



**Final Supplemental Watershed Plan No. 1 - Environmental
Assessment**

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Central Sonoma Watershed - Matanzas Creek Dam Rehabilitation Project
Sonoma County, California

Sponsoring Local Organization: Sonoma County Water Agency

Lead Agency: Natural Resources Conservation Service (NRCS)

October 2026

Appendix D - TM007 - Alternative Development and Evaluation



TM007 – Alternative Development and Evaluation

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1.0 Introduction

Matanzas Creek Dam (CA00794) is an earthen embankment dam located in Sonoma County, California. Construction of the dam was proposed as a result of the original Central Sonoma Watershed Plan developed in 1958 under the National Resources Conservation Service (NRCS) PL-566 program. The dam was designed with technical oversight and financial assistance from the NRCS and constructed in 1964 as a flood control structure. Sonoma County Water Agency (Sonoma Water) currently owns, operates, and maintains the dam.

In 2016, HDR and Kleinfelder completed a dam assessment for the NRCS, which evaluated the dam based on Technical Release 210-60 (TR-60) (NRCS, 2019) design criteria. It was determined that Matanzas Creek Dam is out of compliance with TR-60 criteria due to its inability to route the principal spillway hydrograph without activating the earthen auxiliary spillway (HDR; Kleinfelder, 2016).

1.1 Purpose and Scope

Jones & DeMille Engineering (JDE) and AECOM have contracted with the NRCS to develop a supplemental watershed plan and environmental document (further referred to as Plan-EA) that focuses on bringing Matanzas Creek Dam into compliance with NRCS and California Division of Safety of Dams (CA DSOD) standards. JDE and AECOM have completed hydrologic, hydraulic, geotechnical, and seismic evaluations of the existing dam and have identified several deficiencies and constraints for the existing dam.

Each alternative must meet the purpose and need of the Plan-EA, which is to preserve and increase flood protection downstream of Matanzas Creek Dam and to bring the dam and spillway facilities into compliance with federal and state standards.

This document provides conceptual design descriptions, preliminary drawings, and cost estimates for each alternative to be included in the Plan-EA.

1.2 Site Overview

Matanzas Creek Dam is an earthen embankment dam that was constructed in 1964 to provide flood protection for downstream infrastructure, which includes the City of Santa Rosa. The dam is located approximately five river miles upstream from the confluence of Santa Rosa Creek and Matanzas Creek. The contributing watershed to the dam is 11.45 square miles. The NRCS and CA DSOD hazard classifications for the dam are High Hazard and Extremely High Hazard, respectively.

The dam has a crest elevation of 427.63 feet (NAVD 88), a crest length of approximately 685 feet, a crest top width of 24 feet, and a total height of approximately 95 feet. The embankment has a 3:1 upstream slope with one wave berm that is 10 feet in width. The downstream face of the dam has a 2.5:1 slope and two stability berms that are also both 10 feet wide. The dam features a principal spillway and auxiliary spillway with crest elevations of 377.63 feet and 412.63 feet (NAVD 88), respectively. The auxiliary spillway of the dam is a vegetated earthen spillway that wraps around the right abutment of the embankment. The auxiliary spillway operates as a broad-crested weir with a weir length of 200 feet and 2:1 side slopes. The crest of the spillway includes a concrete cut-off wall that extends 10 feet below the ground surface.

For additional information and photographs of the existing dam, refer to *TM001 – Existing Condition Assessment* (JDE & AECOM, 2023) and *TM005 – Existing Hydrology Analysis* (JDE, 2023a).

