Boardman Dam Removal Observations and Lessons Learned

Troy Naperala, PE

May 11, 2018

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PROJECT PARTNERS

- U.S. Army Corps of Engineers
- Grand Traverse Band
- City of Traverse City
- Grand Traverse County
- Michigan DEQ
- Michigan DNR
- Michigan Hydro Relicensing Coalition
- Traverse City Light & Power
- U.S. Fish & Wildlife Service
- U.S. Environmental Protection Agency
- Conservation Resource Alliance
- Grand Traverse Conservation District
- Grand Traverse County Road Commission
- Rotary Camps & Services
- Watershed Center, Grand Traverse Bay
- Garfield Twp.

BOARDMAN DAM REMOVAL OBSERVATIONS AND LESSONS

- Project Overview
- Community Interaction
- Change Management
- Engineer Intent vs. Contractor Interpretation
- Recycle/Reuse – opportunities and challenges
- When It Rains, It Pours

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Minnesota
Ontario
Quebec
Wisconsin
Boardman River Watershed
Traverse City
Michigan
New York
Detroit
Iowa
Chicago
Illinois
Indiana
Ohio
Pennsylvania

Boardman River Dams

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PROJECT OVERVIEW

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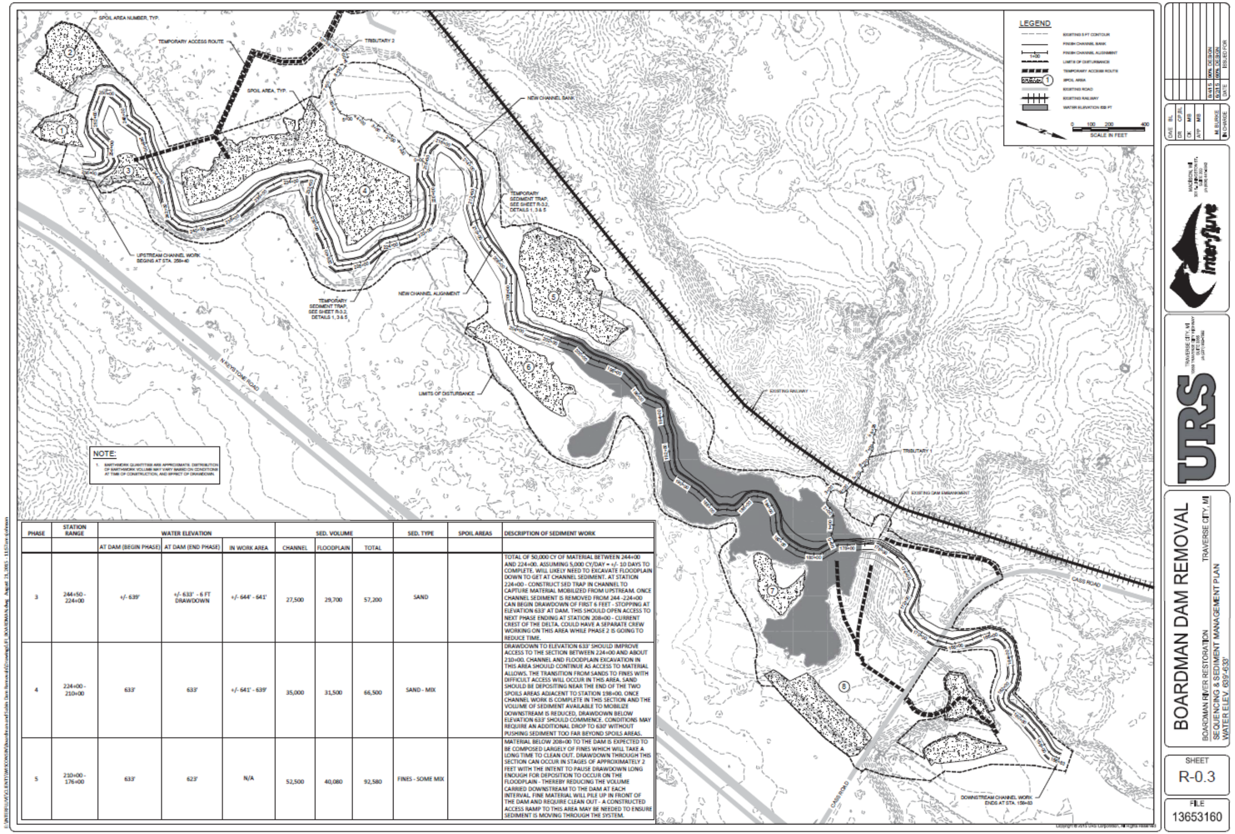
PROJECT OVERVIEW TOP 10 LIST

- 360,000 CYD of material moved
- 11,000 ft. of restored channel
- 400 logs
- 18 months of construction



