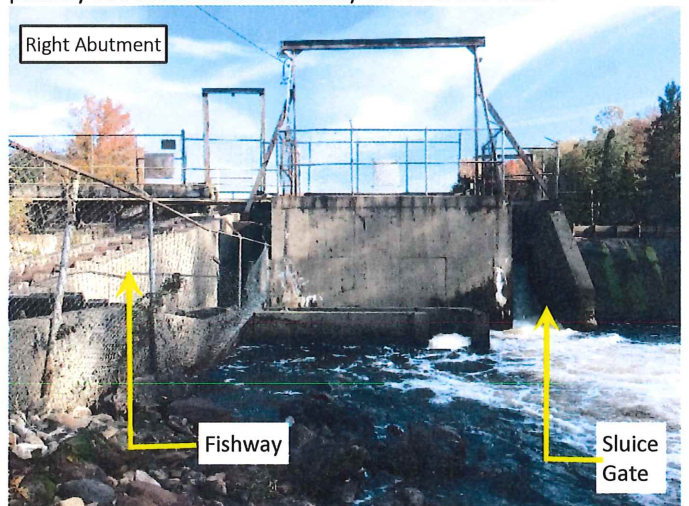
5. Left non-overflow section taken from left downstream. Crack matches horizontal crack in 4. Above. Clear trees & brush to allow for regular easy inspection of abutment. Note ledge.



2. View from right upstream shoreline. No debris seen on screen. General Concrete deterioration. Security fence, Gate & Fishway functional but rusted in places.



4. Left abutment. Horizontal & diagonal crack through the structure. See photo 5 taken from opposite face. Concrete aggregate exposed possibly due to surface corrosion by tannin in the water.



6. View of gate & fishway structure. No movement seen. Concrete spalling & flaking on ogee spillway. Green trace on spillway is either algae or moss. No instability seen.



7. Sluce gate & Left concrete ogee weir spillway. Photograph modified to accentuate concrete surface deterioration. Owner requested to have the underwater toe area probed for undercutting by water currents in tail-pond.



8. Breach of Alamoosook Dam likely to wash out Upper Falls Road CMP Bridge.



APPENDIX B

INSPECTION CHECKLIST



APPENDIX B

DAM INSPECTION CHECKLIST



DAM INSPECTION CHECKLIST		DATE: _____	
DAM: _____		INSPECTED BY: _____	
Item	Satisfactory	Unsatisfactory	Corrective Actions
1. Access			
2. Crest			
a. Settlement			
b. Misalignment			
c. Cracks			
d. Trees and Brush			
3. Upstream/Downstream Slopes			
a. Slope Protection			
b. Erosion/Beaching			
c. Trees and Brush			
d. Visual Settlements			
e. Sinkholes			
f. Animal Burrows			
g. Seepage			
h. Toe Drains			
i. Relief Wells			
j. Slides/Slumps			
4. Abutment Contact			
a. Erosion			
b. Seeping			
c. Boils			
d. Springs			
5. Appurtenances/Structures			
a. Concrete Condition:			
- Spalling			
- Cracking			
- Exposed Reinforcement			
- Loss of Joint Filler			
- Scaling			
b. Drains/Weepholes			
c. Stone			
d. Gates/Sluices Serviceable			
e. Spillway Obstructed/Bypassed			
6. Reservoir			
a. Signs of Shoreline Instability			
b. Sedimentation			
c. Excessive Debris			
d. Ice Related Problems			
e. Environmental Concerns			
f. Other			
7. Downstream Channel			
a. Eroding/Back cutting			
b. Sloughing			
c. Obstruction			
8. Fishways			
a. Baffles			
b. Obstructions			
c. Structural Condition			
9. Level			
a. Lake / Pond Level			
10. Gate			
a. Position			
11. Notes:			
Subject: Dam Inspection Checklist		Doc. ID: 40354	
Effective: 1/27/2020		Document Owner: Bucksport Mill LLC	
Once printed this is not a controlled document. All controlled documents exist in electronic form on the Mill web site.		Approved By: _____	



Inspection Continued:

Seepage Monitoring

EMBANKMENT	ZONE	VOLUME (GALLONS)	TIME (MINUTES)	RATE (GAL/MIN)	RESERVOIR LEVEL



APPENDIX C

DAM MAINTENANCE LOG AND SCHEDULE



DAM MAINTENANCE LOG

DATE	STRUCTURE ¹	FEATURE ²	TYPE ³ OF REPAIR/ MAINTENANCE	REPAIR/MAINTENANCE CONDUCTED BY	REPAIR/ MAINTENANCE COST	COMMENTS

NOTES: _____

¹Stoplog gate, east spillway, west spillway, etc.

