



Exeter Reservoir Dam Feasibility Study

Project Update #3

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Presented By

Stephanie Hudock, PE

VHB Project Engineer





Town of Exeter Water Treatment Plant

Portsmouth Ave

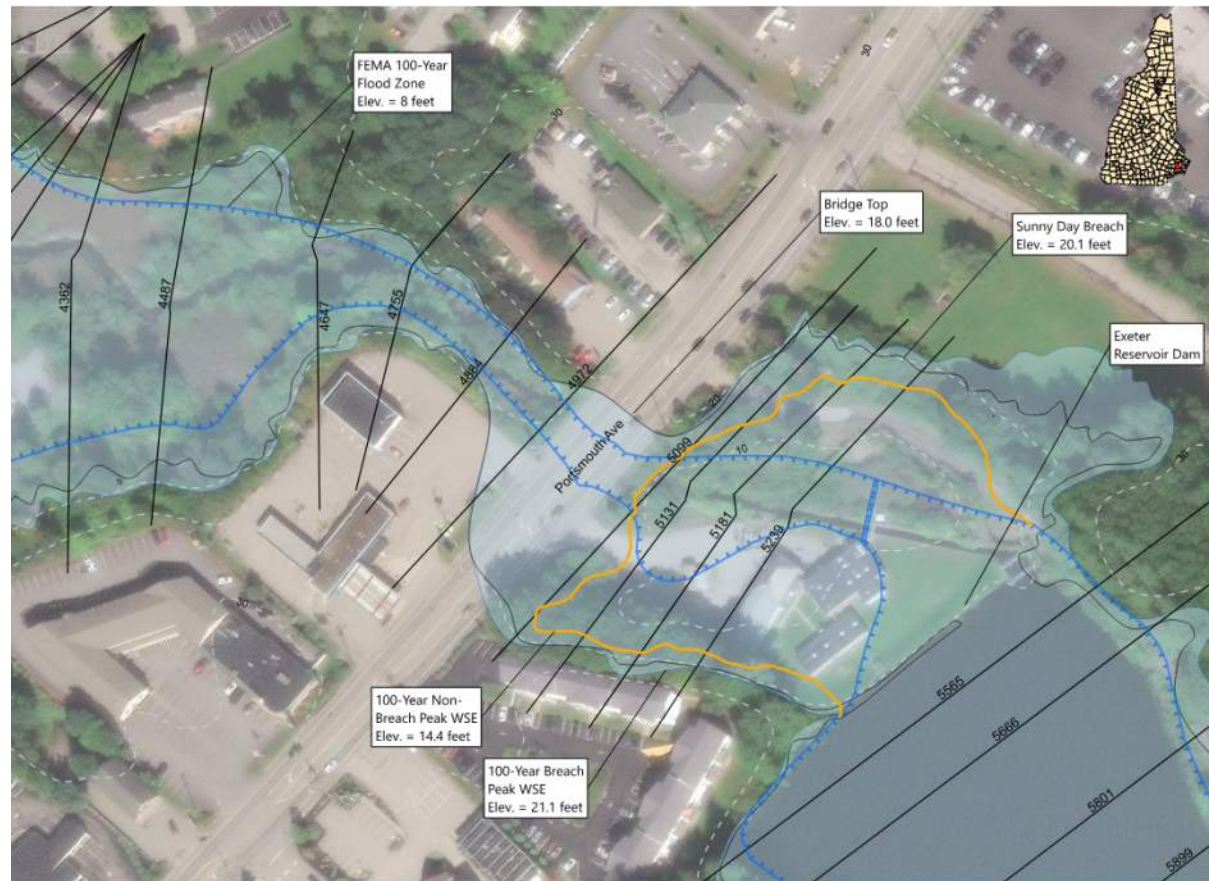
Exeter Reservoir Dam

NH Route 101 W

Maxar

Background

- Commonly known as WaterWorks Dam
- Pickpocket Dam Letter of Deficiency requesting Breach Analysis
 - Exeter Reservoir only had simplified Breach Analysis
- Breach Analysis confirmed High-Hazard Classification
 - Overtops Portsmouth Avenue
 - Flood heights greater than 1' on 1st floor of 3 structures - water treatment plant (4,500 customers) and 21 Webster Ave
- Feasibility Study to evaluate alternatives to bring dam into compliance