PHASE	STATION RANGE	WATER ELEVATION			SED. VOLUME			SED. TYPE	SPOIL AREAS	DESCRIPTION OF SEDIMENT WORK
		AT DAM (BEGIN PHASE)	AT DAM (END PHASE)	IN WORK AREA	CHANNEL	FLOODPLAIN	TOTAL			
3	244+50 - 224+00	+/- 639'	+/- 633' - 6 FT DRAWDOWN	+/- 644' - 641'	27,500	29,700	57,200	SAND		TOTAL OF 50,000 CY OF MATERIAL BETWEEN 244+00 AND 224+00. ASSUMING 5,000 CY/DAY = +/- 10 DAYS TO COMPLETE. WILL LIKELY NEED TO EXCAVATE FLOODPLAIN DOWN TO GET AT CHANNEL SEDIMENT. AT STATION 224+00 - CONSTRUCT SED TRAP IN CHANNEL TO CAPTURE MATERIAL MOBILIZED FROM UPSTREAM. ONCE CHANNEL SEDIMENT IS REMOVED FROM 244 -224+00 CAN BEGIN DRAWDOWN OF FIRST 6 FEET - STOPPING AT ELEVATION 633' AT DAM. THIS SHOULD OPEN ACCESS TO NEXT PHASE ENDING AT STATION 208+00 - CURRENT CREST OF THE DELTA. COULD HAVE A SEPARATE CREW WORKING ON THIS AREA WHILE PHASE 2 IS GOING TO REDUCE TIME.
4	224+00 - 210+00	633'	633'	+/- 641' - 639'	35,000	31,500	66,500	SAND - MIX		DRAWDOWN TO ELEVATION 633' SHOULD IMPROVE ACCESS TO THE SECTION BETWEEN 224+00 AND ABOUT 210+00. CHANNEL AND FLOODPLAIN EXCAVATION IN THIS AREA SHOULD CONTINUE AS ACCESS TO MATERIAL ALLOWS. THE TRANSITION FROM SANDS TO FINES WITH DIFFICULT ACCESS WILL OCCUR IN THIS AREA. SAND SHOULD BE DEPOSITING NEAR THE END OF THE TWO SPOILS AREAS ADJACENT TO STATION 198+00. ONCE CHANNEL WORK IS COMPLETE IN THIS SECTION AND THE VOLUME OF SEDIMENT AVAILABLE TO MOBILIZE DOWNSTREAM IS REDUCED, DRAWDOWN BELOW ELEVATION 633' SHOULD COMMENCE. CONDITIONS MAY REQUIRE AN ADDITIONAL DROP TO 630' WITHOUT PUSHING SEDIMENT TOO FAR BEYOND SPOILS AREAS.
5	210+00 - 176+00	633'	623'	N/A	52,500	40,080	92,580	FINES - SOME MIX		MATERIAL BELOW 208+00 TO THE DAM IS EXPECTED TO BE COMPOSED LARGELY OF FINES WHICH WILL TAKE A LONG TIME TO CLEAN OUT. DRAWDOWN THROUGH THIS SECTION CAN OCCUR IN STAGES OF APPROXIMATELY 2 FEET WITH THE INTENT TO PAUSE DRAWDOWN LONG ENOUGH FOR DEPOSITION TO OCCUR ON THE FLOODPLAIN - THEREBY REDUCING THE VOLUME CARRIED DOWNSTREAM TO THE DAM AT EACH INTERVAL. FINE MATERIAL WILL PILE UP IN FRONT OF THE DAM AND REQUIRE CLEAN OUT - A CONSTRUCTED ACCESS RAMP TO THIS AREA MAY BE NEEDED TO ENSURE SEDIMENT IS MOVING THROUGH THE SYSTEM.

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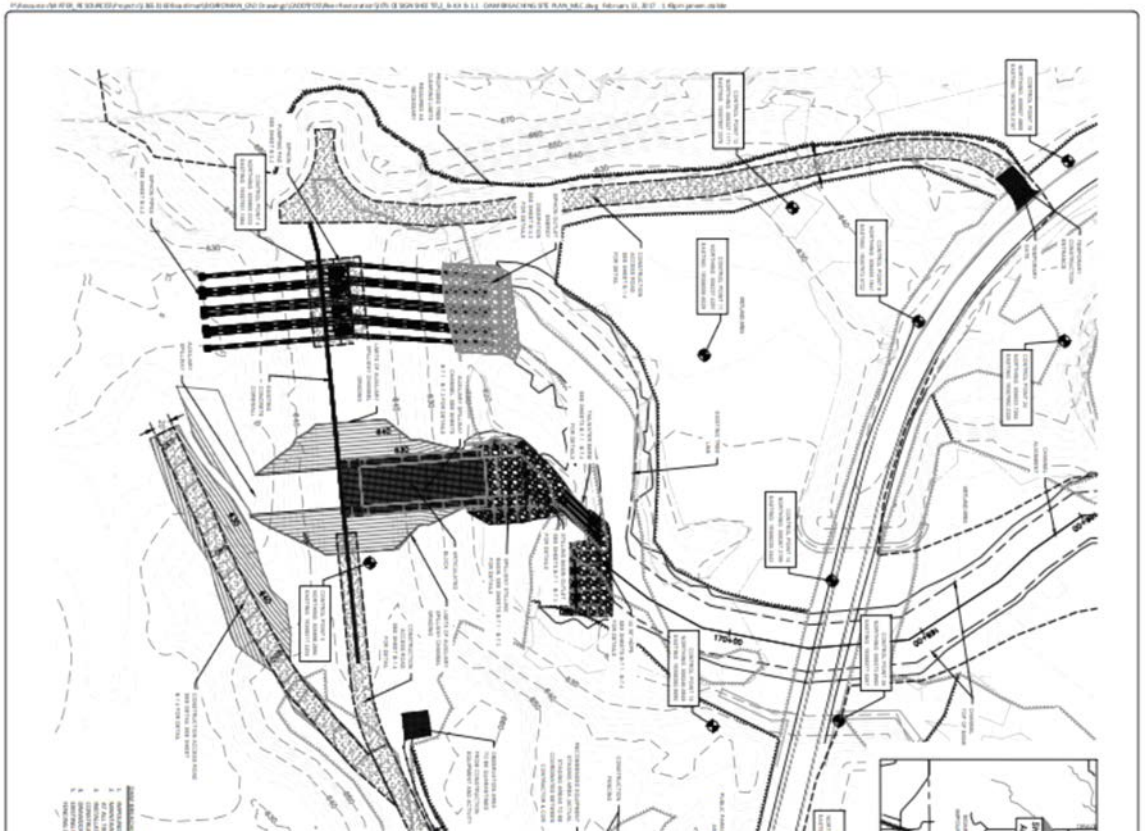
PROJECT OVERVIEW TOP 10 LIST

- 14 siphons @ 400 - 700 cfs
- 26 ft. of head
- 1 powerhouse demo
- 1 constructed riffle
- 1 temporary spillway



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- Project Overview
- **Community Interaction**
  - **Public Interaction**
  - **Turbidity**
- Change Management
- Engineer Intent vs. Contractor Interpretation
- Recycle/Reuse – opportunities and challenges
- When it Rains, it Pours

