ARROWHEAD LAKE COMMUNITY ASSOCIATION





INCREASING CONVEYANCE CAPACITY AT NORTH ARROWHEAD LAKE DAM NOVEMBER 4, 2023



NORTH ARROWHEAD LAKE - MAIN EMBANKMENT



OWNERSHIP OF THE DAM

North Arrowhead Lake was constructed in 1970 as a recreational structure by the All-American Realty Co. who owned numerous dams in the area.

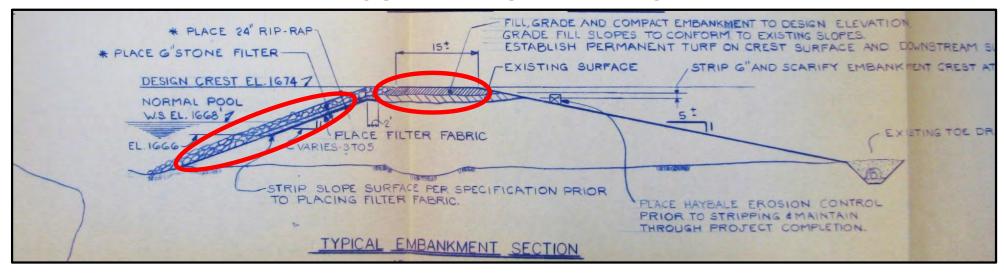
In 1982 All-American Reality Co. filed for bankruptcy.

Ownership was transferred to the Association on August 6, 1984.



Photograph of upstream face of main embankment from 1985 inspection

1987 IMPROVEMENTS







2008 REPLACEMENT OF LOW-LEVEL OUTLET WORKS



NATURAL LOW AREA



LOW AREAS AT LOTS 12, 13, 14 AND 15



CLASSIFICATION OF DAMS - HAZARD POTENTIAL CATEGORY

CATEGORY	POPULATION AT RISK	ECONOMIC LOSS
1 HIGH	Substantial - Numerous homes, businesses or schools	Excessive - Residential, Commercial or agricultural damage or substantial public inconvenience
2	Few – Small number of homes or small businesses	Appreciable – Limited residential, commercial or agricultural damage or moderate public inconvenience
3	None expected – No permanent structures for human habitation or employment	Significant damage to private or public property and short duration public inconvenience
4 LOW	None expected – No permanent structures for human habitation or employment	Minimal damage to private or public property and no significant public inconvenience