Exeter Reservoir Dam

- High Hazard and in Poor Condition
- Concrete face earth fill dam with steel sheet piling
 - 15' high and 248' long
 - Top of Concrete ~23.4'
- 49' long spillway that leads into 8' wide and 220' long sluiceway
 - Top of Stoplogs: 21.6'
 - To of Concrete Weir: 19.65'



Hydrologic Analysis

- Impounds Dearborn Brook and water pumped from Exeter River
- 1.75 square mile contributing area
- Revised watershed boundaries in 2016 hydrologic HEC-HMS model
- Incorporated future rainfall analysis

STEP 6 TABLE. APPROACH FOR CALCULATING PROJECTED EXTREME PRECIPITATION ESTIMATES BASED ON TOLERANCE FOR FLOOD RISK.

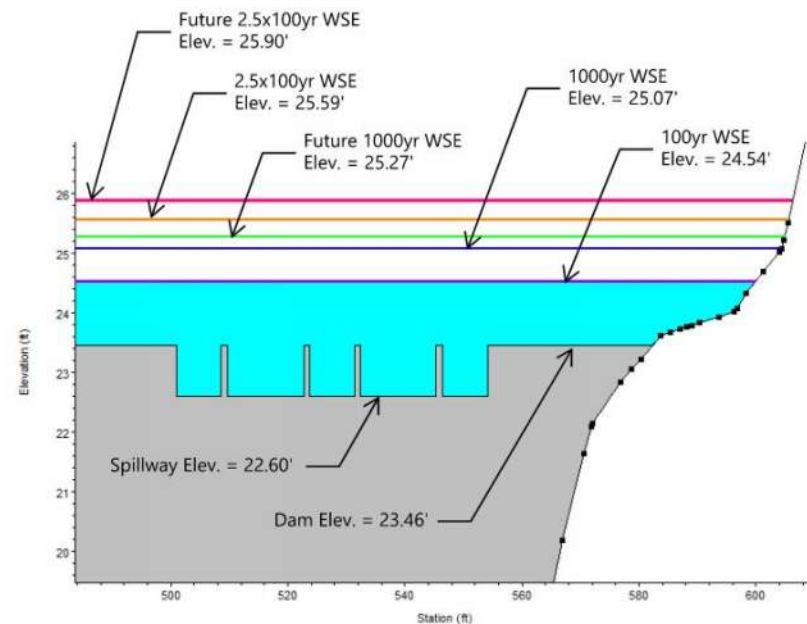
	HIGH TOLERANCE FOR FLOOD RISK	MEDIUM TOLERANCE FOR FLOOD RISK	LOW TOLERANCE FOR FLOOD RISK	VERY LOW TOLERANCE FOR FLOOD RISK
PROJECTED EXTREME PRECIPITATION ESTIMATE =	(Best available precipitation data) x (1.15)		(Best available precipitation data) x (>1.15)	

- Evaluated 1000-year event for NHDES rulemaking for Env-Wr 100-700

Design Storm	Peak Discharge (cfs)
50-year, 24-hr	1,000
100-year, 24-hr	1,200
200-year, 24-hr	2,050
1000-year, 24-hr	2,100
Future 100-year, 24-hr	1,450
Future 1000-year, 24-hr	2,400