Public Viewing

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Public Viewing

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Walking & Paddling

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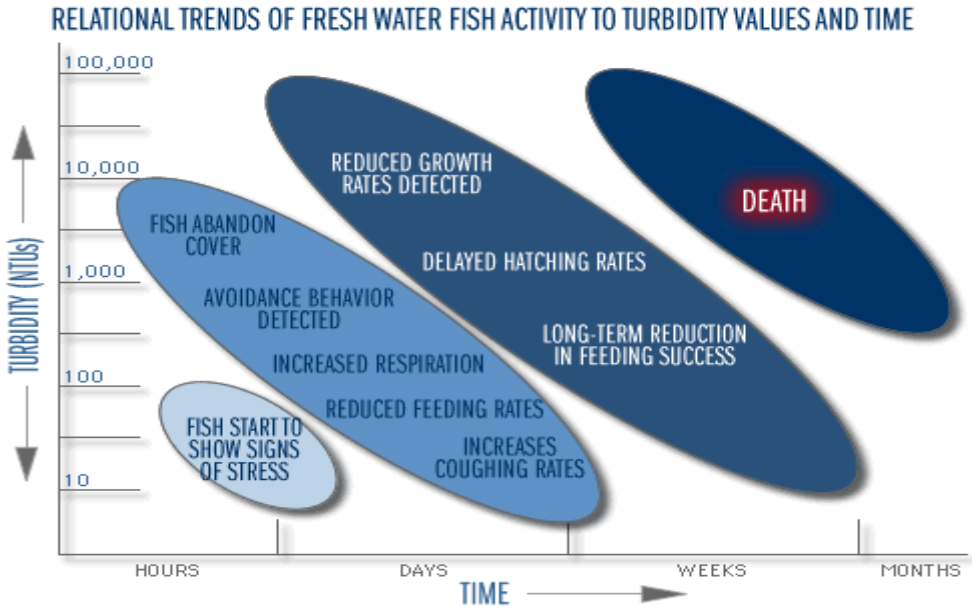
Walking & Paddling

Turbidity



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- **Change Management**
  - **Relic Structures**
  - **Evolving River Conditions**
  - **Design Flexibility**
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Relic Structures – Cass Bridge

Relic Structures
Corewall

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Relic Structures
Corewall

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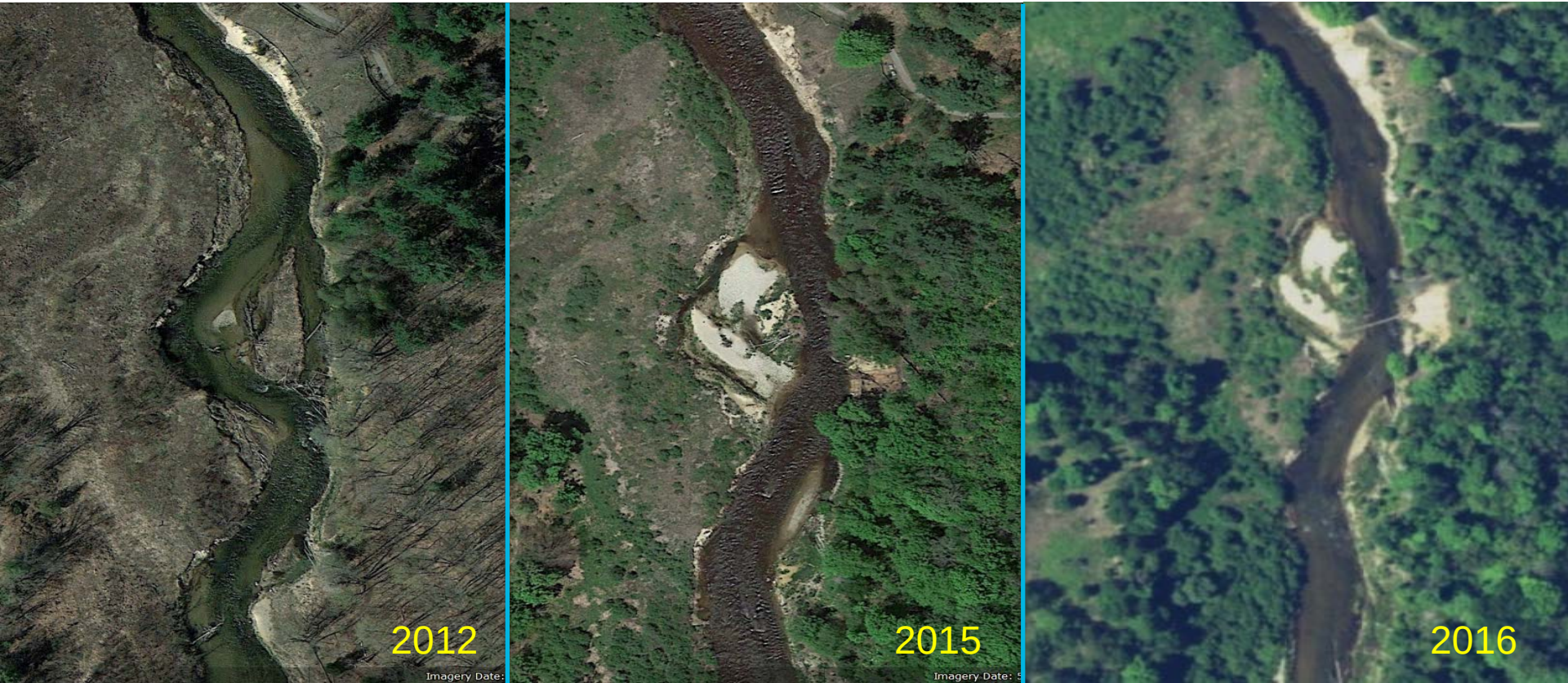
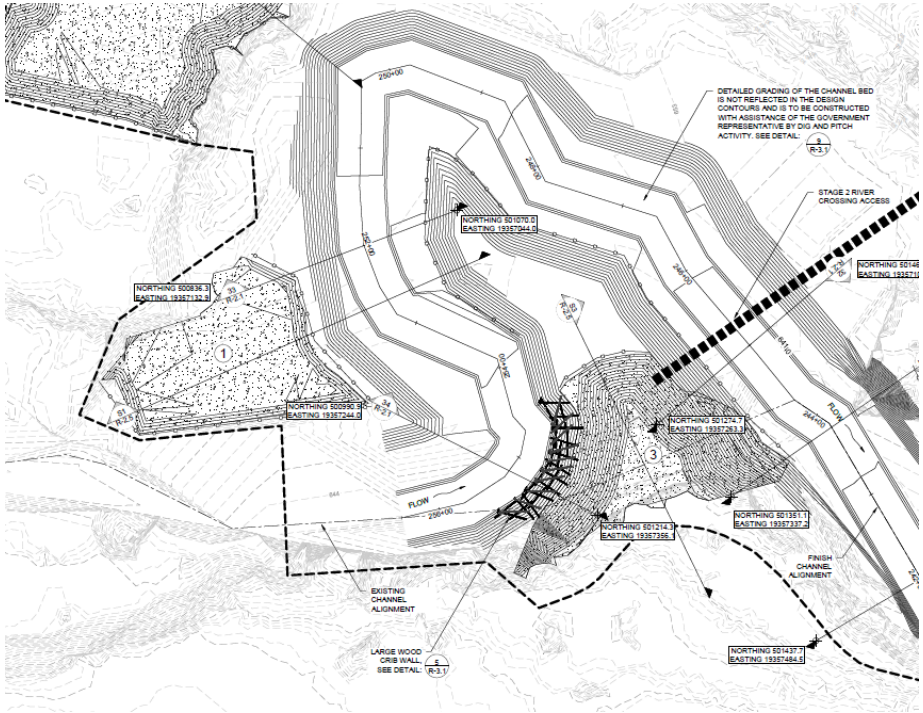
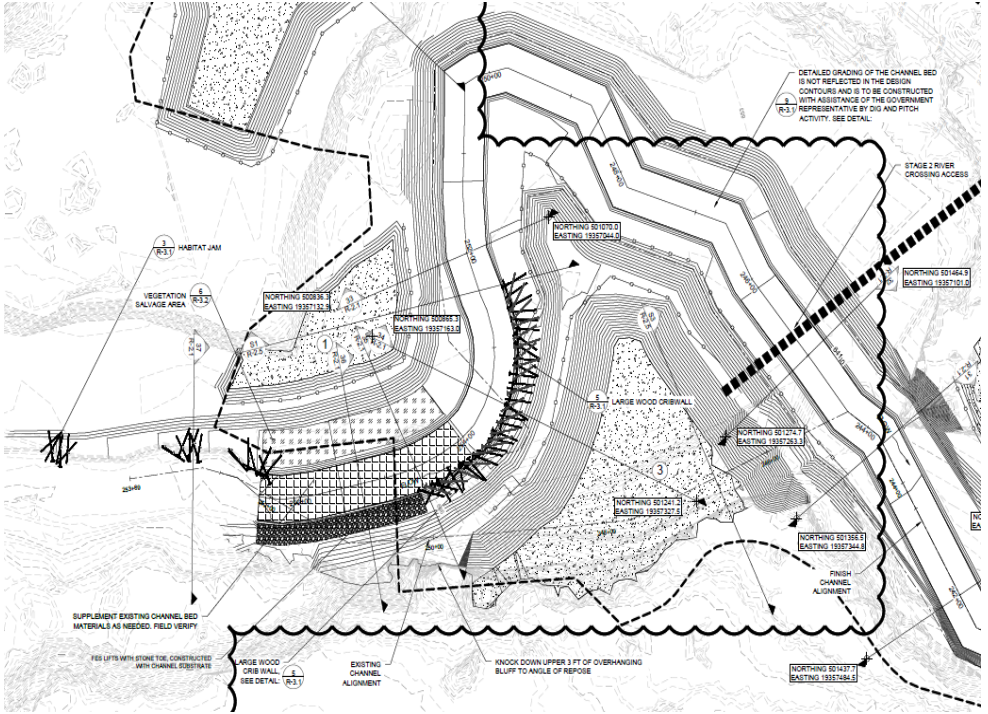
Evolving River Conditions