DOWNSTREAM INUNDATION AREA

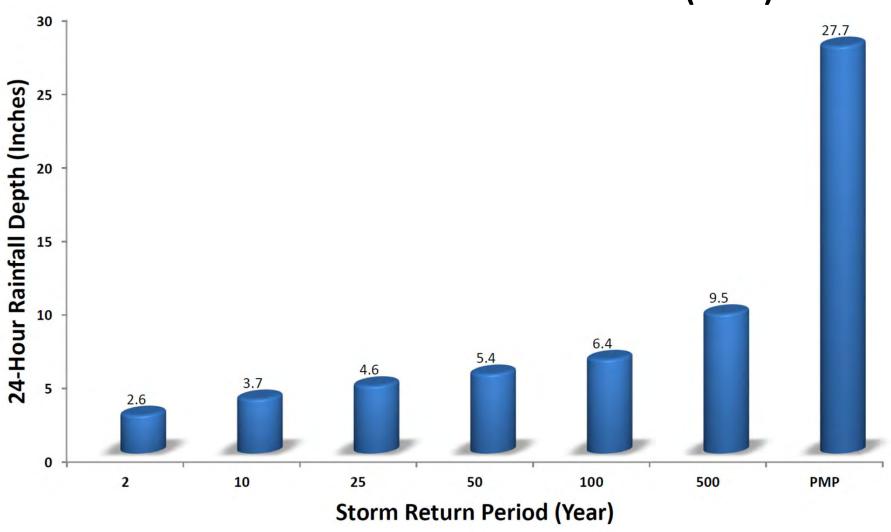
MAIN EMBANKMENT



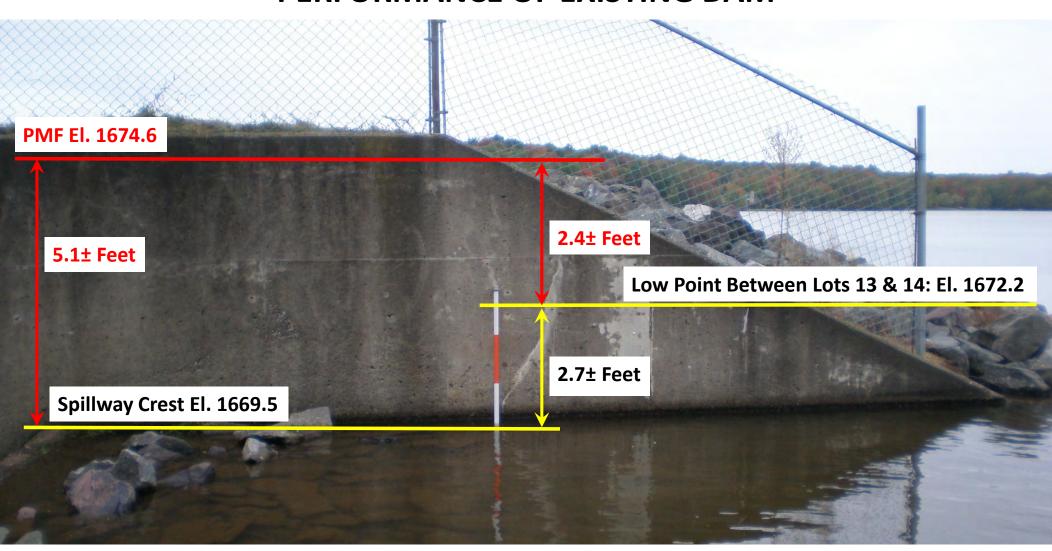
DIKE EMBANKMENT



PROBABLE MAXIMUM PRECIPITATION (PMP)



PERFORMANCE OF EXISTING DAM



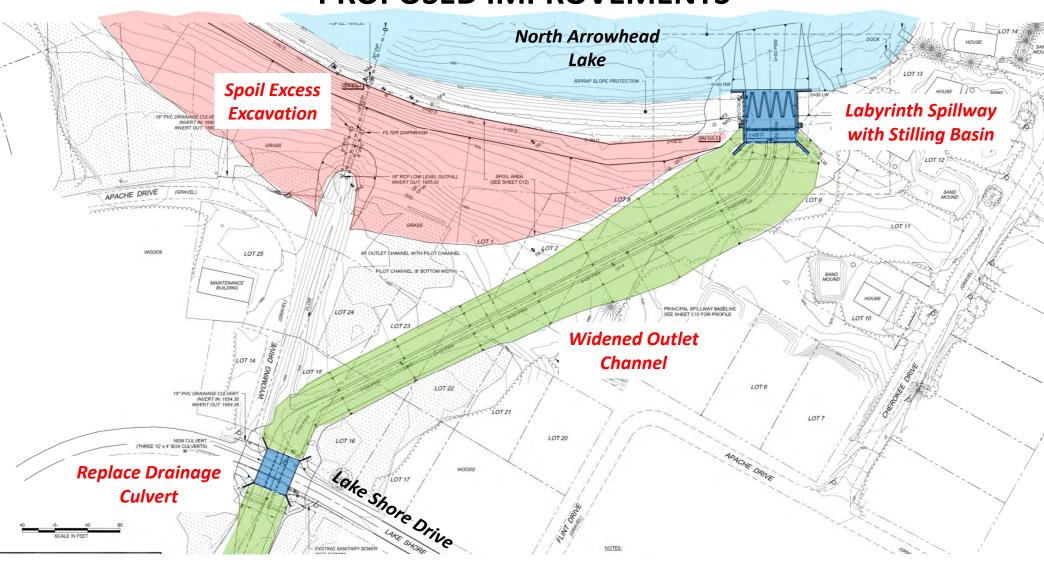
INCREASE CONVEYANCE CAPACITY WITH LABYRINTH SPILLWAY