2.0 Identified Deficiencies and Constraints

JDE has completed hydrologic, hydraulic, geotechnical, and seismic evaluation of the existing Matanzas Creek Dam, and have identified the following deficiencies per federal and/or state criteria:

1. Sediment Capacity – insufficient sediment storage capacity for an additional 50-year design life (AECOM and JDE, 2023)
2. Principal Spillway Hydrograph (PSH) – existing dam is unable to route the PSH without activating the existing earthen auxiliary spillway (JDE, 2023a)
3. Auxiliary Spillway Integrity – based on the available, limited geotechnical data for the auxiliary spillway, the spillway may breach during the 24-hour Freeboard Hydrograph (FBH) storm event (JDE, 2023b)
4. Dam/Foundation Liquefaction Triggering – simplified methods indicated borderline triggering based on 84th percentile ground motion (AECOM, 2022a)
5. Dam Seismic Stability – Existing dam meets CA DSOD criteria, but post-earthquake (liquefied) conditions do not meet NRCS criteria (AECOM, 2022a)
6. Dam Seismic Deformation – simplified methods indicate borderline acceptable deformations (AECOM, 2022a)

In addition to the deficiencies of the existing dam, there are other constraints that were considered for all alternatives developed, which are summarized below:

1. The existing conveyance of Matanzas Creek downstream of the dam does not have sufficient capacity for several storm events.
 - a. Overtopping of existing downstream channel banks occurs during outflows from the 2-year 24-hour storm event near the Bennett Valley Golf Course. There are also capacity limitations near downtown Santa Rosa.
 - b. Increased outlet flows from the principal spillway would likely cause induced flooding
2. Several homes are located near the peak reservoir surface elevation upstream of the dam (the lowest based elevation of the homes is approximately 428 feet)
 - a. This limits dam crest and spillway crest raise possibilities while meeting upstream inundation requirements. Per Circular 390-21-1, “landrights must be acquired to an elevation no lower than the maximum water surface elevation during to pass of the 100-year, 24-hour storm through the dam or the minimum elevation determined to be appropriate and approved in the watershed plan, whichever is higher” (NRCS, 2021).
3. Desired level of flood protection
 - a. The primary purpose of Matanzas Creek Dam is to provide flood protection to downstream infrastructure. This is done by temporarily storing the flood water and allowing a controlled released through the principal spillway attenuating the peak flow from the watershed. Currently, the existing dam can route the 25-year 24-hour storm event through the principal spillway and barely activate the auxiliary spillway (JDE, 2023a). When the auxiliary spillway is activated, higher peak flows are released from the dam. This introduces a high flood risk to infrastructure downstream of the dam. “Desired level of flood protection” in this case refers to the dam’s ability to route a specified storm event solely through the principal spillway. It does not refer to downstream flood impacts due to insufficient capacity of Matanzas Creek. If the Sponsor desires to increase the

level of flood protection, then the flood storage or operation of the principal and/or auxiliary spillways must be modified.

4. All alternatives considered must meet minimum NRCS and CA DSOD dam safety regulations and standards

3.0 Alternative Development

This section provides a narrative description of the required alternatives to be included in the Plan-EA, per the National Watershed Program Manual. It also describes the alternative development and evaluation process and justification for dismissing alternatives for further analysis, particularly for the structural rehabilitation alternatives. More information for each alternative will be described in Section 4 of the Plan-EA.

The required alternatives to be considered as part of the Plan-EA are as follows:

1. Future Without Project (FWOP; also commonly referred to as the ‘No Action’ alternative) – *the estimated most probable future condition expected to occur in the absence of any of the study’s alternate plans*
2. Federal Decommission – *Removes the storage function of the dam and reconnects, restores, and stabilizes the upstream reservoir area/sediment pool and downstream floodplain functions*
3. Non-Structural – *Removal of downstream population at risk*
4. Structural Rehabilitation – *any structural rehabilitation to the dam (i.e. a dam raise, spillway modifications, embankment modifications, etc.) which bring dam into compliance with existing NRCS and CA DSOD criteria*

3.1 Future Without Project (No-Action) Alternative

For the FWOP alternative, also referred to as the No-Action alternative, the Sponsor has determined that they would continue to maintain the dam and would perform additional geotechnical analysis to further investigate the possible deficiencies related to the auxiliary spillway integrity, the dam and/or foundation liquefaction triggering, the dam seismic stability and deformation. The Sponsor has indicated that no modifications to the dam or spillways would be made in the FWOP alternative based on the information available at this time.