Evolving River Conditions





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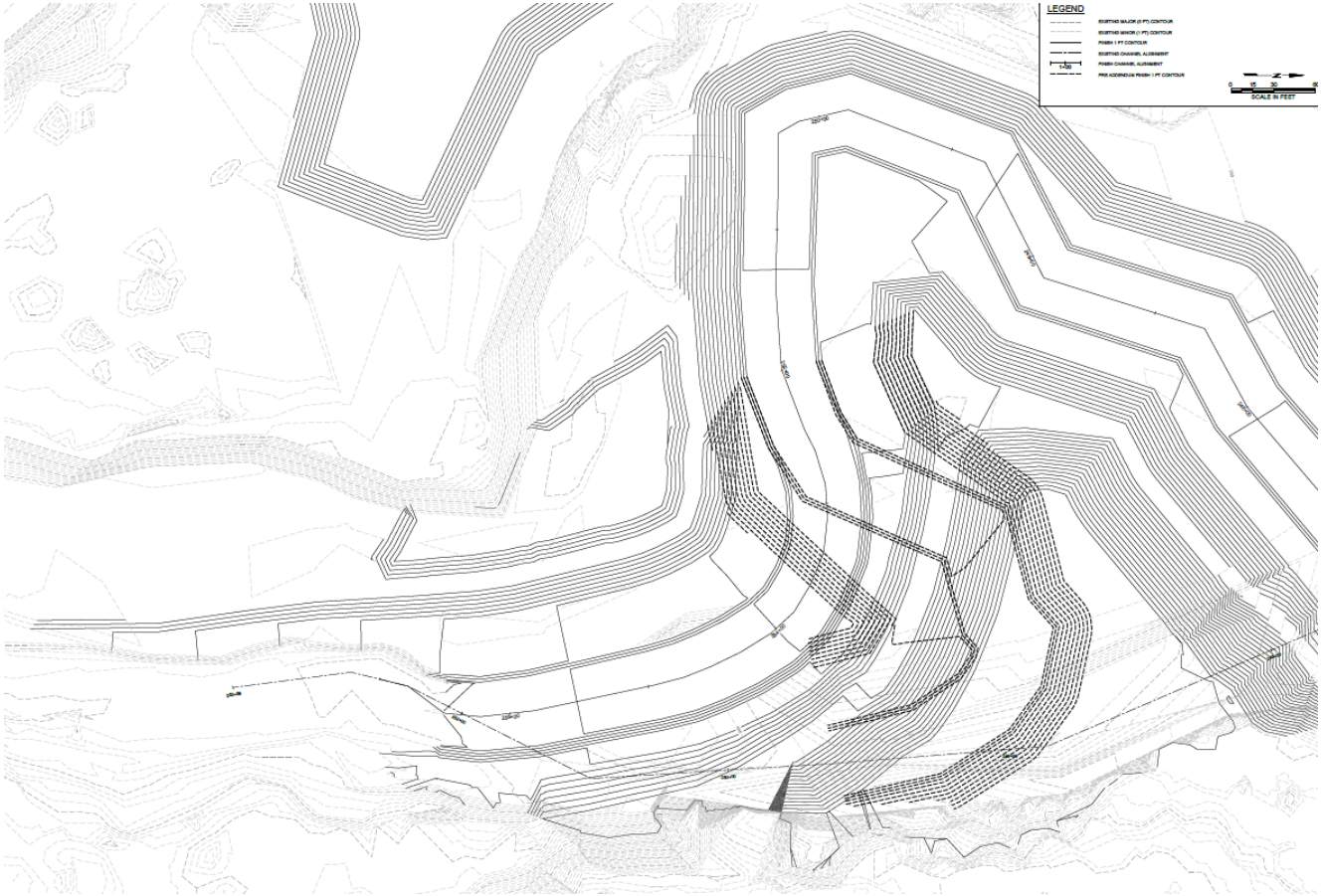