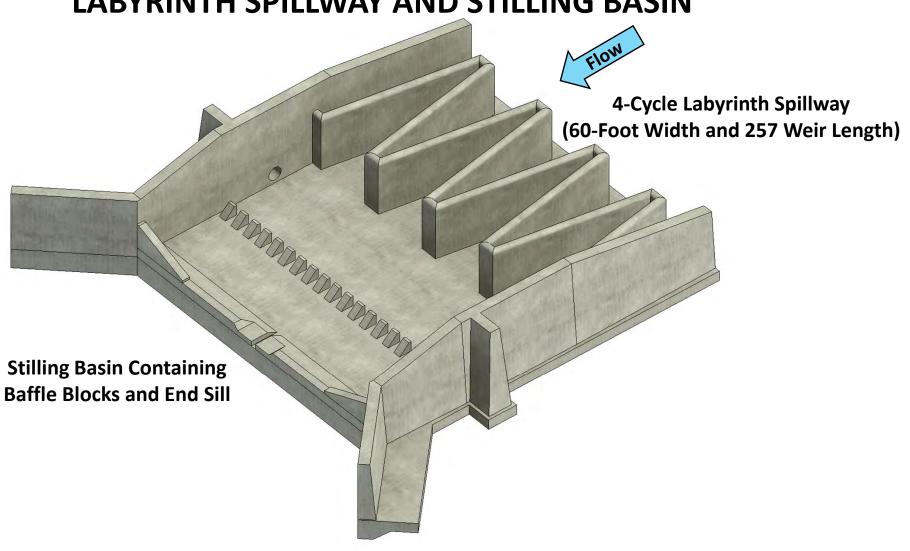


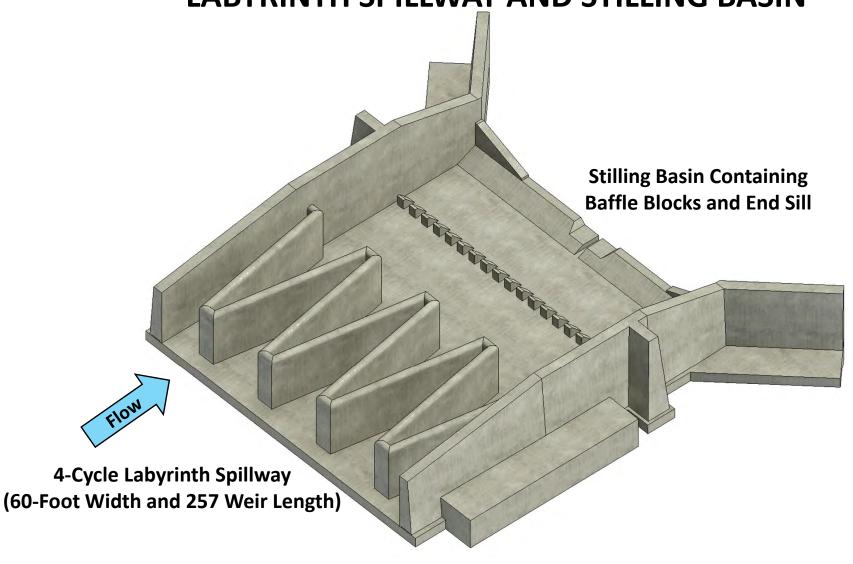
INCREASE CONVEYANCE CAPACITY WITH LABYRINTH SPILLWAY