Due to the deficiencies of the dam, the dam could possibly fail (breach) either by 1) the auxiliary spillway breaching during the FBH storm event, or 2) failure of the dam during a seismic event with the reservoir being partially full. The corresponding damages from a resulting dam breach of these two scenarios will be evaluated economically for the FWOP alternative. The dam breach inundation maps of these two scenarios were previously determined in *TM004 – Hazard Classification* (JDE, 2021).

Further description and economic analysis of the FWOP alternative will be provided in Section 4 of the Plan-EA and *TM009 – Economics* (AECOM, 2023).

3.2 Federal Decommissioning Alternative

For the federal decommissioning alternative, the embankment is partially removed (or breached) and the downstream conveyance (Matanzas Creek, road crossings, downtown culverts, etc.) are upgraded to provide an equivalent level of flood protection that Matanzas Creek Dam currently provides. In addition, this alternative consists of stabilizing the upstream reservoir where the sediment pool exists to mitigate excessive sediment transport and upstream headcutting of Matanzas Creek.

As described in Circular 390-21-1 (NRCS, 2021), induced flooding caused by the proposed alternative must be mitigated by removing infrastructure from the floodplain (purchasing of real property or flood easements) or by improving the capacity of the downstream conveyance system. For Matanzas Creek Dam, there would be significant induced flooding impacts from decommissioning of the dam, requiring significant improvements to Matanzas Creek and flood control facilities and channels along Santa Rosa Creek to its confluence with the Laguna de Santa Rose. There are approximately nine major road crossings and five miles of channel between the existing dam and Highway 101 that would need to be improved to prevent induced flooding after decommissioning the dam. In addition, it is likely that further improvements would be required downstream of Highway 101 which includes the broader conveyance of the Central Sonoma Watershed. Based on the 100-year floodplain if the dam were decommissioned and noting that increasing the Matanzas Creek's capacity would not be feasible, there are thousands of homes and other infrastructure that would need to be removed from induced flooding (JDE, 2023c). Downstream conveyance improvements and/or acquisition of infrastructure within the induced flooding is cost prohibitive. In addition, decommissioning of the dam is not a desired alternative for the Sponsor as it would be unacceptable to Sonoma County residents that the dam currently provides flood protection for. Therefore, the decommissioning alternative has been dismissed from further detailed evaluation.

3.3 Non-Structural Alternative

The non-structural alternative for Matanzas Creek Dam assumes removal of all structures and other risks within the dam breach inundation area. In the dam breach analysis completed, the population at risk from a hydrologic breach was 28,680. This includes more than 4,100 residential homes, 10 school buildings, and eight critical buildings (hospitals, assisted living buildings, etc.) with more than 1 foot of flooding after a dam breach has occurred. Acquisition of these facilities is cost prohibitive and would likely cause controversy; therefore, the non-structural has been dismissed from further detailed analysis.

3.4 Structural Rehabilitation Alternatives

Various structural rehabilitation alternatives were developed and considered to bring Matanzas Creek Dam back into federal and state requirements and to maintain or improve the flood protection to downstream infrastructure. In total, there were 17 rehabilitation alternatives considered. The alternative concepts ranged from increasing the size of the principal spillway, construction of an additional principal spillway, armoring the existing auxiliary spillway, raising the crest of the auxiliary spillway, construction of a structural spillway in various forms (labyrinth spillway, roller compacted concrete spillway, etc.), a staged auxiliary spillway, and increasing the dam crest elevation. Each of the 17 alternatives considered were evaluated against NRCS and CA DSOD dam safety requirements using SITES, version 2005.1.11 (USDA, 2020). For more information on the hydrologic and hydraulic methods for evaluating the dams, refer to *TM005 – Existing Hydrology Analysis* (JDE, 2023a).