²Top, upstream/downstream slope or face, apron, trash racks, handrail, etc.

³Concrete, earthwork, stone masonry, rock riprap, grass mowing, vegetation control, debris removal, etc.

MAINTENANCE SUMMARY AND SCHEDULE TABLE

This maintenance summary and schedule is intended to provide the owner with a quick reference of the recommended frequency intervals for inspecting and

performing routine maintenance on the components of a dam.

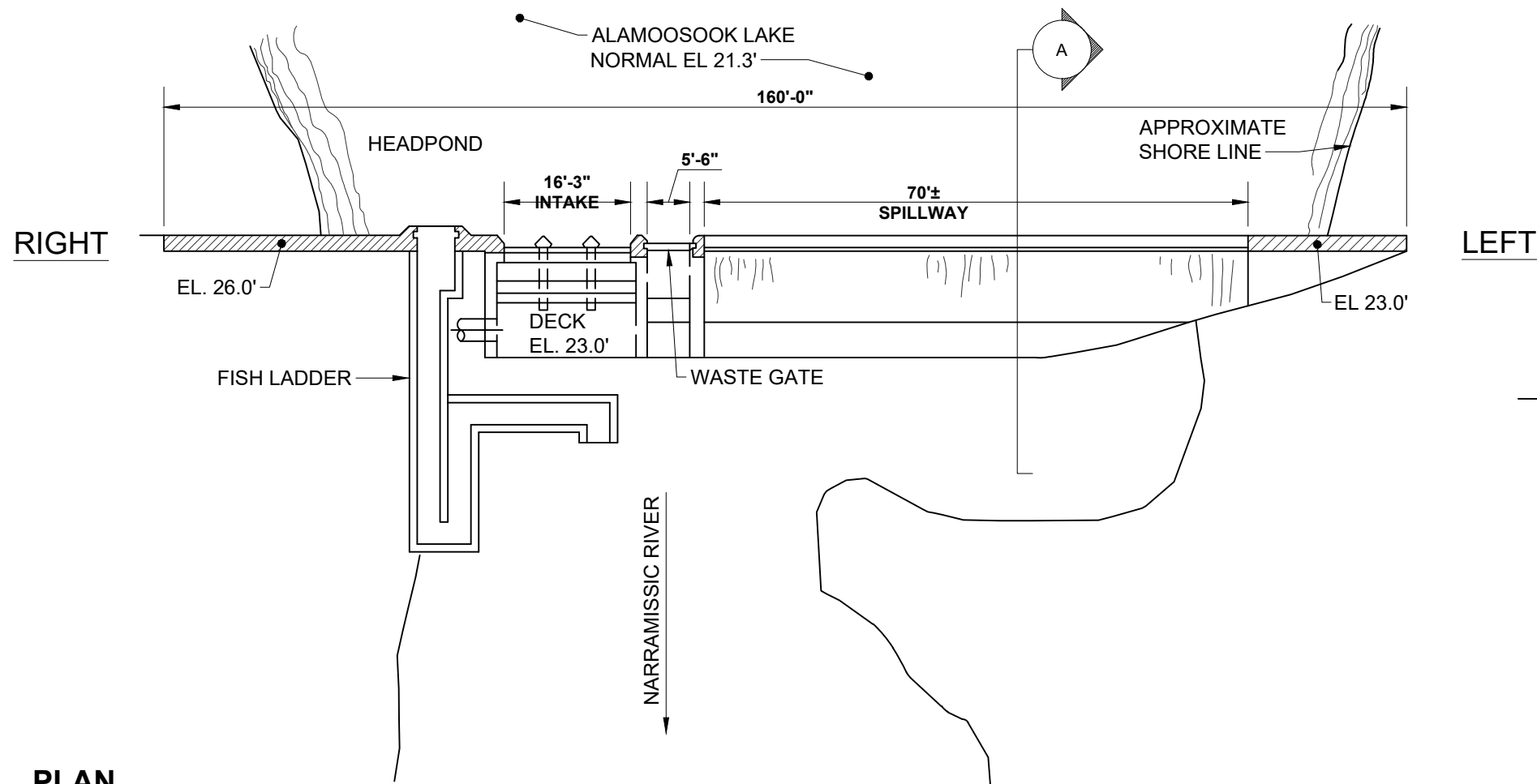
Component	Maintenance Activity	Frequency
Embankment	Vegetation control Rodent control Minor earthwork, erosion repair Erosion protection	Twice per year, minimum Check once per year, perform as required Check once per year, perform as required As required
Principal Spillway	Vegetation control Minor earthwork, erosion repair Erosion protection Concrete repair	Twice per year Check twice per year, perform as required Check twice per year, perform as required As required
Emergency Spillway	Vegetation control Minor earthwork, erosion repair Erosion protection Concrete repair	Twice per year Check twice per year Check twice per year As required
Intake/Outlet Structures	Trashrack cleaning Mechanical operation Internal conduit inspection Concrete features inspection	After every major storm Once per year Once per year Once per year
Masonry Walls	Vegetation control Missing stones	Twice per year As required
Miscellaneous Safety and Access Features	Vehicle/pedestrian access route(s) maintenance Fences, locks, signs inspection	Once per year Once per year