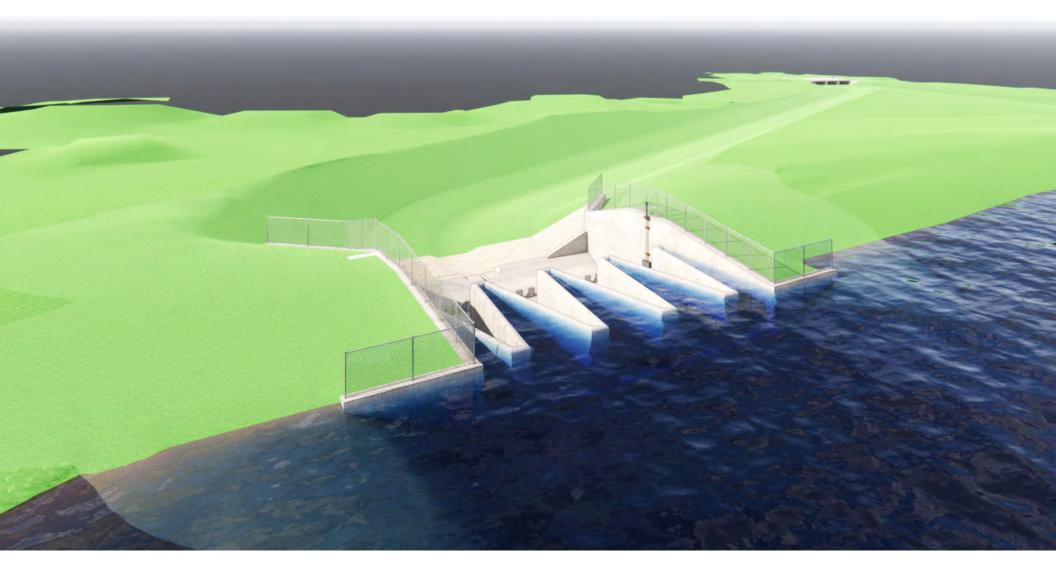


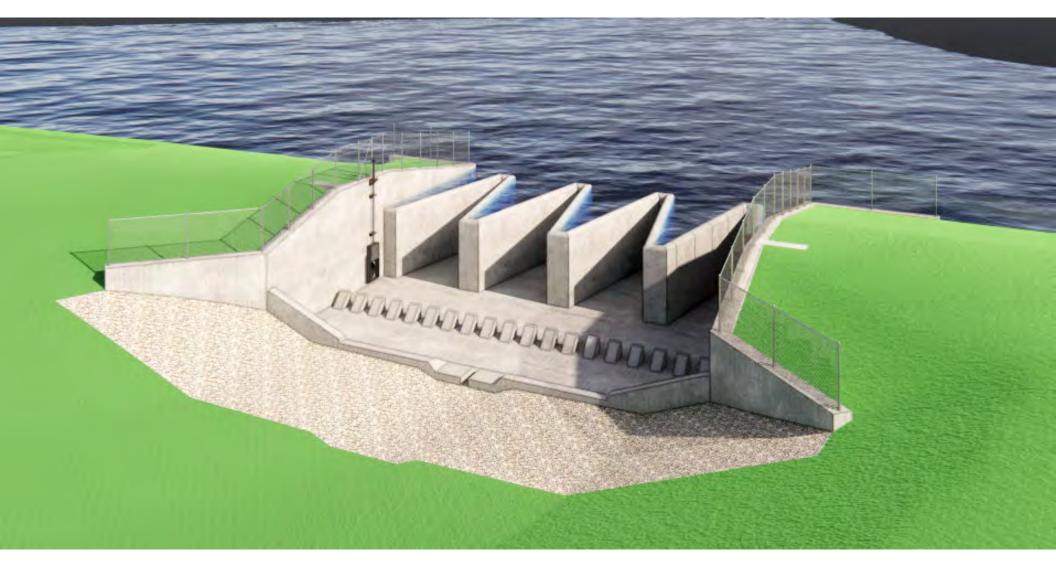
PROPOSED IMPROVEMENTS





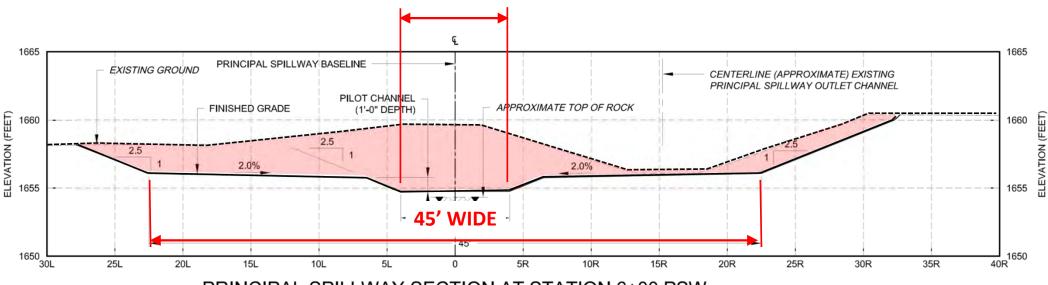






PRINCIPAL SPILLWAY OUTLET CHANNEL





PRINCIPAL SPILLWAY SECTION AT STATION 6+00 PSW

PRINCIPAL SPILLWAY OUTLET CHANNEL



PRINCIPAL SPILLWAY OUTLET CHANNEL



DRAINAGE CULVERT UNDER LAKE SHORE DRIVE



SPOIL EXCESS EXCAVATION



ESTIMATE OF PROBABLE CONSTRUCTION COSTS

No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
Mobi	ization & Demobilization				\$265,482
1.	Mobilization & Demobilization				
	a. General Mob/Demob (~7% of Contract Price)	1	LS	XXX	\$206,482
	b. Bonds & Insurances (~2% of Contract Price)	1	LS	XXX	\$59,000
Pre-C	onstruction Activities and Establishment of Site Access				\$68,900
2.	Establishment of Site Access and Demolition Activiles				
	a. Clearing and Grubbing	0.10	AC	12,000.00	\$1,20
	b. Individual Tree Removal	13	EA	700.00	\$9,10
	b. Aggregate for Access Road (Temporary Construction Road)	325	CY	50.00	\$16,25
	c. Geotextile for Access Road (Temporary Construction Road)	1,950	SY	3.00	\$5.85
	d. Traffic Control Signage, Flagmen, Etc.	1	LS	2,500.00	\$2,50
	e. Relocate Private Dock (Lot 12)	1	LS	5,000.00	\$5.00
	f. Temporary Stream Crossing (Off of Wyoming Drive)	1	EA	4.000.00	\$4.00
3.	Field Surveys				
	a. Construction Stakeout, Quantity Verification, As-Builts, Etc.	1	LS	25,000.00	\$25,00
	on Control and Management of Water				\$501,50
4	Miscellaneous Erosion Control Measures				2001,00
4.	a. Rock Construction Entrance (Assume 1)	1	EA	4.000.00	\$4.00
-	b. Compost Filter Sock (Assumed Length)	1,500	LF	5.00	\$7,50
-	c. Sediment Traps (Assume 2)	1,500	EA	45,000.00	\$90,00
5.	Management of Water	- 2	EM	45,000.00	\$90,00
3,	a. Temporary Cofferdam (Assume Port-a-Dam) & Water Diversion	1	LS	250.000.00	\$250.00
		1		200000000000000000000000000000000000000	
	b. Dewatering of Work Area (i.e., Spillway Foundation)		LS	150,000.00	\$150,00
_	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements			200000000000000000000000000000000000000	\$150,00
aby	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities	1	LS	150,000.00	\$150,000 \$2,054,84
_	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment	1 400	LS	150,000.00	\$150,000 \$2,054,84 \$4,000
_	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth)	400	LS CY CY	150,000.00 10.00 10.00	\$150,00 \$2,054,84 \$4,00 \$13,15
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway	1 400	LS	150,000.00	\$150,000 \$2,054,84 \$4,000 \$13,15
_	b. Dewatering of Work Area (i.e., Spillway Foundation) Inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels	400 1,315 1	CY CY CY LS	10.00 10.00 10.00 10,000.00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil)	1 400 1,315 1 11,255	LS CY CY LS CY	10.00 10.00 10.00 10.00 10.00 10.00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6' Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation)	1 400 1,315 1 11,255 3,200	CY CY LS CY CY	10.00 10.00 10.00 10.00 0 10.00 50.00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55 \$160,00
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6° Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill)	1 400 1,315 1 11,255 3,200 4,570	CY CY CY LS CY CY	150,000.00 10.00 10,000.00 10,000.00 50.00 15.00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55 \$160,00 \$68,55