Several of the 17 structural rehabilitation alternatives were dismissed because either they 1) did not bring the dam back into compliance with NRCS and CA DSOD requirements, or 2) there was another more cost-effective rehabilitation alternative versus the alternative being dismissed. Several meetings were held with the Sponsor, NRCS-CA representatives, and at times the National Water Management Center during the development of structural rehabilitation alternatives. The meetings were conducted to receive input from Sponsor and NRCS representatives, discuss concerns with alternatives, and receive clarification on guidelines found in the National Watershed Program Manual and Handbook. A summary of the hydraulic design of these 17 alternatives is provided in Appendix A.

It was determined to include three of the structural rehabilitation alternatives for further detailed analysis. The three alternatives are described in the following subsections.

3.4.1 Rehabilitation Concepts Included for Alternatives 1-3

While Alternatives 1 through 3 incorporate unique rehabilitation concepts (which will be described in the following sections), all three alternatives require the same rehabilitation needs to bring the dam into compliance with regards to sediment capacity, dam and/or foundation liquefaction, and dam seismic stability and deformation.

The existing Matanzas Creek Dam does not have sufficient sediment pool capacity for an additional 50-year design life. As explained in *TM001 – Existing Conditions Assessment* (AECOM and JDE, 2023), the dam needs approximately 190 acre-feet of sediment storage for a 50-year design life; the existing dam has approximately 86 acre-feet of sediment storage remaining. For mitigation of this deficiency, options to remove the impounded sediment to restore the sediment pool versus continual maintenance (systematic removal of impounded sediment) was discussed with the Sponsor. For the purpose of the Plan-EA, it was decided to include a full restoration of the required sediment pool as part of the structural rehabilitation alternatives (a removal of approximately 104 acre-feet of impounded sediment).

To mitigate the liquefaction and seismic concerns of the embankment for the 84th percentile ground motion, the construction of stability berms on both the upstream and downstream embankment faces are required. The crest elevations of the upstream and downstream stability berms are 378 feet and 380 feet, respectively. The required width of the stability berms is 100 feet. The construction of the stability berms also requires an extension of the principal spillway conduit and relocation of the existing principal spillway intake structure and the outlet stilling basin. The stability berms and rehabilitation of the principal spillway is included for Alternatives 1 through 3.

3.4.2 Alternative 1

Alternative 1 involves converting the earthen auxiliary spillway to a structural auxiliary spillway. The structural spillway would consist of a labyrinth weir being constructed near the existing auxiliary spillway crest and constructing a concrete spillway channel to a stilling basin near the downstream valley floor. This alternative does not require the crest of the dam to be raised. The structural auxiliary spillway crest would be raised to 417.88 feet, which is the highest possible raise without needing to raise the crest of the dam. At this crest elevation, the dam would be able to route the 25-year 24-hour storm event without activating the auxiliary spillway, which matches the existing dam's ability.

This alternative resolves the PSH deficiency because the PSH can be routed through a structural auxiliary spillway, per TR-60 guidelines (NRCS, 2019). The structural spillway also resolves the integrity concern of the earthen spillway.

3.4.3 Alternative 2

The conceptual design for Alternative 2 consists of raising the crests of both the dam and the earthen auxiliary spillway. The minimum auxiliary spillway crest elevation of 420 feet (a total raise of approximately 7.4 feet) is required to route the PSH through the principal spillway without activating the earthen auxiliary spillway. This auxiliary spillway crest would be able to route the 50-year 24-hour storm event without activating the auxiliary spillway. In result of the earthen auxiliary spillway crest raise, this would require a dam crest raise to elevation 431 feet (a total raise of approximately 3.4 feet) to meet all NRCS and CA DSOD dam safety requirements. The dam crest raise would be completed by importing additional fill material on the upstream slope of the embankment.

In addition to the auxiliary spillway crest raise, the earthen spillway will need to be regraded with a more consistent slope and spillway width to meet spillway stability and integrity requirements. Near the crest of the auxiliary spillway, armoring of the spillway with roller compacted concrete and construction of a cutoff wall will be required to meet spillway integrity requirements.