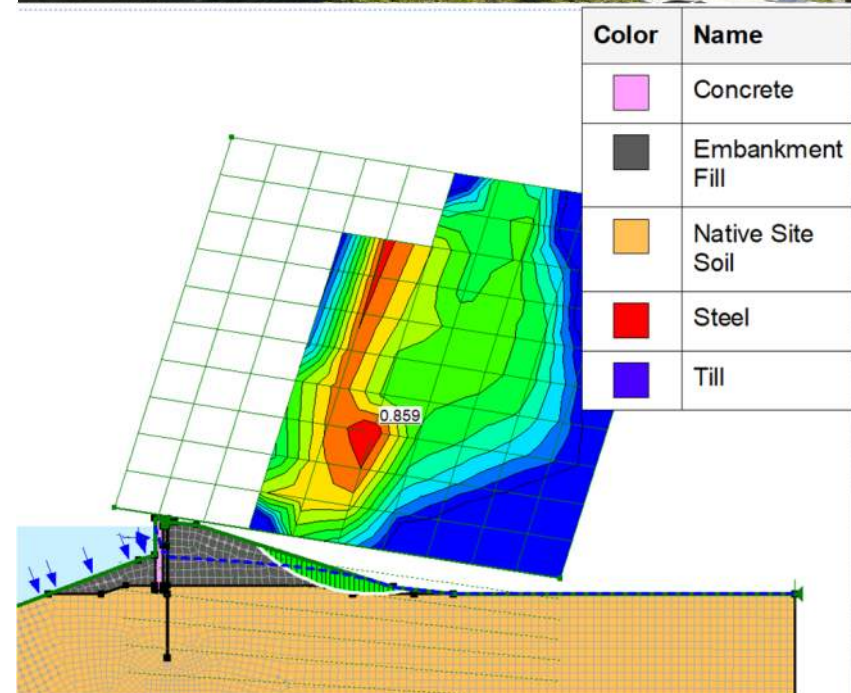
Hydraulic Analysis

- Incorporated topographic and bathymetric survey data into HEC-RAS hydraulic model
- Tide elevation of 3.29 as downstream tailwater condition
- Current Spillway Capacity (top): 135 cfs
- Required Spillway Capacity: 3,000 cfs
- Current Sluiceway Capacity: 1,000 cfs