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs)	1 400 1,315 1 11,255 3,200 4,570 420	CY CY CY LS CY CY CY	10,000,000 10,000 10,000,000 10,000,000 10,000,00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55 \$160,00 \$68,55 \$210,00
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Exavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs) e. Cast-in-Place Concrete (Walls)	1 400 1,315 1 11,255 3,200 4,570 420 460	CY CY LS CY CY CY CY CY CY CY	150,000 00 10,00 10,00 10,000 00 10,000 00 10,000 00 15,00 50,00 1,000 00	\$150,000 \$2,054,84 \$4,000 \$13,151 \$10,000 \$112,551 \$160,000 \$68,551 \$210,000 \$460,000
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs) c. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement	1 400 1,315 1 11,255 3,200 4,570 420 460 45	CY CY LS CY CY CY CY CY CY CY CY CY	10.00 10.00 10.00 10.00 10.00 50.00 15.00 500.00 1,000.00 550.00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55 \$160,00 \$68,55 \$210,00 \$460,00 \$24,75
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) Inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs) e. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe	1 400 1,315 1 11,255 3,200 4,570 420 460 45 45	CY CY LS CY	150,000.00 10.00 10.00 10.00 50.00 15.00 500.00 1,000.00 500.00 200.00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55 \$160,00 \$68,55 \$210,00 \$460,00 \$24,75 \$9,00
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Silabs) e. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30* Ductile Iron Pipe Steel Reinforcement (at 150 lbs per cy of concrete)	1 400 1,315 1 1 11,255 3,200 4,570 460 46 45 45 138,750	CY CY LS CY CY CY CY CY CY CY CY CY LF LBS	150,000.00 10,00 10,00 10,000.00 10,000 50,00 15,00 50,00 1,000.00 550,00 200.00 2,00	\$150,00 \$2,054,84 \$4,00 \$13,15 \$10,00 \$112,55 \$160,00 \$68,55 \$210,00 \$460,00 \$24,75 \$9,00 \$277,50
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6' Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-im-Place Concrete (Slabs) c. Cast-im-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30' Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation	1 400 1,315 1 11,255 3,200 4,570 420 460 45 45	CY CY LS CY SY CY	150,000.00 10.00 10,000.00 10,000.00 50.00 15.00 500.00 1,000.00 550.00 200.00 2.00 50.00	\$150,000 \$2,054,84 \$4,000 \$13,15 \$10,000 \$112,55 \$160,000 \$68,55 \$210,000 \$460,000 \$24,75 \$9,000 \$330,000
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway. Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs) e. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill	1 400 1,315 1 11,255 3,200 4,570 420 460 45 45 45 138,750 600 1	CY CY LS CY LF LBS SY LS	150,000.00 10.00 10.00 10.00 50.00 15.00 50.00 1,000.00 200.00 2.00 50.00 50.00 50.00	\$150,000 \$2,054,84 \$4,000 \$13,15 \$10,000 \$112,55 \$160,000 \$68,55 \$210,000 \$24,75 \$9,00 \$27,50 \$30,000 \$50,000
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Exavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Casti-n-Place Concrete (Slabs) e. Casti-n-Place Concrete (Walls) f. Ductile Iron Pipe Enassement g. 30* Ductile Iron Pipe Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors	1 400 1,315 1 1 11,255 3,200 4,570 420 460 45 138,750 600 1 1	CY CY LS CY CY CY CY CY CY LF LBS SY LS EA	150,000.00 10,00 10,00 10,000.00 10,000.00 15,00 50,00 1,000.00 550.00 2,000.00 2,000.00 2,500.00 2,500.00	\$150,000 \$2,054,84 \$4,000 \$13,15 \$10,000 \$112,55 \$160,000 \$68,55 \$210,000 \$24,75 \$9,000 \$277,50 \$30,000 \$277,50