APPENDIX D

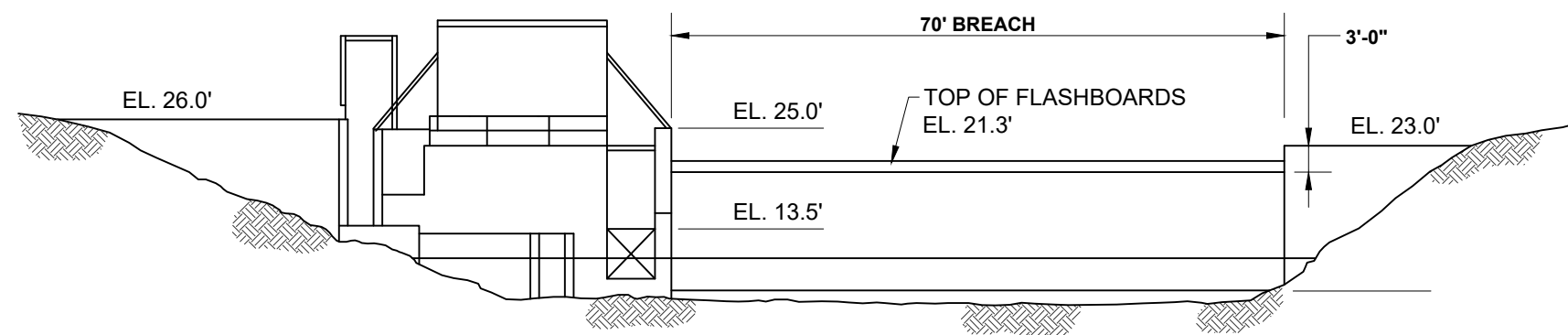
PROJECT DRAWINGS

P:\ME11299-AMM_DEVELOPMENT\023-RIVER RD BUCKSPORT EAP_UPDATES 3 DAMS-DBK02-CAD_DRAWINGS\CIVIL\11299.023 ALAMOOSOOK LAKE - FIGURE 2.DWG