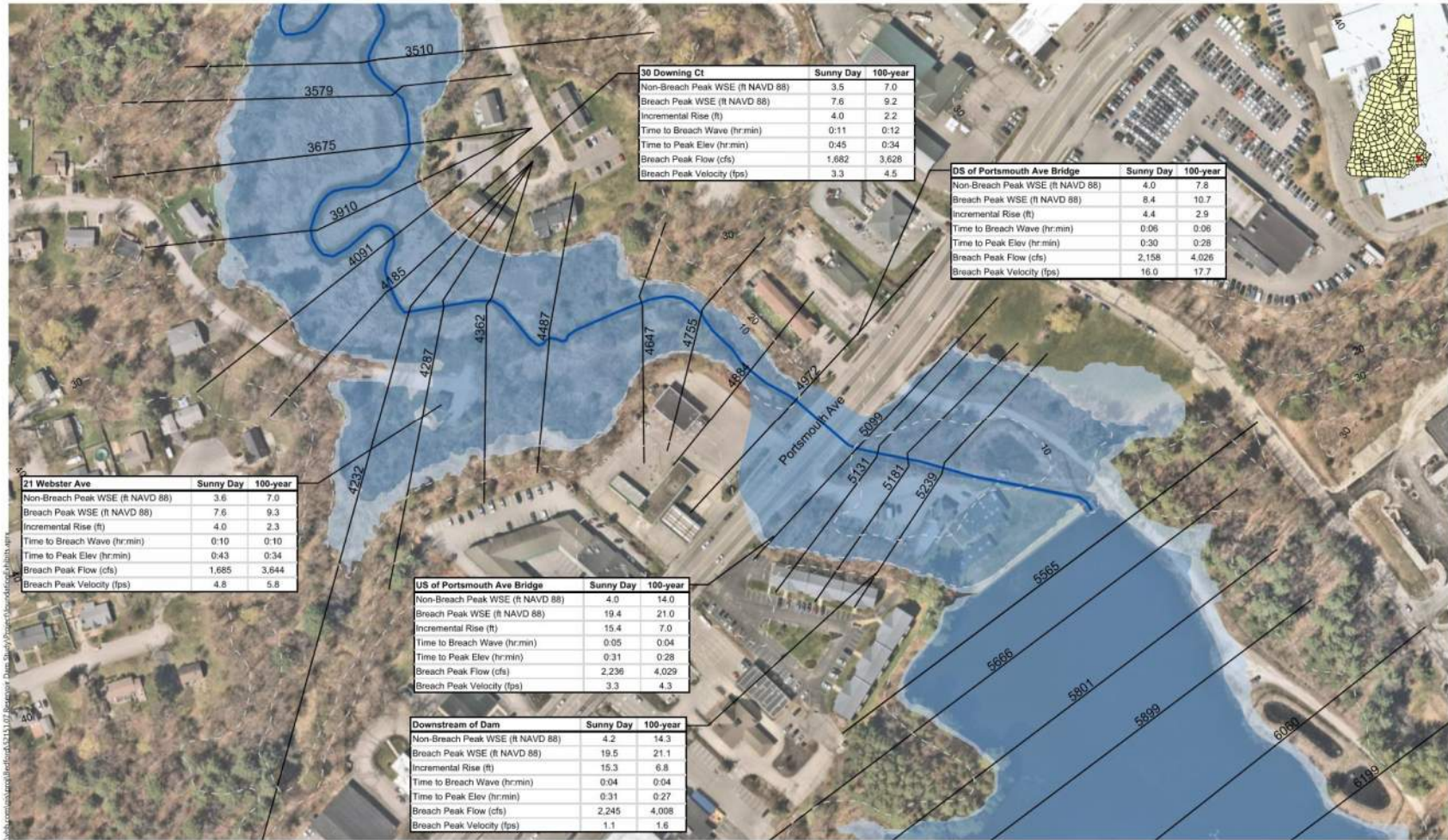


Results of Stability Analysis

- Subsurface investigation completed November 2023 & June 2024
 - Embankment Fill: 0' ~ 7' below crest, loose to medium dense sand with some silt
 - Native Soil: 7' ~ 35' below crest, medium to stiff clay
 - Glacial Till: > 41' below crest, very dense sand with little gravel
- Embedment depth of steel sheet pile cutoff wall is sufficient
- Upstream concrete wall is stable
- Seepage and slope stability factors of safety are acceptable other than downstream slope stability during SDF and seismic loading conditions

