Hemlock Dam
Feasibility Study

Hemlock Dam, Sauk County, Wisconsin

Prepared for:

Sauk County Parks Department
Sauk County

June 2019

HireSmart®

Hemlock Dam Feasibility Study

Hemlock Dam, Sauk County, Wisconsin

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Ayres Associates Project No.
File: i:\26\sauk county\hemlock dam\2019 feasibility study\report.docx

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Introduction

This report summarizes the assumptions, calculations, and underlying technical details of the dam repair or removal options for Hemlock Dam.

As qualifications for preparing this report, Ayres Associates has designed the following dam removals:

- East Troy Dam Removal Feasibility Study – study only
- Rosemeyer Dam Removal Feasibility Study – study only
- Eau Claire River's Gordon Dam - removed
- Duck Creek Fish Passage and Dam Removal – removed two dams
- Milwaukee River's Young American Dam - removed
- Pine River's Parfrey Dam - removed
- Apple River's Woodley Dam - removed
- Couderay River's Grimh Dam– removed
- Straight River's Straight Lake Dam Evaluation – Dam reconstructed
- Clam River's Clam Falls Dam – Feasibility Study– study only
- Washburn County Little Grassy Flowage – removal
- Iowa County TP 7 and TP 8 Dam Removal Feasibility Studies – study only

Background

The Hemlock dam is located on the south side of the Hemlock Slough on the 400 State Trail. The dam consists of a horseshoe shaped earth embankment with a corrugated metal pipe whistle tube structure. The dam is located on the north of the of the 400 State Trail which separates the impoundment from the Baraboo River. A bridge spans the dam's outlet channel on the State Trail.

A dam failure analysis was completed in 2015 for Sauk County for the Hemlock dam by Montgomery Associates Resource Solutions LLC (MARS). This analysis determined that the dam is classified as a low hazard dam and spillway capacity needs to meet NR333 standards of passing the 100 year return frequency storm. The analysis by MARS concluded that the dam as currently configured does have capacity to pass the 100 year storm.

In 2018 a flood on the Baraboo River overtopped the Hemlock dam from the downstream side. This flood caused erosion and damage to the upstream embankment. As a result the County removed the stoplogs from the whistle tube spillway and the lake is currently drawdown.

Photographs and Site Characteristics

From survey shots the embankment shows an approximate 14-foot wide crest with 3H:1V upstream and downstream side slopes. The available storage above the normal pool elevation, according to the dam failure analysis on the slough is roughly 94 ac-ft at a flood stage 2-feet above normal pool. Normal pool elevation was assumed to be 895 in the dam failure analysis, while survey showed the top of the embankment to be approximately 898. Due to the placement of additional stop logs or screens in the spillway, the dam has been maintained at an elevation about 1.5 feet above the original design intent.

Photograph 1 is obtained from Google Earth imagery dated 2019. Photographs 2 through 7 show the intake pipe, outlet pipe, embankment, structure, spillway, and natural channel conditions.

Photograph 1. Overall Site Viewed from Google Earth imagerey dated 2019


Photograph 2 upstream pipe

Photograph 3 downstream spillway

Photograph 4 downstream pipe

Photograph 5 upstream damaged embankment

Photograph 6 Drop Inlet Structure

Photograph 7 Down stream looking towards the Baraboo River

Removal or Repair Feasibility

The Hemlock dam as shown in photos above was damaged by the 2018 flooding of the Baraboo River. The spillway pipe is an over 50 year old corrugated metal pipe. This spillway pipe was both damaged in the flood or from subsequent ice loading and corrugated metal pipe life expectancy is typically less than 50 years. The spillway for the dam either needs to be replaced or the dam removed. The following sections evaluate options for removal and repair.

When considering a dam as a candidate for removal, several considerations must be reviewed. The following section of this report discusses considerations for hydraulics and hydrology pre-removal compared to post-removal, sediment analysis, endangered resources, permitting, construction phasing, and economics.

Hydraulics and Hydrology

According to the DFA, the 100-year flood event would produce 61 ac-ft of runoff, while the Hemlock dam has 94ac-ft of storage. The Hemlock slough would hold all of the 100-year event, but the 100 year flood elevation for the Baraboo river, located downstream from the Hemlock Dam, is 899.9. This makes modeling a little different than most cases because this elevation overtops the top of the dam embankment, which is at an elevation of 898. In this case the Baraboo river is back flooding into the Hemlock Slough and there is no outflow from the dam structure downstream. For the purpose of this feasibility study, the outflow for each replacement option was calculated by assuming the water elevation to be at 897, which is two feet above normal pool (as modeled in the DFA), and one foot below the top of the embankment. Then an outlet pipe was sized using a HY-8 model to make sure the outlet pipe could accommodate the outflow. Three different alternatives were looked at in this study including replacing the whistle tube in kind with an upsized inlet and outlet pipe, placing a 4x4 drop structure in the slough just north of the embankment with an outlet pipe, or complete removal of the dam. For replacement option one, the flow over a four-foot weir with water elevation of 897 was used to size the outlet pipe. A four-foot weir under this scenario will pass 84 cfs at a pool elevation of 897 For

option two, the flow over two, three-foot weirs with water elevation of 897 was used to size the outlet pipe. This flow was calculated to be 88 cfs. These conceptual designs exceed the existing dam spillway capacity.

Spillway Upgrade Alternatives

Two alternatives were considered to upgrade the spillway. Alternative 1 is replacement of the existing whistle tube with a similarly designed concrete whistle tube system. Alternative 2 is replacement of the whistle tube with a drop inlet structure.

Replacement Whistle Tube Dam

This alternative consists of a four-foot diameter concrete rise pipe with a 30 inch diameter intake pipe extending into lake and a 30 inch diameter discharge pipe. The inside of the four-foot manhole would be fitted with bolted on stop log slots. See drawings in Appendix B.

This option is basically the same system as current dam configuration. Advantages of this option is it is a low cost alternative (cost included in later section). Disadvantage is possible plugging and difficult access to intake pipe.

Drop Inlet Structure

For this option a pre-cast or cast in place four-foot square culvert will serve as drop in the intake structure. A 2x2 low level slide gate will be installed to facilitate lowering the lake if needed. Normal and flood flows would flow over weirs on either side of the spillway. A grate with railing would be provided on top of the spillway to allow access to remove vegetation and operate the slide gate.

Advantages of this option is it is a an easier system to operate and would not require divers to unplug the intake. Disadvantage is this alternative is more costly than replacement with similar whistle tube system.