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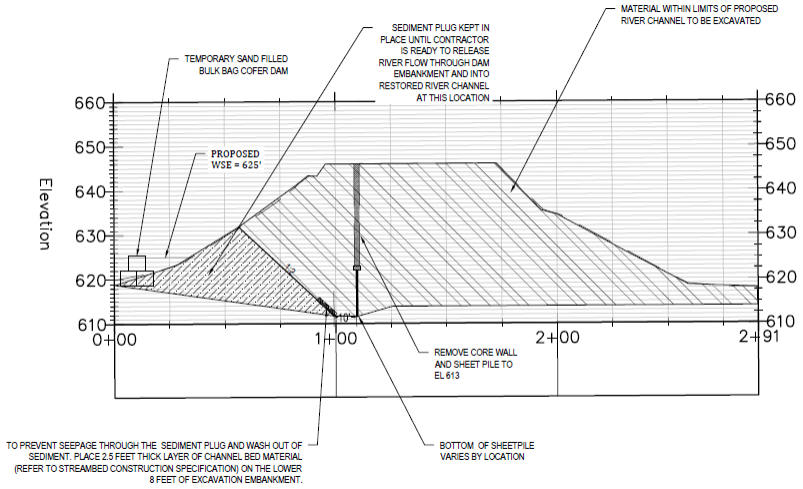
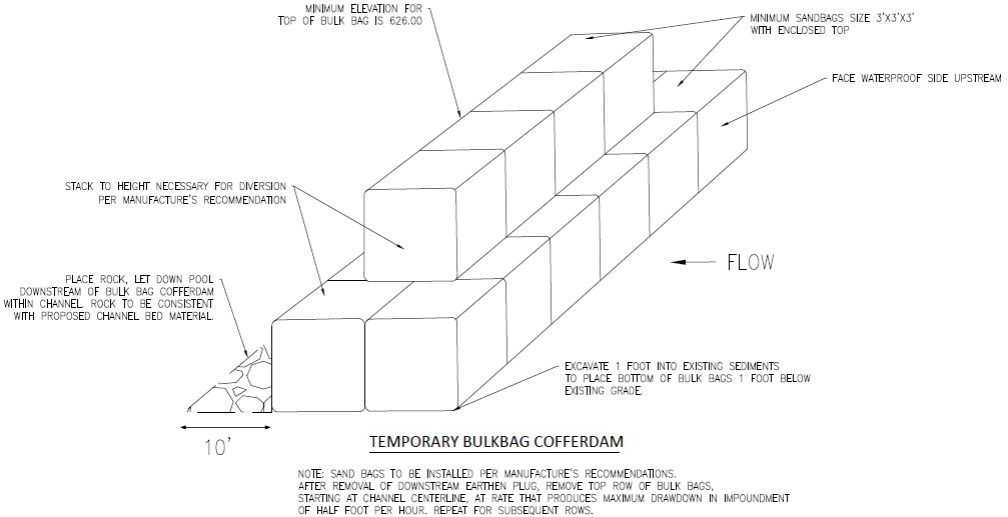
Design Flexibility





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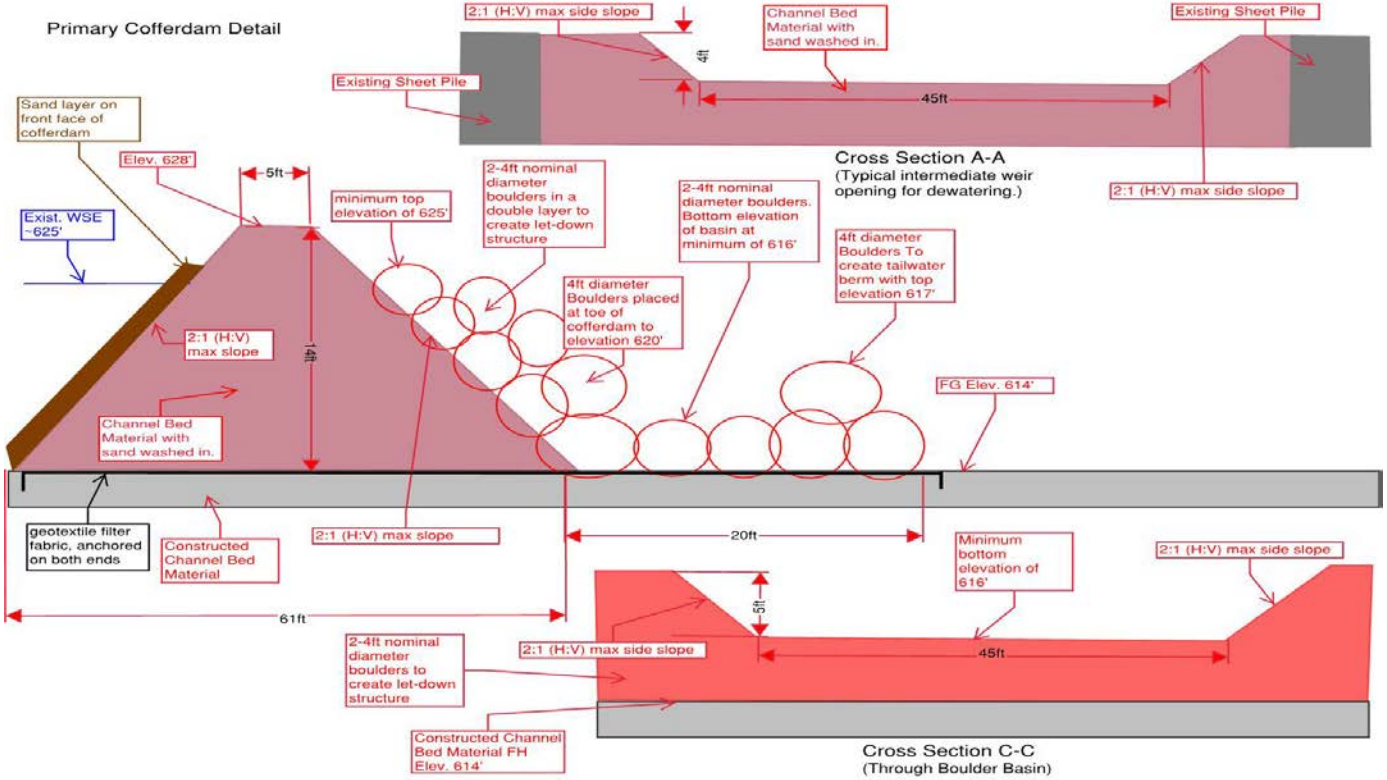