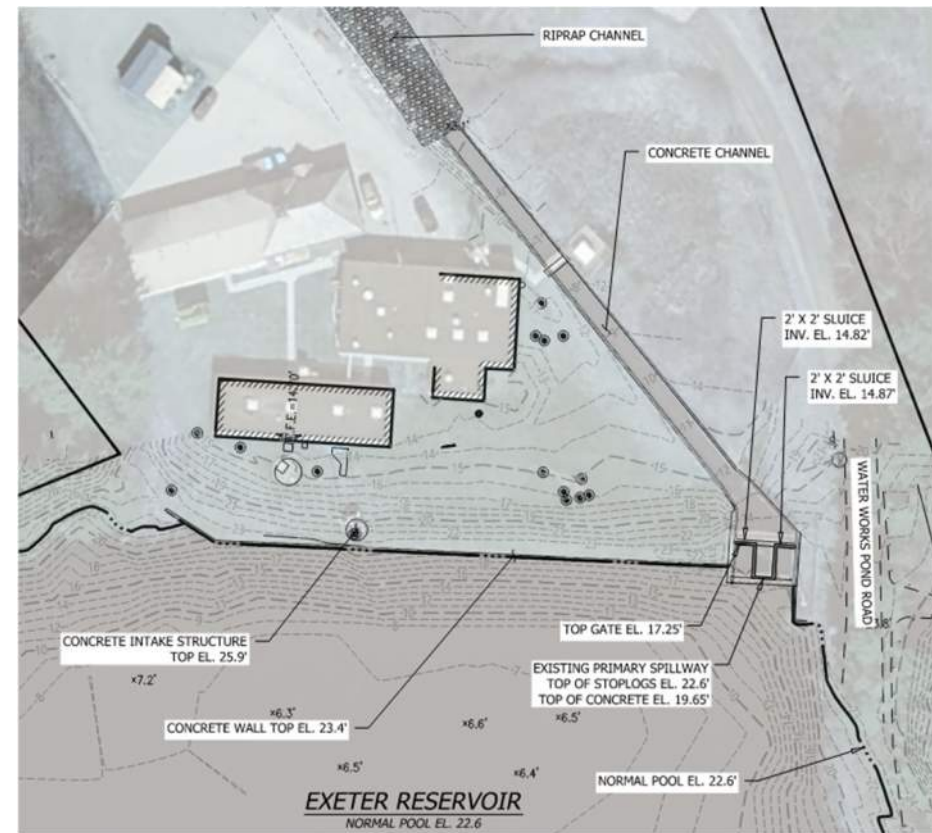


Emergency Action Plan & Operation, Maintenance Plan



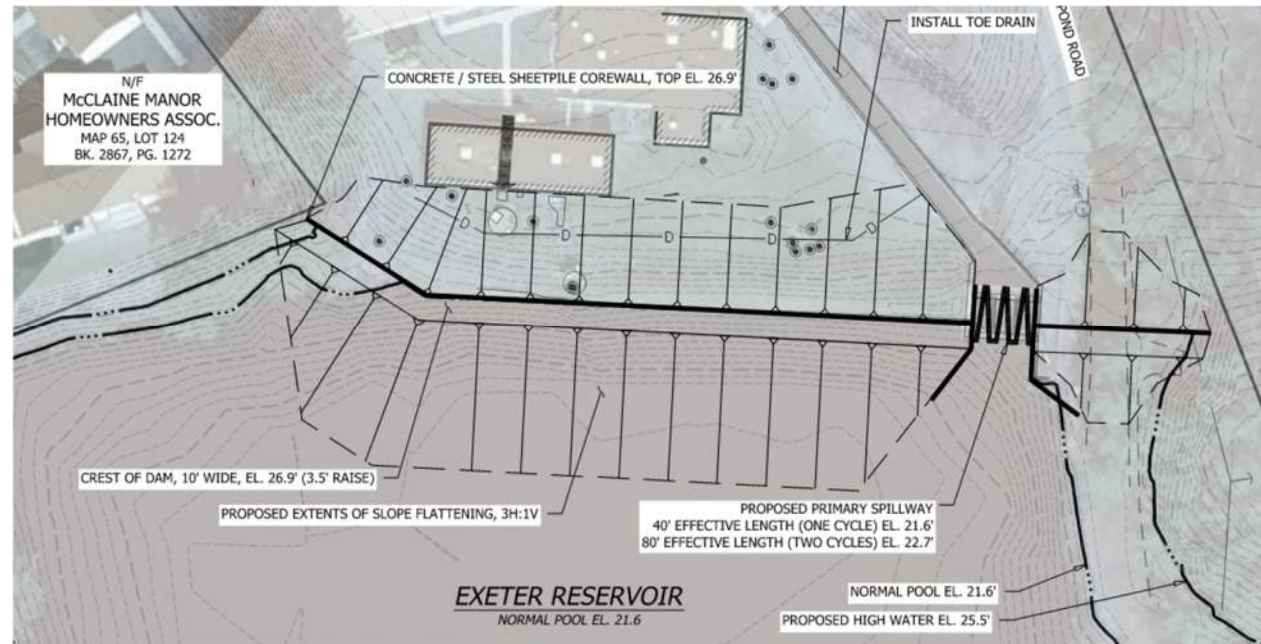
Rehabilitation Design Constraints

- NH ENV-Wr 100-800 – Dam Regulations:
 - Pass 1,000-year storm flows with 1 foot of freeboard and no operations
 - Slope stability meeting NRCS Technical Release 210-60 guidance
- Surface Water Treatment Plant (SWTP) located at the toe of the downstream slope
- Water Works Pond Road passing through the right abutment
- No seepage drain present



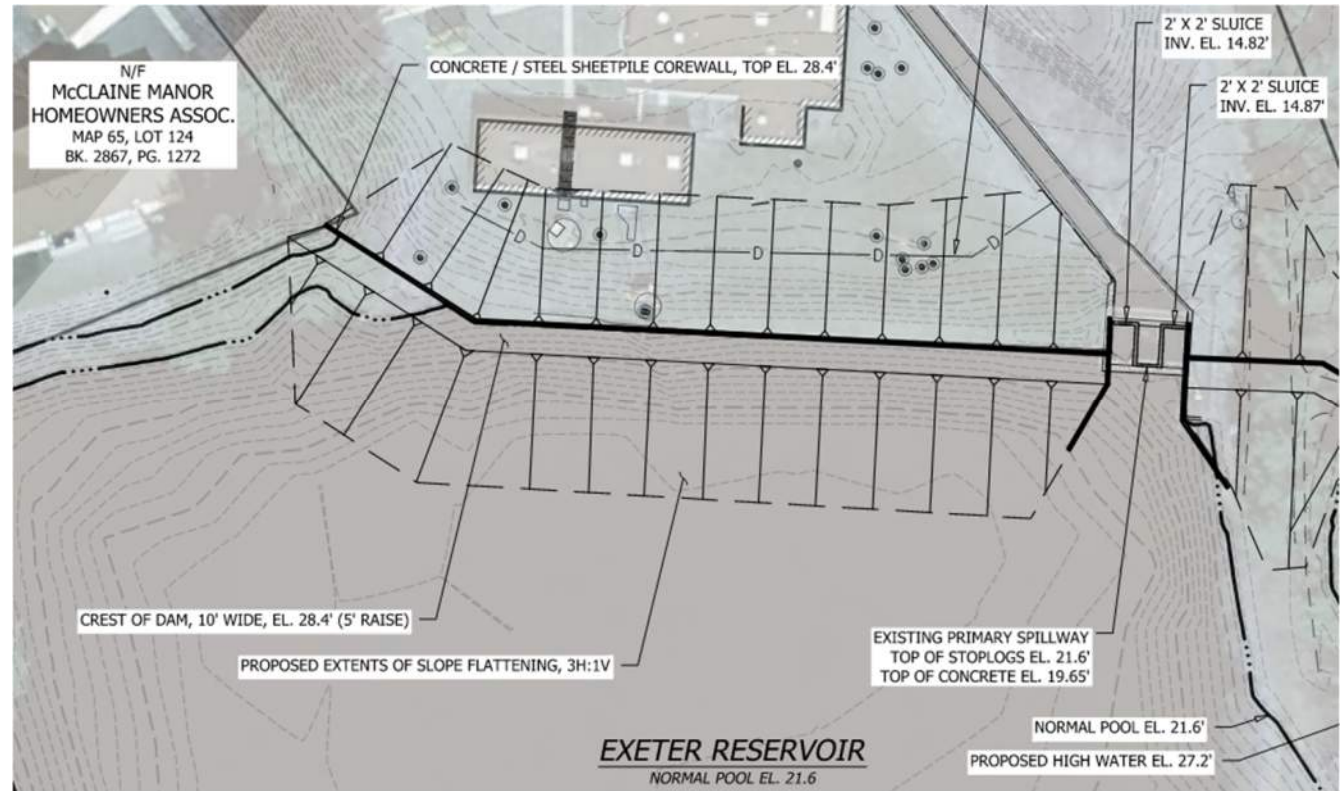
Alternative 1:

- Raise top of dam 3.5 feet (earthen fill), replace spillway with labyrinth weir having 120-foot effective length



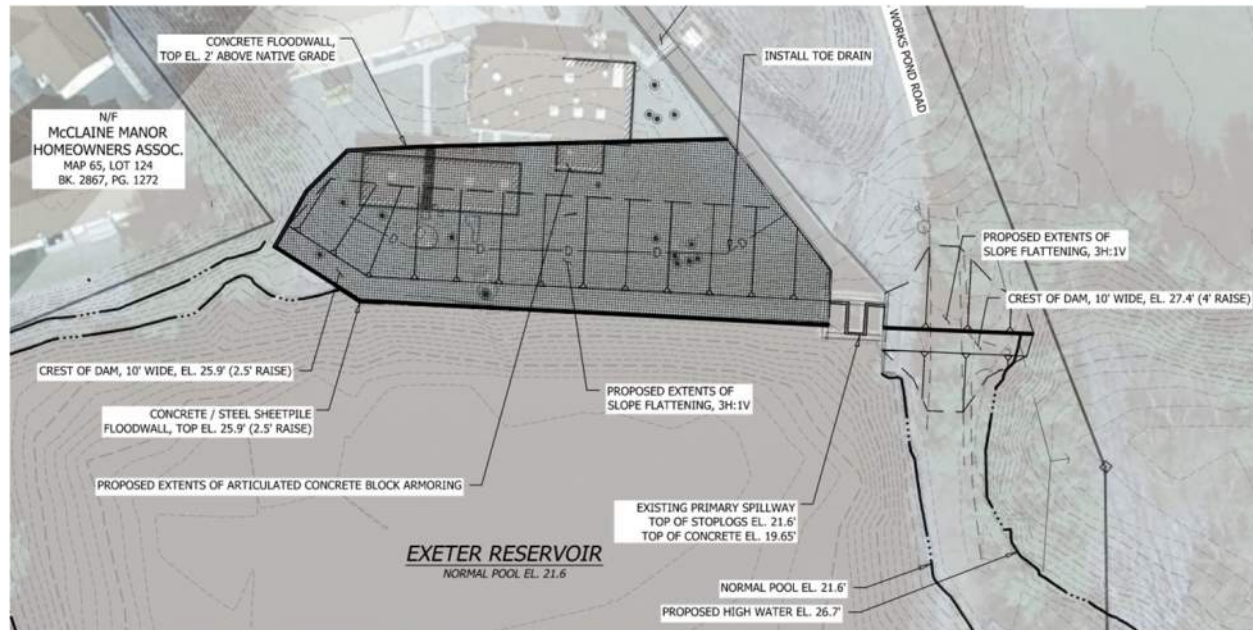
Alternative 2

- Raise top of dam 5 feet (earthen fill), keep existing spillway
 - May require purchasing land at the left abutment
 - Would impact WTP