Dam Removal

Sediment Analysis Considerations

Contamination databases from the WDNR (BRRTS) indicated low potential of sediment contamination within the tributary to the Hemlock Slough Watershed

For the Hemlock Dam watershed, the BRTTS database listed no sites (Figure 1) that could contribute pollution to the tributary to the Hemlock Slough tributary upstream the Hemlock Dam.

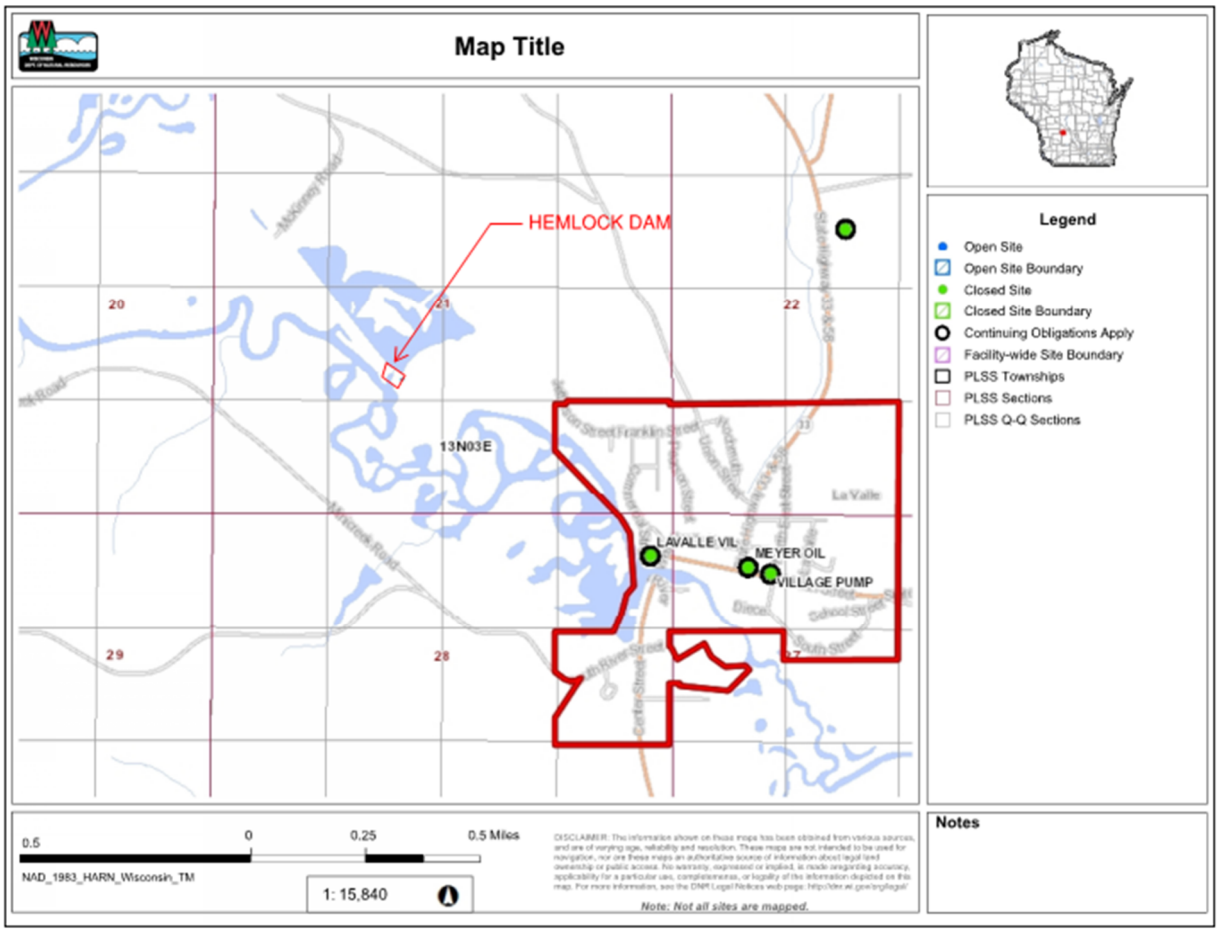

Figure 1. BRTTS sites around the Hemlock Dam

Endangered Resources Considerations

Endangered resources considerations include completing an environmental resource review and complying with terms of the review. A preliminary endangered resources review was completed in May 2019 (Appendix D). The report noted that 'further actions were recommended'. If the dam removal project moves forward, a formal Endangered Resources Review should be filed and completed by the WDNR. The fee for this review is $75/hour. For recent reviews, the total cost has been limited to $75.

The WDNR requires dam removal applicants to identify wetland areas, disposal locations (fill only), and construction scheduling to minimize impacts to endangered resources. A WDNR map of wetland indicators is shown in Figure 2.