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soci) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slaba) c. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors i. Topsoil Placement (Assume 6" Thickness)	1 400 1,315 1 1 11,255 3,200 4,570 420 460 45 45 138,750 600 1 1 11,140	CY CY LS CY CY CY CY CY CY CY LF LBS SY LS	150,000.00 10,000 10,000.00 10,000.00 50,00 15,00 500.00 1,000.00 550.00 200.00 50.	\$150,000 \$2,054,84 \$4,000 \$13,15 \$10,000 \$112,55 \$160,000 \$460,000 \$24,75 \$9,000 \$30,000 \$277,500 \$30,000 \$277,500 \$31,000 \$277,5
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway. Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs) e. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) f. Foundation Preparation J. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors I. Topsoil Placement (Assume 6" Thickness) m. Riprap Scour Protection	1 400 1,315 1 1 1,255 3,200 4,570 420 460 45 45 138,750 6000 1 11,140 370	CY C	150,000.00 10.00 10.00 10.00 50.00 15.00 500.00 1,000.00 200.00 2 00 50,000.00 2,500.00 2,500.00 1,000.	\$150,000 \$2,054,84 \$4,000 \$13,151 \$10,000 \$112,551 \$160,000 \$460,000 \$24,751 \$210,000 \$30,000 \$30,000 \$50,000 \$27,500 \$513,000 \$40,700
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Salbas) e. Cast-in-Place Concrete (Walls) f. Ductile fron Pipe Encasement g. 30* Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors I. Topsoil Placement (Assume 6* Thickness) m. Riprap Scour Protection n. Handrail / Fencing (Left and Right Spillway Training Walls)	400 1,315 1 1 1,255 3,200 4,570 420 460 45 138,750 600 1 1 11 1,140 3,70 200	CY CY LS CY CY CY CY CY CY CY CY LF LBS SY LS EA CY CY LF LS CY LF LS	150,000.00 10,00 10,00 10,000.00 10,000.00 15,00 50,00 1,000.00 550,00 2,000.00 2,000.00 2,500.00 45,00 60.00	\$150,000 \$2,054,84 \$4,000 \$13,151 \$10,000 \$112,555 \$160,000 \$460,000 \$460,000 \$247,500 \$277,500 \$277,500 \$50,000 \$50,000 \$50,000 \$40,7
7.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Socil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Slabs) d. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) j. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors l. Topsoil Placement (Assume 6" Thickness) m. Riprap Scour Protection h. Handrail / Fencing (Left and Right Spillway Training Walls) o. Low-Level Dewatering Gate & Trash Rack	1 400 1,315 1 1 1,255 3,200 4,570 420 460 45 45 138,750 6000 1 11,140 370	CY C	150,000.00 10.00 10.00 10.00 50.00 15.00 500.00 1,000.00 200.00 2.00 50,000.00 2,500.00 2,500.00 1,000.	\$150,000 \$2,054,84 \$4,000 \$13,151 \$10,000 \$112,555 \$160,000 \$460,000 \$460,000 \$247,500 \$277,500 \$277,500 \$50,000 \$50,000 \$50,000 \$40,7