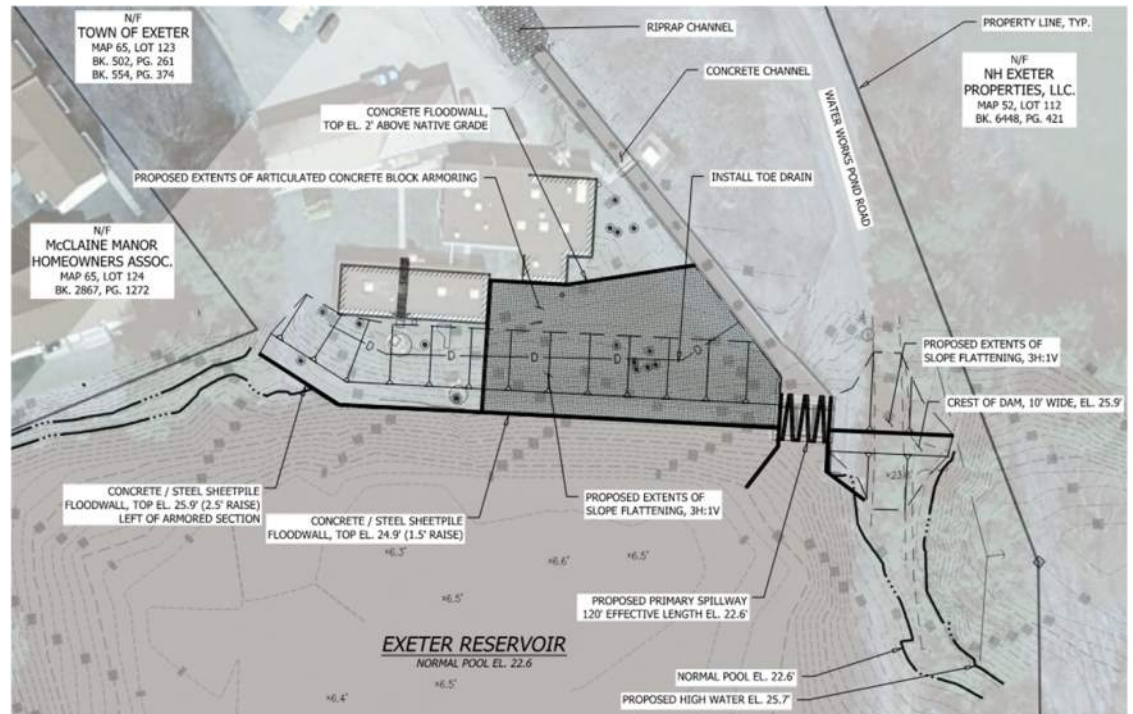
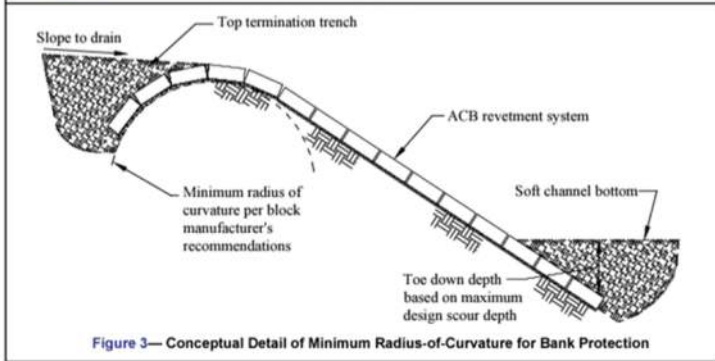
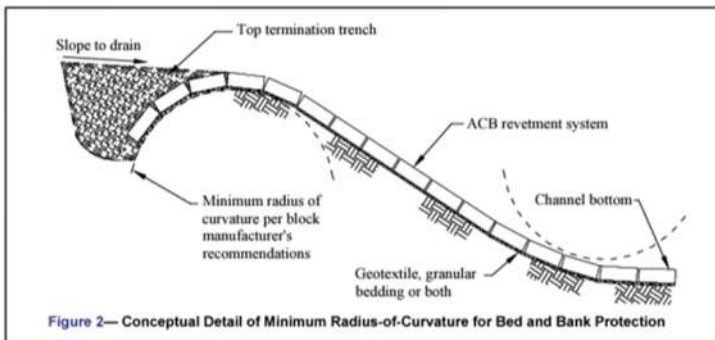
Alternative 3

- Raise top of dam 2.5 feet (earthen fill), keep existing spillway, install overtopping protection
- Would require removal / reconfiguration of the SWTP