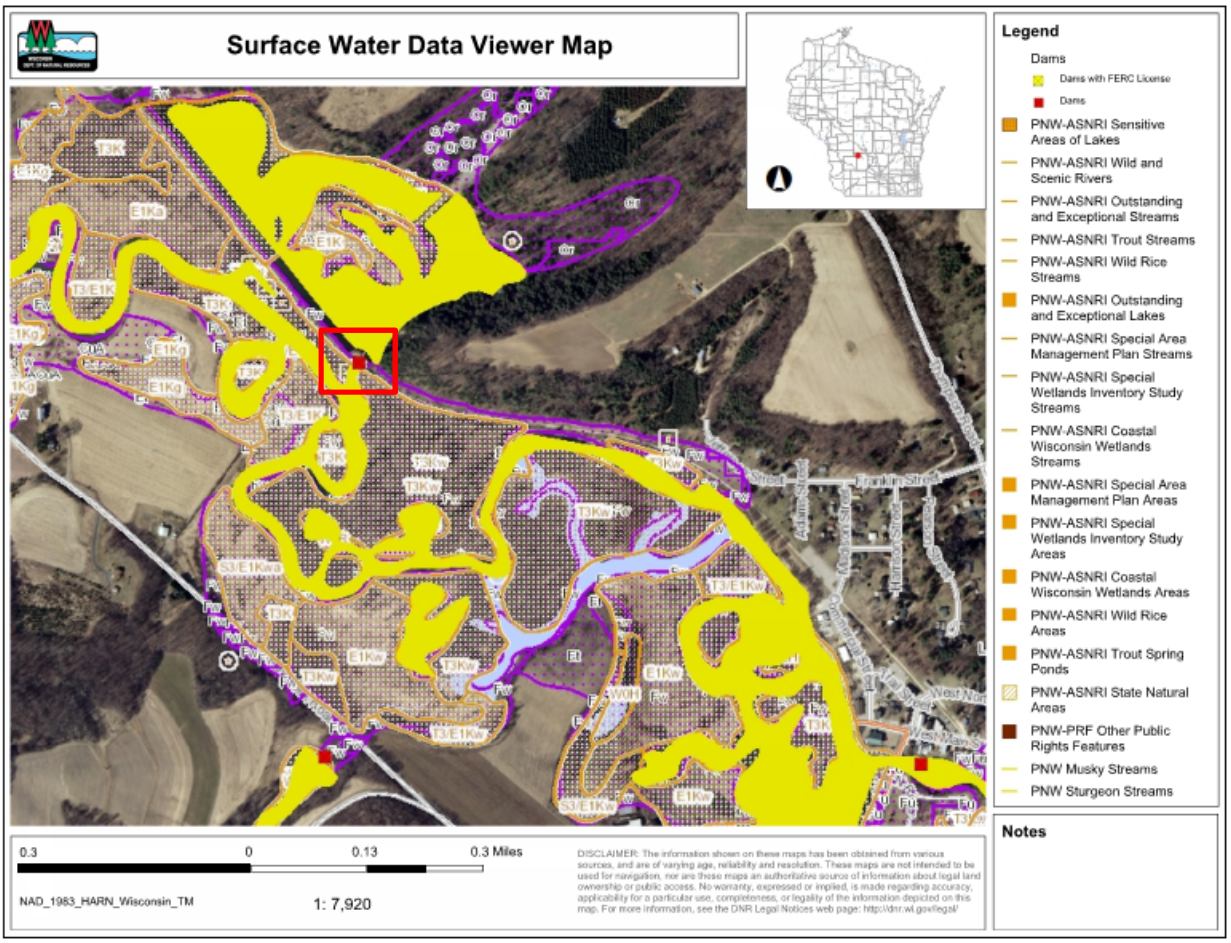

Figure 2. Surface Water Data Viewer Map

Permitting Considerations

Permitting considerations include complying with WDNR dam plan approval permit and Sauk County's site erosion control permit for shoreline related projects. The fees associated with both permit applications have been included in the cost estimate. This report assumes the project will not have to file a state permit for construction site stormwater, since the total area with land disturbing activities will be less than one acre.

The removal process permitting will also require a hydraulic model of post removal conditions to evaluate downstream flood impacts of removing the dam. Because the dam is within the 100-year flood plain of the Baraboo River, we do not expect issues to prevent removal of the dam due to flooding concerns. However, the modeling will be required as part of the permitting.

Feasibility Removal Plan Sequencing Considerations

Typically, the WDNR requires excavation of all structural materials (concrete, steel, etc.) down to at least two feet below original grade or upon reaching bedrock and all non-structural materials (earthen embankments, fill, etc.) such that the post-abandonment river channel does not impound more than

one foot of water above the dam nonexistent profile during the regional flood and its channel is functionally equivalent to pre-dam navigation, fish passage, and hydraulics. WDNR statute NR 333.06 and 333.07(3)(a) and Waterway and Wetland Handbook Chapter 140 pages 64-65 show the remaining dam embankments do not require a hazard rating nor classification as a dam if they do not increase the flood profile by more than one foot during the regional flood.

With the reservoir drawn down to 'pipe-free flowing' elevation, removal would proceed by removing the top segment of the embankment crest from a minimum of 2'-0" above pipe free flowing elevation to the top of the existing embankment. This material would be either hauled off site or utilized on-site in an approved area. During the drawdown, provision will be required to pass base flow flowing through the impoundment.

After the bulk of the dam section to be removed is gone, the remainder of the dam would be breached in a controlled fashion by removing a channel through the remaining earthen embankment, stabilizing with riprap, and continuing by widening area and stabilizing with riprap until the remainder of the dam section planned for removal back to original grade.

Erosion control techniques will include use of silt fencing and turbidity barriers as well as other best management practices as necessary. Sediment stabilization techniques will include immediately seeding after reaching final grades. Seeds will be native species with high soil stabilization potential and hardiness for site conditions. Erosion control mulches, blankets, and tackifiers will be used when necessary to stabilize slopes. Hard armor might be necessary and permanent for some high velocity areas. It is assumed that medium riprap will be required to armor the newly cut channel through the dam embankment.

Opinion of Probable Costs

Below is are estimated opinion of probably cost for Alternatives 1 and 2 and dam removal.

Alternative	Estimated cost
Alternative 1, New Whistle Tub Spillway	$129,219
Alterative 2, New Drop Inlet Spillway	$177,880
Dam Removal	$119,360

A detailed estimate for each alternative is included in Appendix C. The costs for above do not include long term costs to own and operate a dam. If the County elects to repair the dam costs of inspections, reporting and general maintenance should also be factored in. Most of the costs would not be incurred if the dam is removed. Once the spillway is upgraded, larger cost maintenance items should not be needed for many years, barring large floods. Typically cost to own and operate a dam include reports, inspections, mowing and general maintenance. From past project's experience, these costs average out to be about $1000/year.

Available Funding

Sauk County can apply for a Municipal Repair Grant, administered by the WDNR, for both removal and repairs. These are competitive grants, however dam removal scores more points than repairs and thus more likely to be funded. Historically this program has focused repairs for high hazard dams. In the last two grant cycles, all applicants that applied received funding. Assuming the program is funded similar to past levels in the next biennial budget, applications for removal or repair would be likely due in Janaurey 2020. It is not possible to predict what the competition will be for the next grant cycle; however, removal programs are almost always funded.

The dam removal grant covers up to $400,000 of design and construction costs with no local cost share. The repair grant covers 50% of the first $400,000 and 25% of next $400,000, up to a total project cost of $800,000.

Summary

The purpose of this study is to recommend repair or removal, but provide the County with options to consider.

For budgetary purposes, the probable opinion of cost for dam removal at Hemlock Dam is $119,360 no sediment contamination, no dredging, no contested permits, and conservative unit costs for removal engineering, permitting, construction, and administration.

Cost for repair of the spillway are between $129,219 and $177,880 depending on which option the County selects. Both spillway elevations assume a normal pool elevation of 893.5, which is 1.5 feet lower than recent pool elevations.

The removal of Hemlock Dam will require permitting and repairs will required submittal of plans for plan approval from the WDNR. For repair or removal, an environmental review will be required prior to permit issuance, and this assessment could require modifications to the feasibility construction plans that will affect opinions of probable cost.