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Design Flexibility

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- **Engineer Intent vs. Contractor Interpretation**
  - **Siphon**
  - **Dewatering and sediment management**
- Recycle/Reuse – opportunities and challenges
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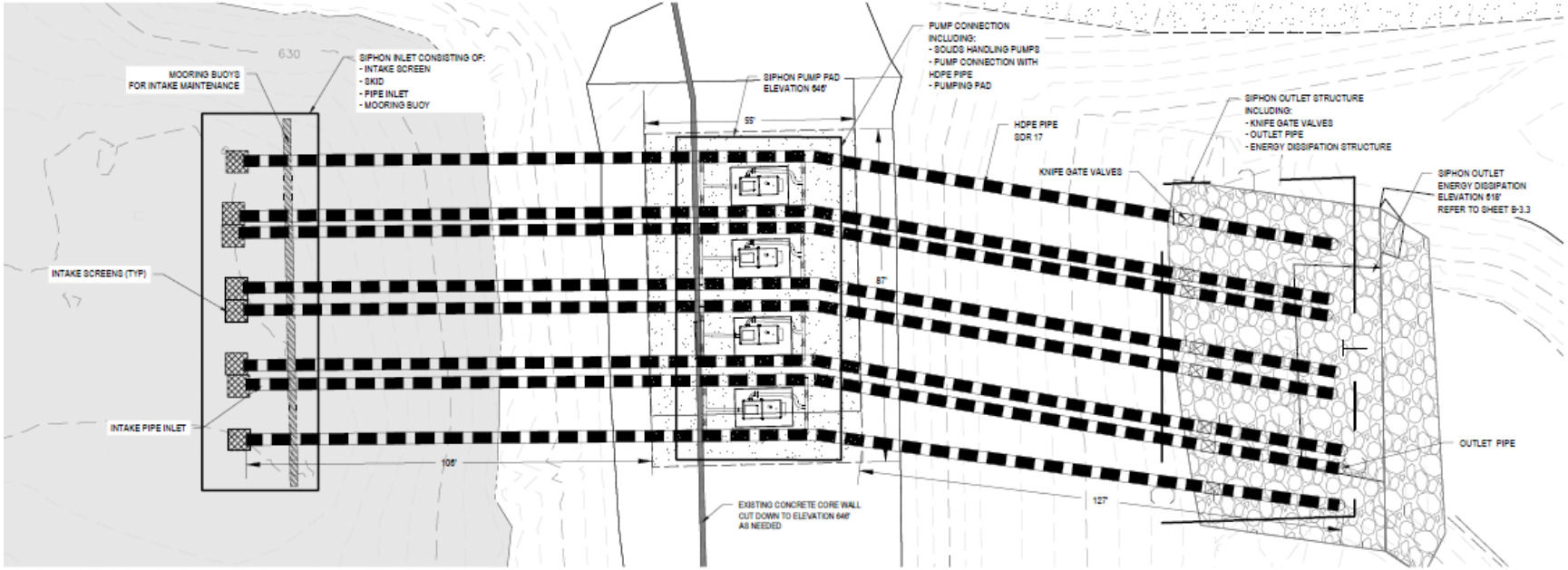
SIPHON SYSTEM