Alternative 4

- Raise top of dam 1.0/2.5 feet (earthen fill or floodwall), replace spillway with labyrinth weir having 120-foot effective length, install overtopping protection over 150 feet of dam
 - Will require floodproofing of Surface Water Treatment Plant



Cost Comparison

	Alt 1: Raise Dam, Labyrinth Spillway	Alt 2: Raise Dam, Existing Spillway	Alt 3: Raise Dam, Overtopping Protection, Existing Spillway	Alt 4: Raise Dam, 150' Overtopping Protection, Labyrinth Spillway
Construction Components				
General Items	\$156,310	\$133,775	\$115,475	\$135,035
Mob. & Demob.	\$18,600	\$18,000	\$18,000	\$18,000
Erosion Controls	\$29,100	\$29,100	\$12,785	\$12,785
Control of Water	\$310,000	\$310,000	N/A	\$220,000
Raise Dam	\$912,275	\$1,151,300	\$681,800	\$399,150
Extend / Raise Core Wall	\$140,850	\$676,350	\$100,800	\$76,800
Install Toe Drain	\$22,116	\$22,116	\$22,116	\$22,116
Install Labyrinth Spillway	\$925,700	N/A	N/A	\$925,700
Install Overtopping Protection	N/A	N/A	\$645,750	\$358,000
General Items				
30% Design Contingency	\$755,000	\$703,000	\$480,000	\$651,000
Const. Cost w/Contg.	\$3,269,000	\$3,044,000	\$2,077,000	\$2,819,000
Engineering & Permitting	\$505,000	\$472,000	\$327,000	\$438,000
Project Admin Costs	\$50,000	\$50,600	\$50,000	\$50,000
Const. Phase Services	\$326,900	\$304,400	\$207,700	\$281,900
Total Const. Phase Cost	\$4,151,000	\$3,870,000	\$2,662,000	\$3,589,000

Environmental Permitting



NHDES Wetlands Permit (NH RSA 482-A)

Required for impacts below top of bank or within wetlands

Abutter Notifications – Direct Abutters

Submissions through Exeter Town Clerk

Coordination:

- NH Natural Heritage Bureau (T&E Plant Species)
- NH Fish and Game (T&E Animal Species)
- Conservation Commissions
- Exeter-Squamscott River Local Advisory Committee



US Army Corps of Engineers (Section 404 Clean Water Act)

Required for impacts below ordinary high water and within wetlands

Possibly authorized through the NH General Permit (NAE-2022-00849)

Coordination:

- USFWS
- NMFS
- NH State Historic Preservation Office (NHDHR)

Additional Permitting



NHDES Water Quality Certification (CWA Section 401)

Triggered by USACE Permit



NHDES – Shoreland Water Quality Protection Act (RSA 483-B)

Upland construction, excavation, or filling activities within the 250 ft of river

Includes review of stormwater and clearing



NHDES - Alteration of Terrain (NH RSA 485-A:17)

Project may qualify for a General Permit by Rule under Env-Wq 1503.03(g)



NHDES Dam Bureau Safety Review (RSA 482)

Dam Modification: Env-Wr 400, RSA 482:9 and 482:29



FEMA – Letter of Map Revision

Triggered by changes to the 100-year floodplain (base flood elevation)

Infrastructure Impacts

- Sluiceway
 - Existing capacity is ~1,000 cfs
 - Concrete from spillway to downstream side of SWTP – 8 feet wide, 4 feet deep
 - Riprap downstream of SWTP – 10 feet wide (minimum), 4 feet deep
 - Widen to 18 feet, extend concrete, raise height at culverts: \$1,250,000
- Surface Water Treatment Plant
 - Direct impact from Alternative 2 & 3
 - Need flood protection for Alternative 4
- Portsmouth Ave
 - No overtopping
 - Headwater from culverts impacts WTP
- Waterworks Pond Road
 - Raise 2-5 feet depending on alternative: \$150,000



Water Supplies

- From EAP development reduced normal level from 22.6' to 21.6'
- Modifications will not impact water supplies
- Intake structure elevation will need to be modified based on alternatives
- 7' diameter concrete wet well intake
 - Top Elevation: 25.9'
 - Invert Elevation: 5.9'



Next Steps

- Awaiting NHDES review of EAP and OMR
- Will develop updated schedule to complete Feasibility Study once comments are received
- Once comments received
 - Will revise model and results based on comments
 - Finalize Feasibility Study

Questions?