If the Owner decides to move forward with applying for the permit and/or grant for removing or replacing the Hemlock Dam, the following steps should be taken:

- Owner to contract with an engineering consultant registered in the state of Wisconsin to design selected option and prepare plans and specifications (consultant can also aid with grant application and permitting process)
- Steps that could be done by Owner or Consulting Engineer:
    - File formal endangered resources review request with WDNR to determine if other environmental considerations are required to be built into the project.
    - Apply for WDNR grant for dam removal
    - Apply for WDNR plan approval for dam removal (done after final plans and specifications are complete, and typically aided by the consulting engineer)
- Steps that must be done by a Consulting Engineer:

    - Complete design, project drawings and specifications.
- Obtain a contractor (bid the project, or advertise by other means)
- Complete construction

The removal and repair costs presented in this report are preliminary and subject to additional design and site investigation results but should be sufficient for decision-making purposes.

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Appendix A:

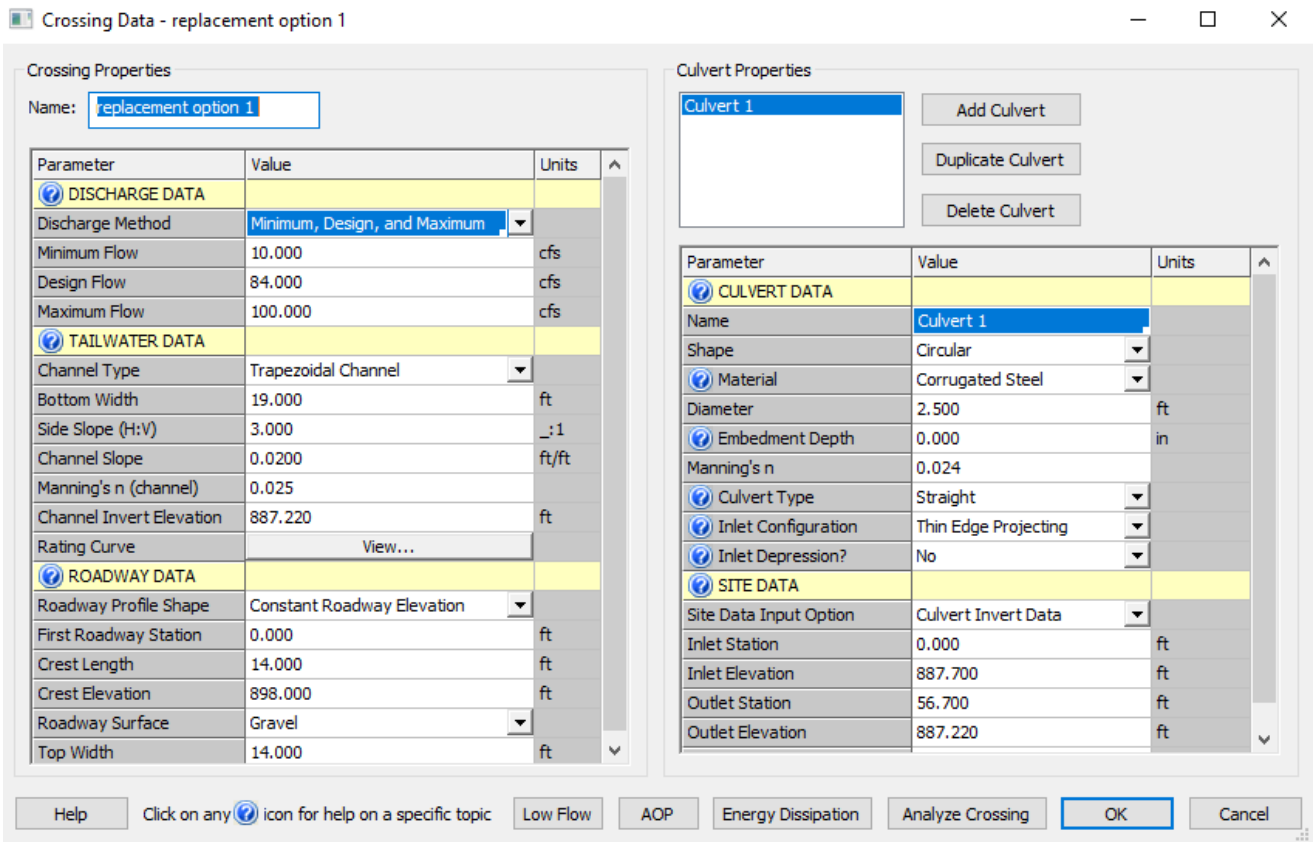
Hemlock Dam Hydaulics

HY-8 Analysis Results

Crossing Summary Table

Culvert Crossing: replacement option 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
889.44	10.00	10.00	0.00	1
890.25	19.00	19.00	0.00	1
891.15	28.00	28.00	0.00	1
892.74	37.00	37.00	0.00	1
894.62	46.00	46.00	0.00	1
896.82	55.00	55.00	0.00	1
898.14	64.00	62.10	1.88	10
898.41	73.00	63.02	9.96	6
898.61	82.00	63.67	18.30	5
898.65	84.00	63.80	20.17	4
898.94	100.00	64.48	35.57	5
898.00	61.62	61.62	0.00	Overtopping



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SPILLWAY RATING CURVE

Dam: *Hemlock Dam - Whistle Tube Spillway*
Location: *Overflow Spillway at elevation 893.5 feet (NGVD29)*

References:
1) Design of Small Dams, 3rd Edition
2) Handbook of Hydraulics, Brater & King, 6th Edition, Ch. 5

Spillway Data

Type of Spillway	Broad Crested Weir		
Crest Elevation	893.50 ft		
Discharge Coefficient, C_o	variable	(Ref. 2)	$Q = CLH^{3/2}$
Crest Length, L'	4 ft		
Number of Piers, N	2		
Pier Contraction Coefficient, K_p	0.01	Round-nosed	
Abutment Contraction Coefficient, K_a	0.00	Rounded where r>0.5Ho & headwall < 45deg to flow direction	
Effective Crest Length, L	$L = L' - 2(NK_p + 1*K_a)H_e$ [ft]	(Ref. 1, pg 365)	*(2 abutments)*