TEMPORARY SIPHON DEWATERING SYSTEM PLAN

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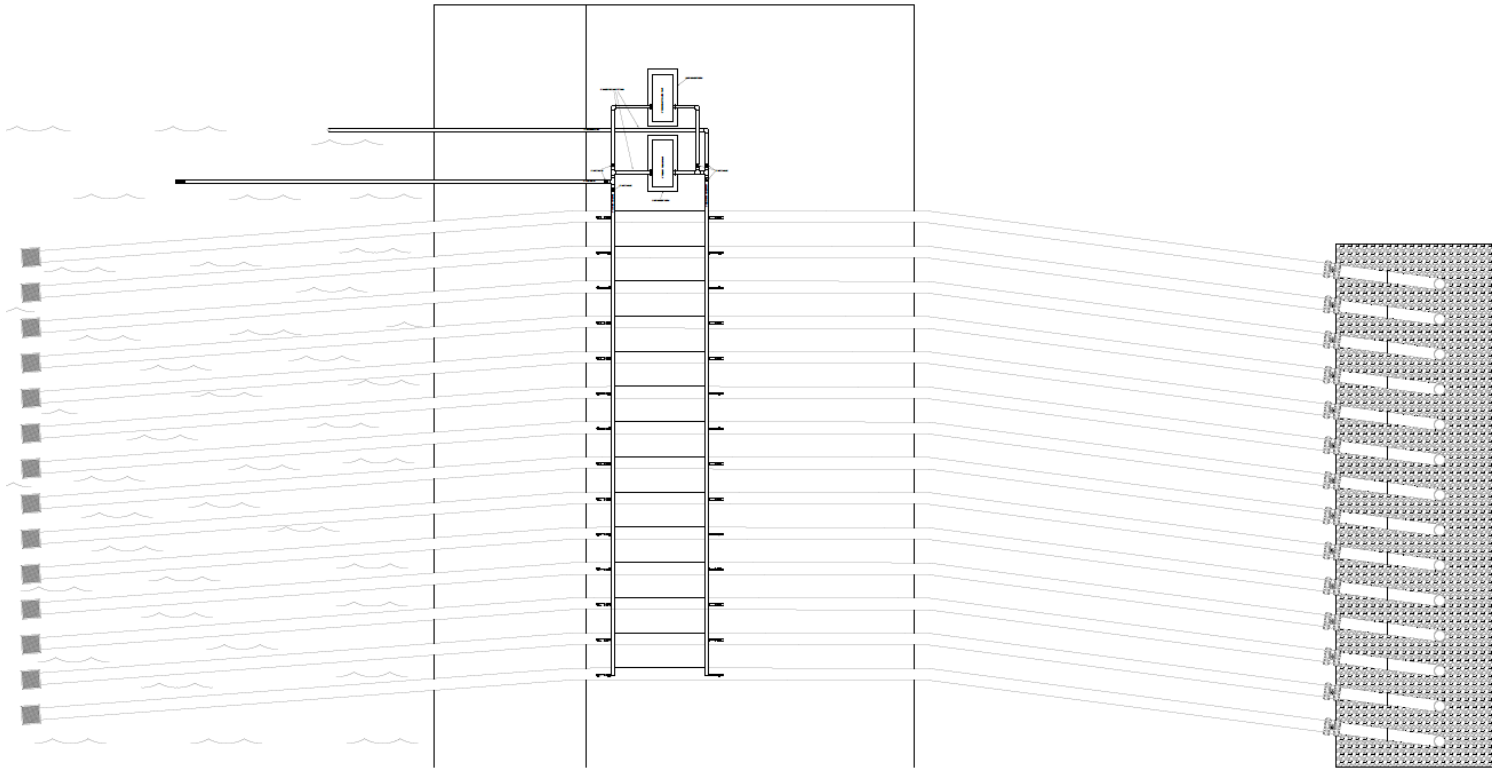
SIPHON SYSTEM



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DEWATERING & SEDIMENT MANAGEMENT

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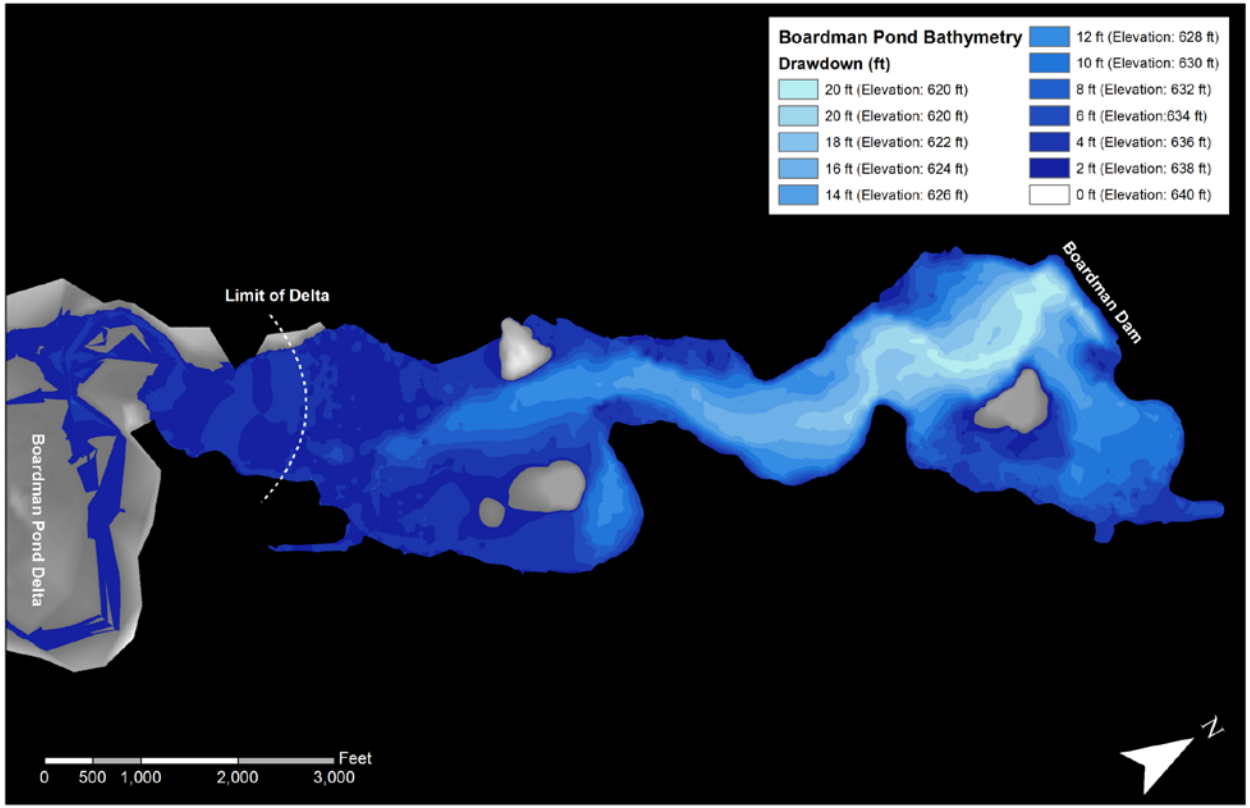
DEWATERING & SEDIMENT MANAGEMENT