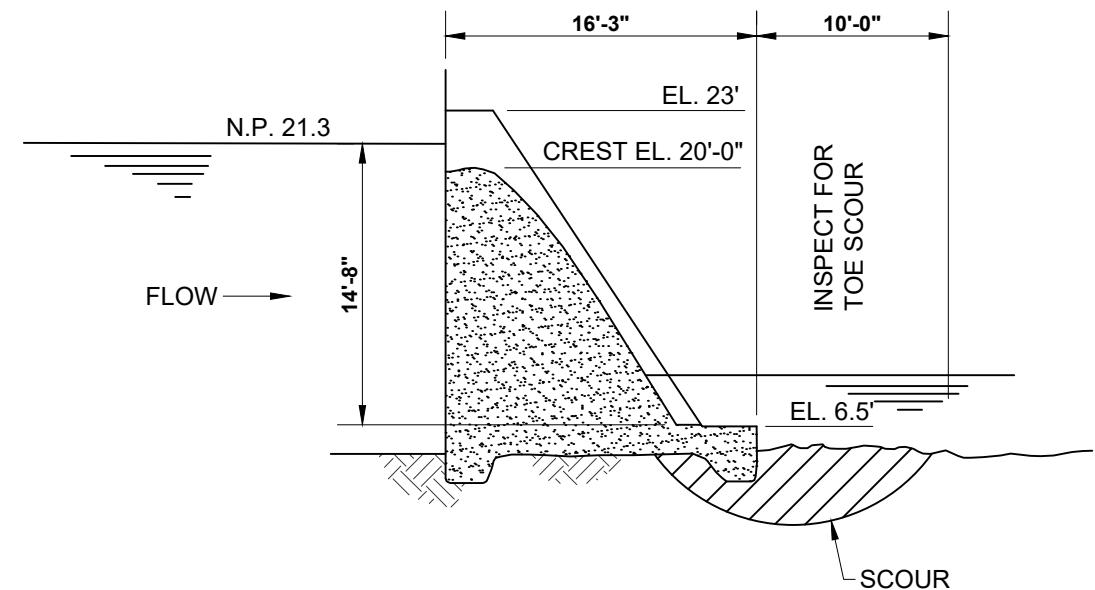
PLAN

SCALE: 1"=20'-0"



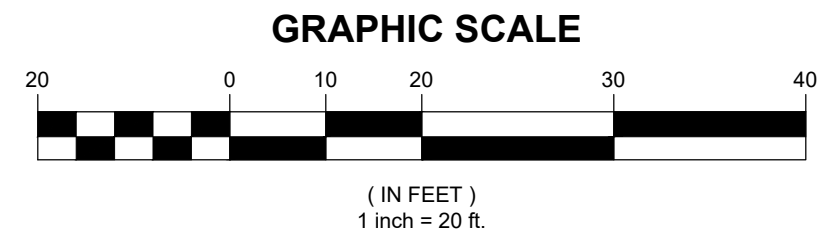
ELEVATION

SCALE: 1"=20'-0"