Spillway Rating Computations

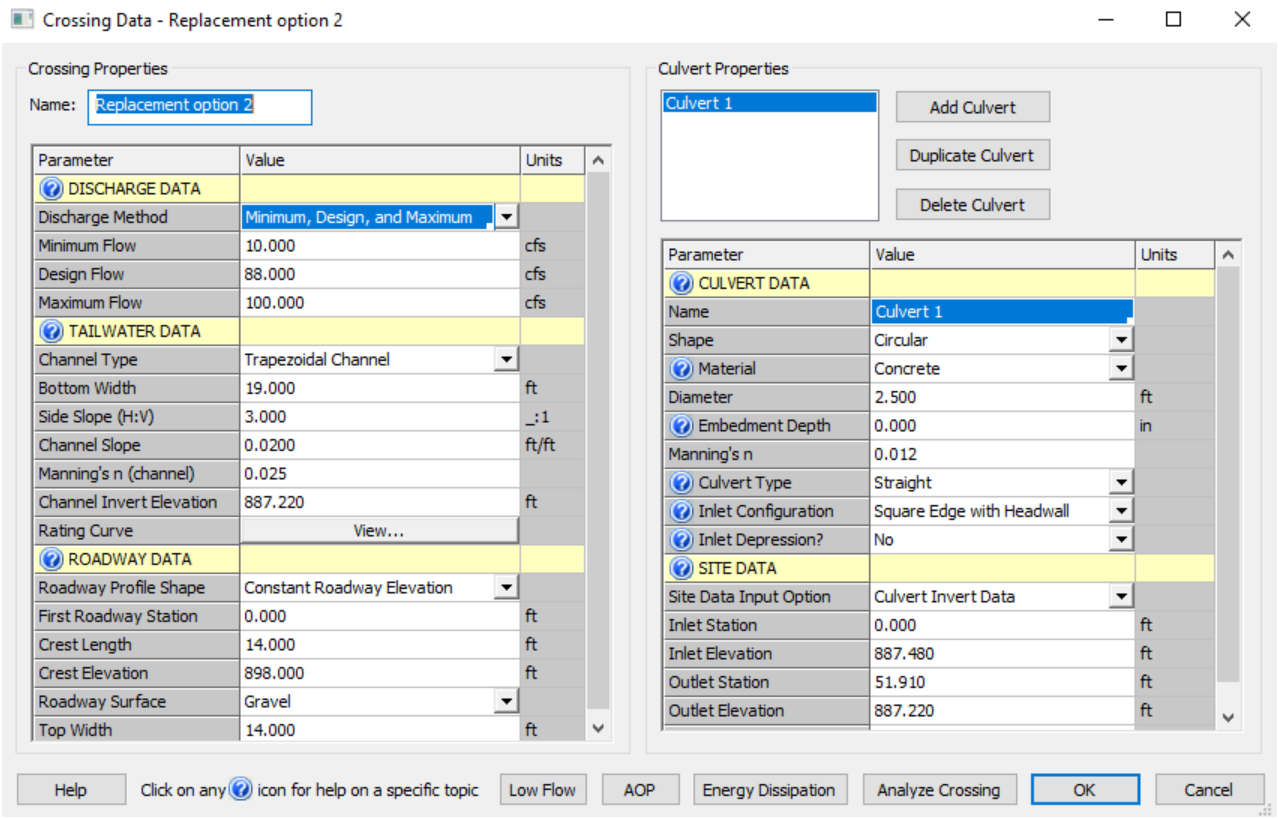
WS EL (ft)	H (ft)	H (ft & in.)	C	L (ft)	Q (cfs)	
893.50	0.00	0	2.64	4.00	0	normal pool
893.75	0.25	3/12	2.88	3.99	1	
894.00	0.50	6/12	3.00	3.98	4	
894.25	0.75	9/12	3.25	3.97	8	
894.50	1.00	1	3.32	3.96	13	
894.75	1.25	1 3/12	3.32	3.95	18	
895.00	1.50	1 6/12	3.32	3.94	24	
895.25	1.75	1 9/12	3.32	3.93	30	
895.50	2.00	2	3.32	3.92	37	
895.75	2.25	2 3/12	3.32	3.91	44	
896.00	2.50	2 6/12	3.32	3.90	51	
896.25	2.75	2 9/12	3.32	3.89	59	
896.50	3.00	3	3.32	3.88	67	
896.75	3.25	3 3/12	3.32	3.87	75	
897.00	3.50	3 6/12	3.32	3.86	84	
897.25	3.75	3 9/12	3.32	3.85	93	
897.50	4.00	4	3.32	3.84	102	
897.75	4.25	4 3/12	3.32	3.83	111	
898.00	4.50	4 6/12	3.32	3.82	121	top of embankment
898.25	4.75	4 9/12	3.32	3.81	131	

HY-8 Analysis Results

Crossing Summary Table

Culvert Crossing: Replacement option 2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
888.99	10.00	10.00	0.00	1
889.72	19.00	19.00	0.00	1
890.46	28.00	28.00	0.00	1
891.39	37.00	37.00	0.00	1
892.62	46.00	46.00	0.00	1
894.13	55.00	55.00	0.00	1
895.97	64.00	64.00	0.00	1
898.05	73.00	72.61	0.35	13
898.36	82.00	73.84	8.13	6
898.51	88.00	74.38	13.58	5
898.74	100.00	75.28	24.70	5
898.00	72.43	72.43	0.00	Overtopping



SPILLWAY RATING CURVE

Dam: *Hemlock Dam - Drop Inlet Structure*
Location: *Overflow Spillway at elevation 893.5 feet (NGVD29)*

References:
1) Design of Small Dams, 3rd Edition
2) Handbook of Hydraulics, Brater & King, 6th Edition, Ch. 5

Spillway Data

Type of Spillway	Broad Crested Weir		
Crest Elevation	893.50 ft		
Discharge Coefficient, C_o	variable	(Ref. 2)	$Q = CLH^{3/2}$
Crest Length, L'	6 ft		
Number of Piers, N	4		
Pier Contraction Coefficient, K_p	0.02	Square-nosed with corner rounded to 0.1 of pier thickness	
Abutment Contraction Coefficient, K_a	0.20	Square w/ headwall at 90deg to flow direction	
Effective Crest Length, L	$L = L' - 2(NK_p + 1*K_a)H_e$ [ft]	(Ref. 1, pg 365)	*(2 abutments)*

Spillway Rating Computations

WS EL (ft)	H (ft)	H (ft & in.)	C	L (ft)	Q (cfs)	
893.50	0.00	0	2.64	6.00	0	normal pool
893.75	0.25	3/12	2.88	5.86	2	
894.00	0.50	6/12	3.00	5.72	6	
894.25	0.75	9/12	3.25	5.58	12	
894.50	1.00	1	3.32	5.44	18	
894.75	1.25	1 3/12	3.32	5.30	25	
895.00	1.50	1 6/12	3.32	5.16	31	
895.25	1.75	1 9/12	3.32	5.02	39	
895.50	2.00	2	3.32	4.88	46	
895.75	2.25	2 3/12	3.32	4.74	53	
896.00	2.50	2 6/12	3.32	4.60	60	
896.25	2.75	2 9/12	3.32	4.46	68	
896.50	3.00	3	3.32	4.32	75	
896.75	3.25	3 3/12	3.32	4.18	81	
897.00	3.50	3 6/12	3.32	4.04	88	
897.25	3.75	3 9/12	3.32	3.90	94	
897.50	4.00	4	3.32	3.76	100	
897.75	4.25	4 3/12	3.32	3.62	105	
898.00	4.50	4 6/12	3.32	3.48	110	top of embankment
898.25	4.75	4 9/12	3.32	3.34	115	