6.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Salbas) e. Cast-in-Place Concrete (Walls) f. Ductile fron Pipe Encasement g. 30* Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors I. Topsoil Placement (Assume 6* Thickness) m. Riprap Scour Protection n. Handrail / Fencing (Left and Right Spillway Training Walls)	400 1,315 1 1 1,255 3,200 4,570 420 460 45 138,750 600 1 1 11 1,140 3,70 200	CY LF LBS SY LS EA CY CY CY LF LS	150,000.00 10,000 10,000 10,000 10,000 15,000 15,000 1,000,000 550,000 2,000 50,000 2,500,000 45,000 45,000 60,000 70,000,000	\$150,000 \$2,054,84 \$4,000 \$13,15 \$10,000 \$68,55 \$210,000 \$40,007 \$9,000 \$277,50 \$30,000 \$27,50 \$40,70 \$12,000 \$12,000 \$12,000 \$12,000 \$12,000
7.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Salbs) e. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors I. Topsoil Placement (Assume 6* Thickness) m. Riprap Scour Protection n. Handrail / Fencing (Left and Right Spillway Training Walls) o. Low-Level Dewaterial (Assume on Downstream Embankment) a. Strip Topsoil (Assume of Thickness)	400 1,315 1 1 1,255 3,200 4,570 420 460 45 138,750 600 1 1 11 1,140 3,70 200	CY LF LBS SY LS CY CY CY LF LS CY CY CY CY CY CY CY CY LF LS CY	150,000.00 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 200 2	\$150,000 \$2,054,84 \$4,000 \$13,151 \$10,000 \$112,55 \$160,000 \$460,000 \$24,75 \$210,000 \$277,50 \$30,000 \$277,50 \$30,000 \$277,50 \$30,000 \$40,700 \$12,000 \$112,000
7.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6" Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway. Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Encasement g. 30" Ductile Iron Pipe h. Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors i. Topsoil Placement (Assume 6" Thickness) m. Riprap Scour Protection n. Handrall / Fencing (Left and Right Spillway Training Walls) o. Low-Level Dewatering Gate & Trash Rack Spoil Excess Material (Assume on Downstream Embankment)	1 400 1,315 1 1 1,255 3,200 4,570 420 460 45 45 138,750 6000 1 1,140 370 200	CY LF LBS SY LS EA CY CY CY LF LS	150,000.00 10,000 10,000 10,000 10,000 15,000 15,000 1,000,000 550,000 2,000 50,000 2,500,000 45,000 45,000 60,000 70,000,000	\$150,000 \$2,054,84 \$4,000 \$13,151 \$10,000 \$112,55 \$160,000 \$460,000 \$24,75 \$210,000 \$277,50 \$30,000 \$277,50 \$30,000 \$277,50 \$30,000 \$40,700 \$12,000 \$112,000
7.	b. Dewatering of Work Area (i.e., Spillway Foundation) inth Spillway and Outlet Channel Improvements Demolition Activities a. Strip and Salvage Riprap from Dam Embankment b. Strip Organic Material (Assume 6* Depth) c. Demolish Existing Concrete Spillway Concrete Labyrinth Spillway, Approach and Discharge Channels a. Excavation (Soil) b. Excavation (Rock - Assume 20% of Total Excavation) c. Earth Backfill Around Structures (Approved Fill) d. Cast-in-Place Concrete (Salbs) e. Cast-in-Place Concrete (Walls) f. Ductile Iron Pipe Steel Reinforcement (at 150 lbs per cy of concrete) i. Foundation Preparation j. Allowance for Over-Excavation & Concrete Backfill k. Foundation Anchors I. Topsoil Placement (Assume 6* Thickness) m. Riprap Scour Protection n. Handrail / Fencing (Left and Right Spillway Training Walls) o. Low-Level Dewaterial (Assume on Downstream Embankment) a. Strip Topsoil (Assume of Thickness)	400 1,315 1 1 1,255 3,200 4,570 420 460 45 138,750 600 1 1 11 1,140 200 1	CY LF LBS SY LS EA CY	150,000.00 10,000 10,000 10,000 10,000 10,000 10,000 10,000 10,000 200 2	\$150.00 \$2,054,84 \$4,000 \$13,151 \$10.00 \$112,555 \$160.00 \$460.00 \$24,755 \$210,000 \$24,755 \$30,000 \$277,500 \$277,500 \$277,500 \$270,000 \$270,000 \$299,94