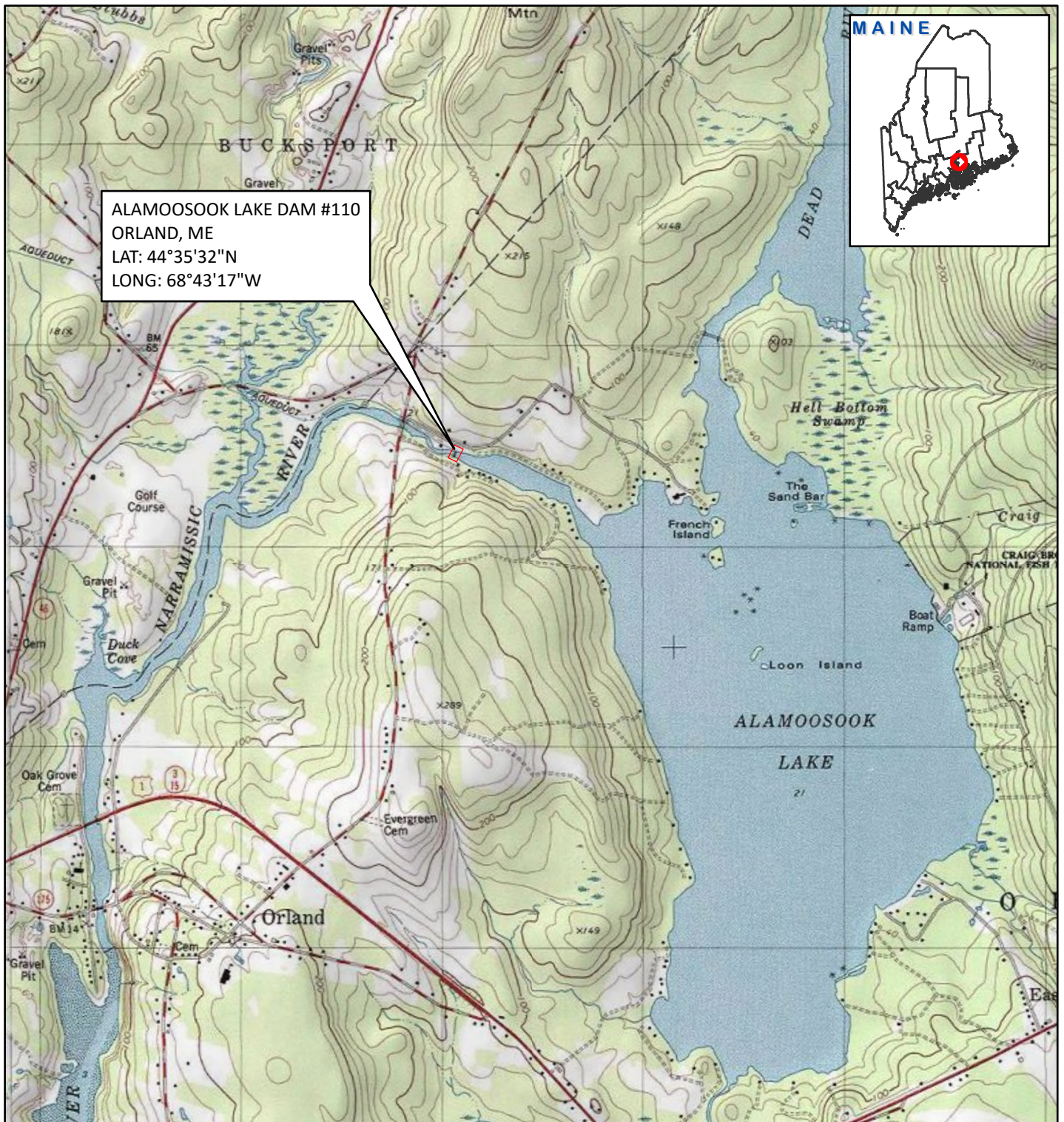


SECTION A

SCALE: 1"=10'-0"



PROJECT	ALAMOOSOOK LAKE DAM, ORLAND, MAINE		DWG No.	FIGURE 2	BY	MEB / DBK	DRAWING STATUS
			JN	11299.023	DATE	2024.06.04	
			SCALE	AS NOTED	REV.		
TITLE	PLAN & ELEVATION				REV. DATE		NOT FOR CONSTRUCTION

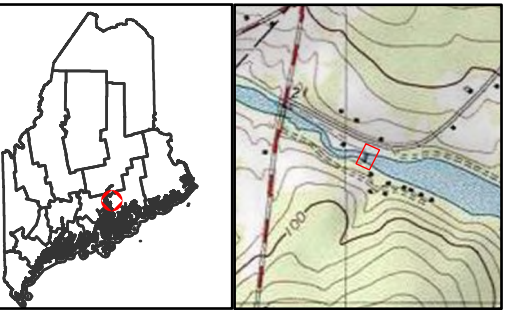


0 500 1,000 2,000
Feet

MAP NOTES:

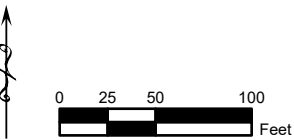
1. MAP IS PROJECTED USING UTM ZONE 19N COORDINATES, AND REFERENCES THE NORTH AMERICAN DATUM OF 1983 (NAD83).
2. NORTH ARROW IS ORIENTED TO GRID NORTH IN ALL MAP EXTENTS DEPICTED HEREIN.
3. SITE FEATURES ARE APPROXIMATE.
4. BASE MAP CREDITS:
Copyright:© 2013 National Geographic Society, i-cubed


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CLIENT	
AIM DEVELOPMENT (USA) LLC	
PROJECT	ALAMOOSOOK LAKE DAM #110 OPERATIONS & MAINTENANCE PLAN ORLAND, ME
TITLE	FIGURE 1 - LOCATION MAP
DATE	PROJECT No.
6/2/2023	11299.023
DRAWN BY	SCALE
SWEATHERBEE	1" = 2,322'



Legend

- MAP NOTES:
1. MAP IS PROJECTED USING UTM ZONE19 COORDINATES, AND REFERENCES THE NORTH AMERICAN DATUM OF 1983 (NAD83).
 2. NORTH ARROW IS ORIENTED TO GRID NORTH IN ALL MAP EXTENTS DEPICTED HEREIN.
 3. BASE MAP COURTESY OF GOOGLE MAPS.



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CLIENT	AIM DEVELOPMENT (USA) LLC
PROJECT	ALAMOOSOOK LAKE DAM #110 OPERATIONS & MAINTENANCE PLAN ORLAND, ME
TITLE	FIGURE 4 - AERIAL
DATE	6/5/2023
PROJECT No.	11299.023
DRAWN BY	SWEATHERBEE
SCALE	1" = 100'