Appendix B:

Preliminary Removal Drawings

AYRES ASSOCIATES
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HEMLOCK DAM REMOVAL FEASIBILITY STUDY

SAUK COUNTY

HEMLOCK-SAUK COUNTY PARK, WISCONSIN

Designed By: BDL
Checked By: LAF

REVISIONS		
MARK	DATE	DESCRIPTION

Project Number: 26-1115.00
Set Type: NOT FOR CONSTRUCTION
Issue Date: MAY 2019

EXISTING SITE

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2019.05.31
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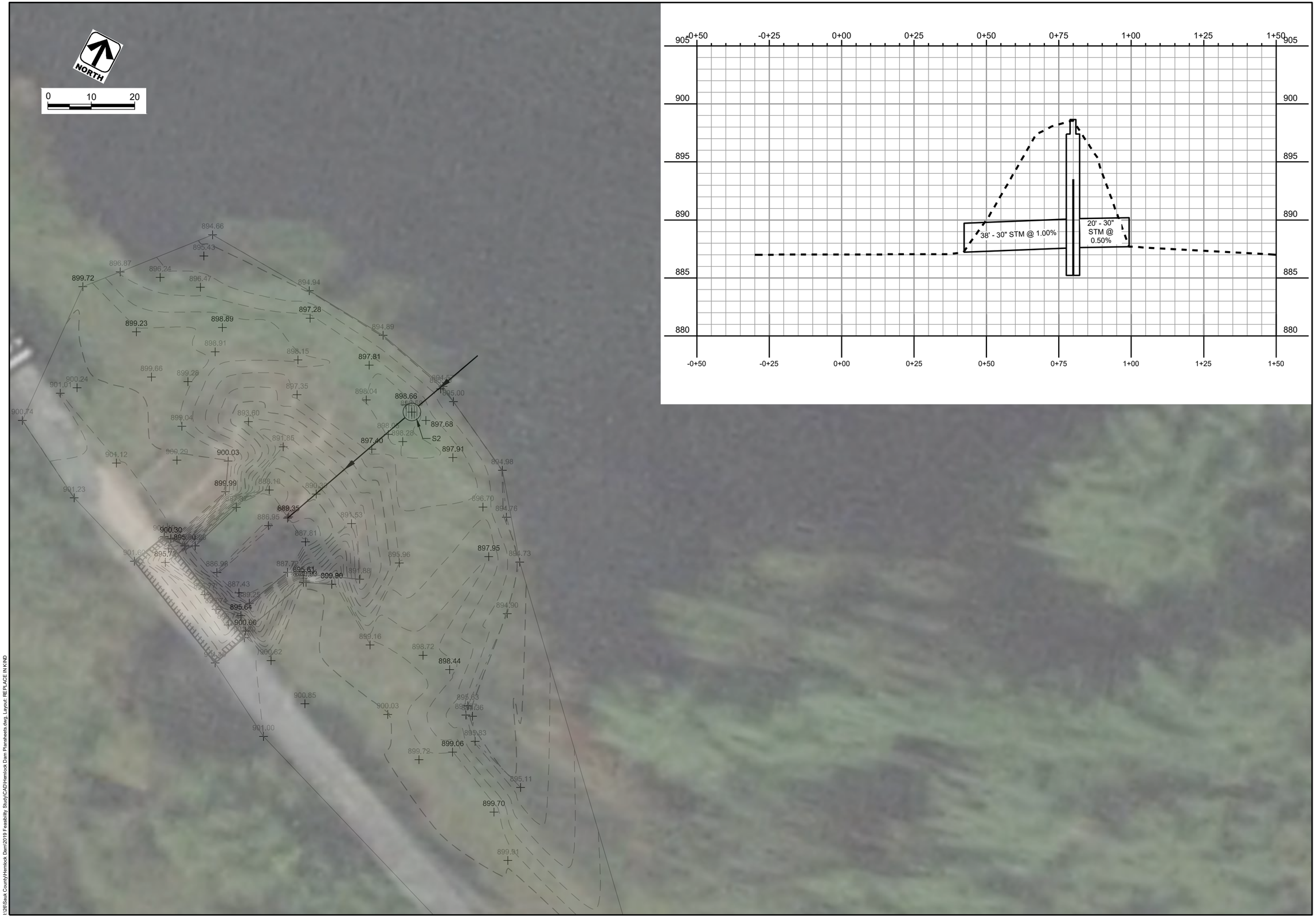