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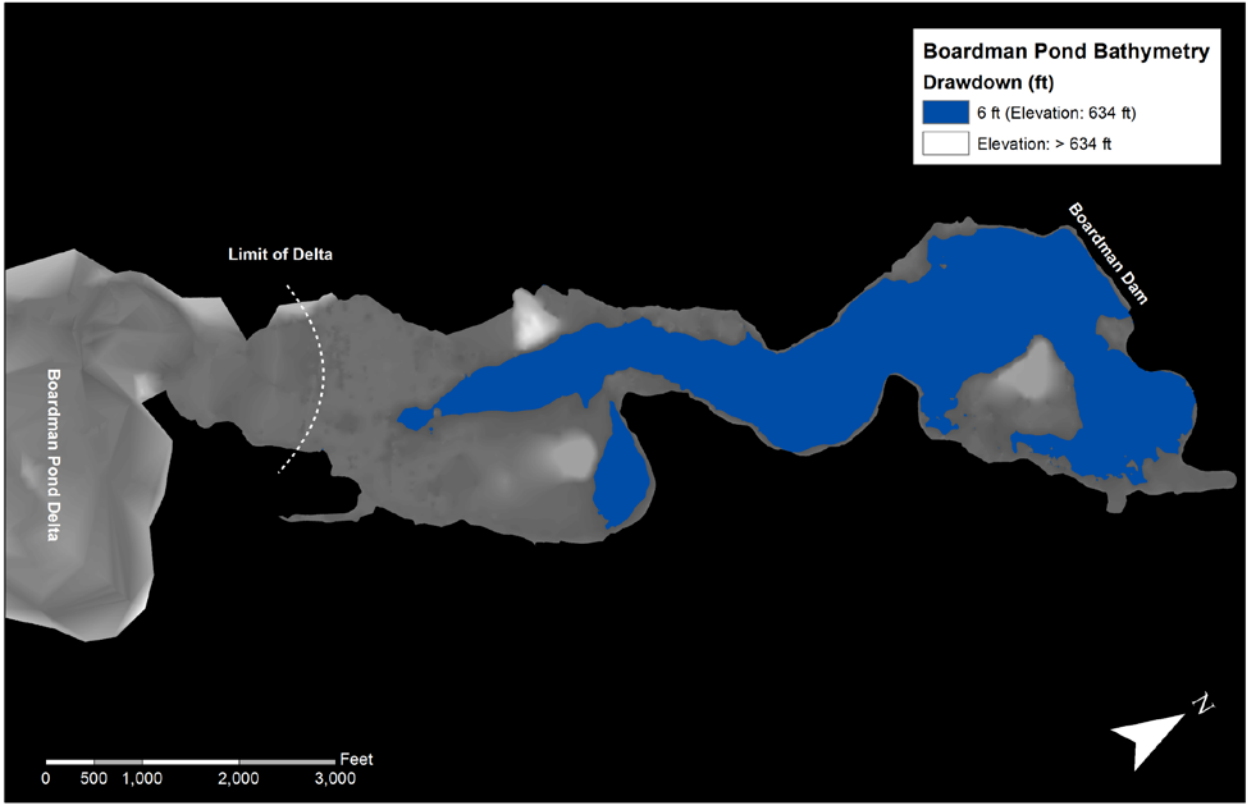

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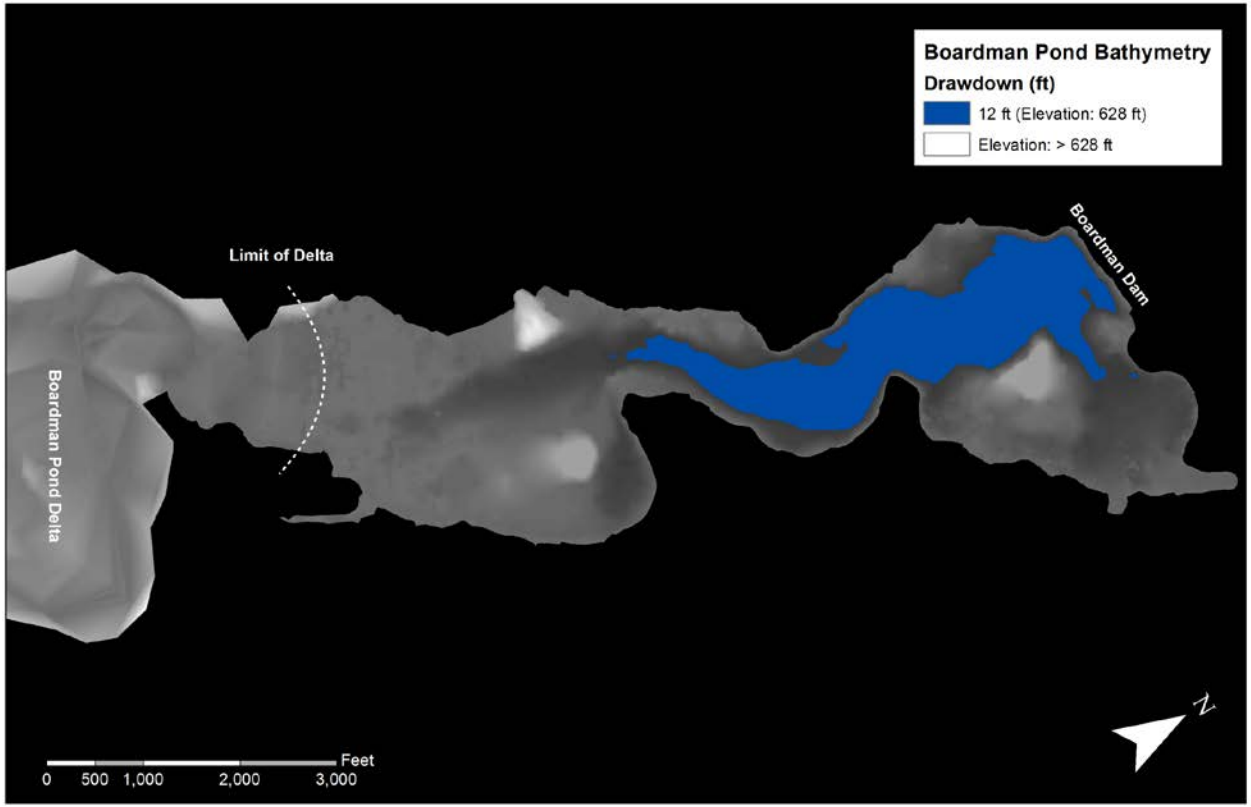

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RECYCLE / REUSE

- Tree clearing as part of project

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RECYCLE / REUSE

- Numerous large wood installations
- Uses for slash material in LWD
- Mulched or buried a lot of cleared debris

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RECYCLE / REUSE

- Vegetation salvage for reestablishing floodplain
- Used in a few designated areas, could have been used more extensively

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RECYCLE / REUSE

- Completed reuse

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October 24, 2017, 700 cfs

Peak on 10/25/17 – 900 cfs
10-yr = 1,200 cfs
100-yr = 1,700 cfs

THERE'S ALWAYS SOMETHING YOU WEREN'T PLANNING FOR

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QUESTIONS?