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
9.	Drainage Improvements				
	a. Triple Cell Box Culvert	46	LF	3,000.00	\$138,000
	b. Box Culvert Wingwalls	4	EA	7,500.00	\$30,000
	c. Guide Rail at Box Culvert	120	LF	50.00	\$6,000
	d. Riprap Outlet Protection	90	CY	110.00	\$9,900
	e. Asphalt Pavement at Box Culvert	160	SY	50.00	\$8,000
	f. Utility Reloactions (Sanitary Sewer)	1	LS	25,000.00	\$25,000
Misce	llaneous Activities				\$24,500
10.	Removal of Temporary Facilities				
	a. Compost Filter Sock	1,500	LF	1.00	\$1,500
	b. Sediment Traps	2	EA	500.00	\$1,000
	c. Gravel Access/Construction Roads	325	CY	10.00	\$3,250
11.	Site Stabilization				
	a. Seed and Mulch Disturbed Areas	5	AC	3,750.00	\$18,750
Out-o	f-Scope Items				\$300.000
12	Grout Curtain at Labyrinth Spillway	1	Allow	ance of \$100,000	to \$200.000
13.	Dual Aggregate Toe Drain (Assume 650' LF)	Allowance of \$80,000 to \$100,00			
	Total Construction	Contract des	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	13, inclusive): Assume 20%):	\$3,215,223 \$643,000
	Estimated Construction Costs for Labyrinth Spi	llway and Outfa	Il Channel Ir	nprovements:	\$3,858,223
Estim	ate of Engineering Costs				\$410,000
12.	Bid and Construction Phase Services				
	a. Bid Phase Services	- (1	LS	30,000.00	\$30,000
	b. Construction Phase Services (assume 6 months of onsite observation)	1	LS	380,000.00	\$380,000

Estimated Construction Cost: \$3.2 Million to \$3.9 Million

(Excludes Bidding and Construction Observation Costs)

NEXT STEPS

Currently in Final Design Phase

Hold Pre-Application Meeting with Reviewing Agencies

Submit Permit Applications in Early 2024

Dedicate 2024 for Permit Reviews

Construction Could Begin in 2025 Pending Permit Review Time