AYRES ASSOCIATES
EAU CLAIRE, WISCONSIN
715.834.3161

HEMLOCK DAM REMOVAL FEASIBILITY STUDY

SAUK COUNTY

HEMLOCK-SAUK COUNTY PARK, WISCONSIN

Designed By:	BDL
Checked By:	LAF

REVISIONS

MARK	DATE	DESCRIPTION

Project Number:	26-1115.00
Set Type:	NOT FOR CONSTRUCTION
Issue Date:	MAY 2019

REPLACEMENT OPTION 1

A4-Standard.stb
2019-05-14
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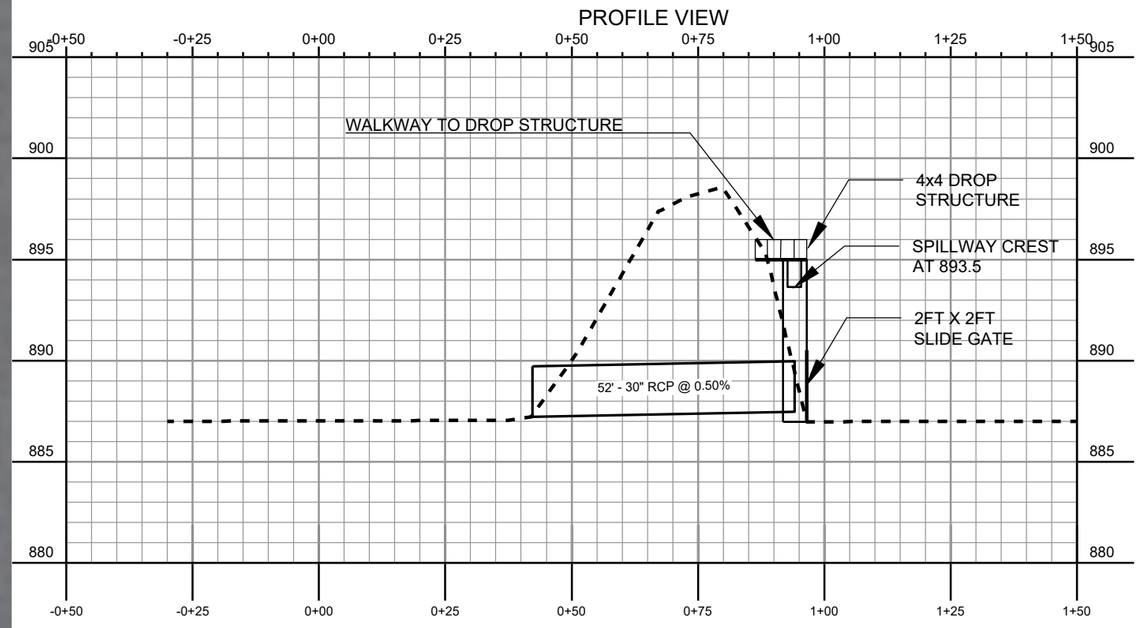
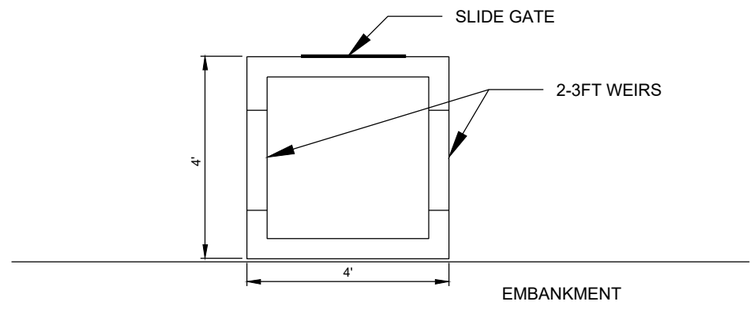


DROP STRUCTURE PLAN VIEW



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HEMLOCK DAM REMOVAL FEASIBILITY STUDY

SAUK COUNTY

HEMLOCK-SAUK COUNTY PARK, WISCONSIN

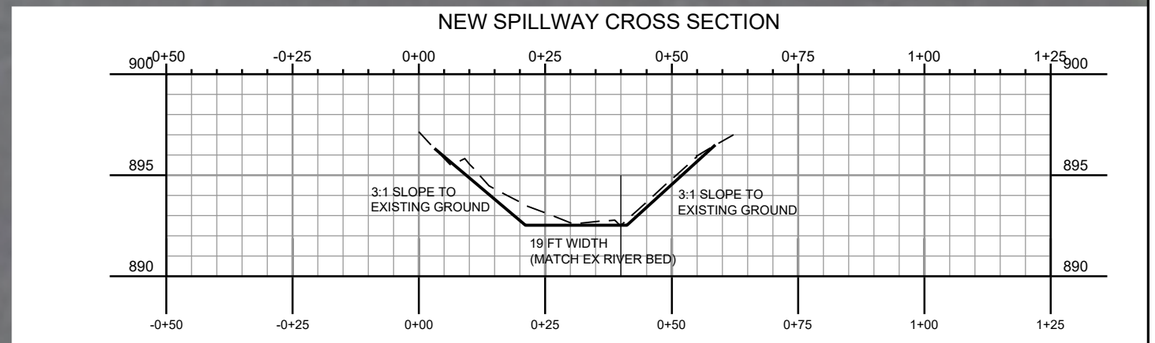
Designed By:	BDL
Checked By:	LAF

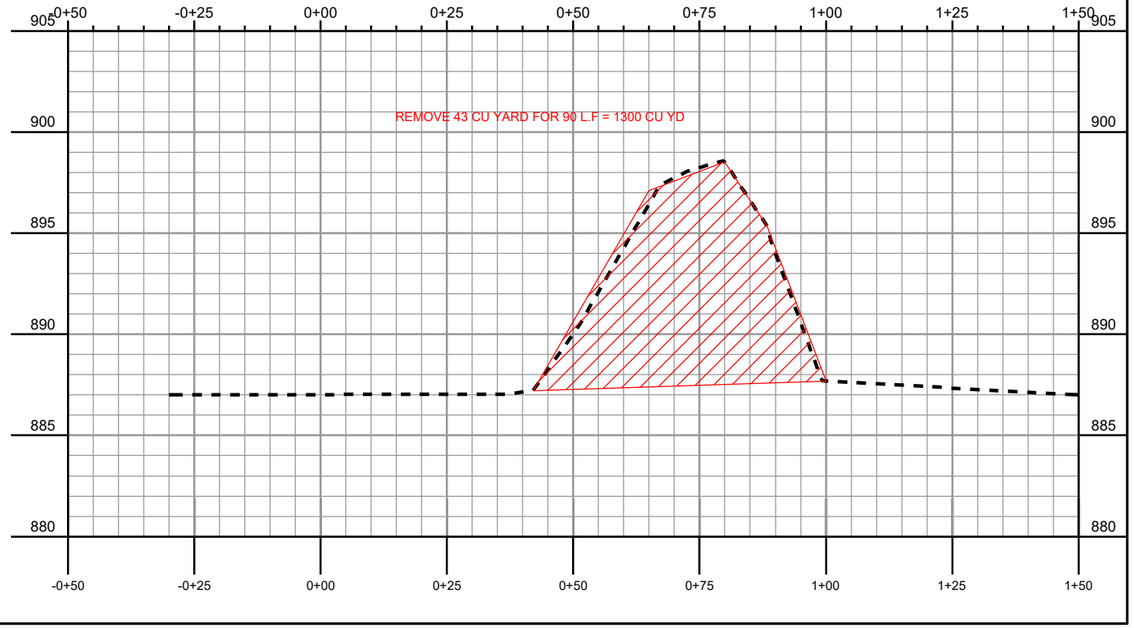
REVISIONS

MARK	DATE	DESCRIPTION

Project Number:	26-1115.00
Set Type:	NOT FOR CONSTRUCTION
Issue Date:	MAY 2019

REPLACEMENT OPTION 2





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HEMLOCK DAM REMOVAL FEASIBILITY STUDY

SAUK COUNTY

HEMLOCK-SAUK COUNTY PARK, WISCONSIN

Designed By: BDL

Checked By: LAF

REVISIONS

MARK	DATE	DESCRIPTION

Project Number: 26-1115.00

Set Type: NOT FOR CONSTRUCTION

Issue Date: MAY 2019

REMOVAL

Appendix C:

Opinion of Probable Costs

Opinion of Probable Cost
Replacement Option 1 of Hemlock Dam

Sauk County
Hemlock-Suak County Park

Jun-19

	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE
O.1	Dewatering	LS	1	$ 25,000.00	$ 25,000.00
C.1	Mobilization	LS	1	$ 20,000.00	$ 20,000.00
C.2	Erosion Control	LS	1	$ 3,500.00	$ 3,500.00
C.3	Earthwork	CY	290	$ 15.00	$ 4,350.00
C.4	Remove Existing Structure (box + pipe)	LS	1	$ 2,000.00	$ 2,000.00
C.5	30" Apron Endwall RCP	Each	1	$ 2,500.00	$ 2,500.00
C.6	Manhole 4 Ft	VF	11	$ 300.00	$ 3,150.00
C.7	30" Culvert RCP	LF	58	$ 55.00	$ 3,190.00
C.8	Stoplogs	LS	1	$ 7,500.00	$ 7,500.00
C.8	Casting type C	Each	1	$ 425.00	$ 425.00
C.10	Riprap stabilization through new channel	CY	125	$ 50.00	$ 6,250.00
C.11	Site Restoration	SY	600.00	$ 2.00	$ 1,200.00
Subtotal:					$79,065
				Contingency of 30%	$23,720
				Construction Total:	**$102,785**
F.1				Endangered Resources Review Fee	$75
F.2				Sauk County Small Site Erosion Control Permit	$0
F.3				WDNR's Chapter 30 Plan Approval Permit	$803
				Fees Total	**$878**
A/E.1				Engineering/Construction Administration (20% of costs):	$20,557
A/E.2				Hydraulic Modeling of pre-removal and post-removal	$5,000
				Engineering Total	**$25,557**
				Project Total:	**$129,219**

LEGEND:

"O"	items assumed to be completed by Owner for no cost
"C"	items assuemd to be completed by a single prime Contractor
"F"	items assumed to be straight fees
"A/E"	items assumed to be completed by A/E - Ayres Associates estimates

Opinion of Probable Cost
Replacement Option 2 of Hemlock Dam

Sauk County
Hemlock-Suak County Park

Jun-19

	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE
O.1	Dewatering	LS	1	$ 25,000.00	$ 25,000.00
C.1	Mobilization	LS	1	$ 20,000.00	$ 20,000.00
C.2	Erosion Control	LS	1	$ 3,500.00	$ 3,500.00
C.3	Earthwork	CY	290	$ 15.00	$ 4,350.00
C.4	Remove Existing Structure (box + pipe)	LS	1	$ 2,000.00	$ 2,000.00
C.5	30" Apron Endwall RCP	Each	1	$ 2,500.00	$ 2,500.00
C.6	4x4 Drop Inlet	VF	11	$ 400.00	$ 4,200.00
C.7	30" Culvert RCP	LF	52	$ 55.00	$ 2,860.00
C.8	Gate	Each	1	$ 20,000.00	$ 20,000.00
C.10	Steel Walkway	Each	1	$ 20,000.00	$ 20,000.00
C.12	Riprap stabilization through new channel	CY	125	$ 50.00	$ 6,250.00
C.13	Site Restoration	SY	600.00	$ 2.00	$ 1,200.00
Subtotal:					$111,860
				Contingency of 30%	$33,558
				Construction Total:	**$145,418**
F.1				Endangered Resources Review Fee	$75
F.2				Sauk County Small Site Erosion Control Permit	$0
F.3				WDNR's Chapter 30 Plan Approval Permit	$803
				Fees Total	**$878**
A/E.1				Engineering/Construction Administration (20% of costs):	$29,084
A/E.2				Hydraulic Modeling of pre-removal and post-removal	$2,500
				Engineering Total	**$31,584**
				Project Total:	**$177,880**

LEGEND:

"O"	items assumed to be completed by Owner for no cost
"C"	items assuemd to be completed by a single prime Contractor
"F"	items assumed to be straight fees
"A/E"	items assumed to be completed by A/E - Ayres Associates estimates

AYRES ASSOCIATES

Opinion of Probable Cost
Removal of Hemlock Dam

Sauk County
Hemlock-Sauk County Park

Jun-19

	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE
O.1	dewatering	LS	1	$ 25,000.00	$ 25,000.00
C.1	Mobilization	LS	1	$ 5,000.00	$ 5,000.00
C.2	Erosion Control	LS	1	$ 3,500.00	$ 3,500.00
C.3	Removal of Earthen Embankment	CY	1300	$ 15.00	$ 19,500.00
C.4	Remove Existing Structure (box + pipe)	LS	1	$ 2,000.00	$ 2,000.00
C.5	Streambed stabilization through embankment	SY	550	$ 5.00	$ 2,750.00
C.6	Riprap stabilization through new channel	CY	360	$ 50.00	$ 18,000.00
C.7	Site Restoration	SY	100.00	$ 2.00	$ 200.00
Subtotal:					$75,950
				Contingency of 30%	$22,785
				Construction Total:	**$98,735**
F.1				Endangered Resources Review Fee	$75
F.2				Sauk County Small Site Erosion Control Permit	$0
F.3				WDNR's Chapter 30 Plan Approval Permit	$803
				Fees Total	**$878**
A/E.1				Engineering/Construction Administration (20% of costs):	$19,747
				Engineering Total	**$19,747**
				Project Total:	**$119,360**

LEGEND:

"O"	items assumed to be completed by Owner for no cost
"C"	items assuemd to be completed by a single prime Contractor
"F"	items assumed to be straight fees
"A/E"	items assumed to be completed by A/E - Ayres Associates estimates

Appendix D:

Endangered Resources Review Preliminary Assessment

Endangered Resources Preliminary Assessment

Created on **5/28/2019**. This report is good for one year after the created date.

Results

Endangered resources are present and the species present are legally protected. **Further actions are required to ensure compliance** with Wisconsin's Endangered Species Law (s. 29.604 Wis. Stats.) and the Federal Endangered Species Act (16 USC ss 1531-43). Therefore you should request an Endangered Resources Review http://dnr.wi.gov/topic/ERReview/Review.html.

Project Information

Landowner name	Sauk County
Project address	400 State Trail
Project description	Dam Removal

Project Questions

Does the project involve a public property?	Yes
Is there any federal involvement with the project?	No
Is the project a utility, agricultural, forestry or bulk sampling (associated with mining) project?	No
Is the project property in Managed Forest Law or Managed Forest Tax Law?	No

Project Area Maps