3.4.4 Alternative 3

Alternative 3 is very similar to the design concept of Alternative 2. The difference is the earthen auxiliary spillway crest and dam crest will be raised to 424 feet (a total raise of approximately 11.4 feet) and 435 feet (a total raise of 7.4 feet), respectively. This additional raise of the crest is to increase the dam's flood storage and routing capabilities to the 100-year 24-hour storm event. This means the 100-year event can be routed solely through the principal spillway, which minimizes the peak flow and flooding downstream of the dam. In contrast, a 100-year storm event for Alternative 2 would route floodwaters through the principal spillway and engage the auxiliary spillway. Although Alternative 3 produces the highest reservoir water surface elevation for the 100-year event, it satisfies the requirement of NRCS Circular 390-21-1 and does not induce flooding upstream infrastructure during the 100-year event.

3.4.5 Summary of Structural Rehabilitation Alternatives

Table 3-1 provides a summary of Alternatives 1 through 3. Conceptual drawings and cost estimates for these alternatives are included in Appendix B and Appendix C, respectively.

Table 3-1. Summary of Structural Rehabilitation Alternatives

Alternative Description	Flood Protection*	Cost Estimate
Alternative 1 - Structural auxiliary spillway (labyrinth weir, concrete channel, concrete stilling basin) - Auxiliary spillway crest = 417.88 feet (raise of 5.25 feet) - Dam crest = 427.63 feet (no raise) - Excavation of impounded sediment, construction of stability berms, and reconstruction of principal spillway	25-year	\$43,706,000
Alternative 2 - Raise of earthen auxiliary spillway and dam crest - Armor earthen auxiliary spillway crest and regrade spillway width and slope - Auxiliary spillway crest = 420 feet (raise of 7.4 feet) - Dam crest = 431 feet (raise of 3.4 feet) - Excavation of impounded sediment, construction of stability berms, and reconstruction of principal spillway	50-year	\$29,647,000
Alternative 3 - Raise of earthen auxiliary spillway and dam crest - Armor earthen auxiliary spillway crest and regrade spillway width and slope - Auxiliary spillway crest = 424 feet (raise of 11.4 feet) - Dam crest = 435 feet (raise of 7.4 feet) - Excavation of impounded sediment, construction of stability berms, and reconstruction of principal spillway	100-year	\$32,025,000

*Flood protection refers to the dam's ability to route the corresponding recurrence interval storm solely through the principal spillway (auxiliary spillway is not activated). This does not indicate that downstream flooding will not occur.

4.0 Summary

JDE and AECOM have developed and evaluated the FWOP, decommissioning, non-structural, and structural rehabilitation alternatives for the Matanzas Creek Dam. All alternatives considered must meet the purpose and need state of the supplement watershed plan, which is to which is to preserve and increase flood protection downstream of Matanzas Creek Dam and to bring the dam and spillway facilities into compliance the federal and state standards.

Conceptual drawings and cost estimates have been developed for the structural rehabilitation alternatives. Hydraulic modeling of the structural rehabilitation alternatives is described in *TM008 – Flood Frequency Routing* (JDE, 2023c). The results of the hydraulic modeling were used to complete the economics analysis of the alternatives, which is discussed in *TM009 – Economics* (AECOM, 2023).

Several coordination meetings with Sponsor and NRCS representations has been completed during the development and evaluation of alternatives. The Sponsor has determined that Alternative 2 will be used as the Preferred Alternative for the Plan-EA.

5.0 References

- AECOM. (2022a). Geologic Investigation Report – Matanzas Creek Dam, Sonoma County, California. February 2022 (DRAFT).
- AECOM. (2023). Technical Memorandum No. 009 – *Economics*. January 2023.
- AECOM, Jones & DeMille Engineering (JDE). (2023). Technical Memorandum No. 001 – *Existing Conditions Assessment*. June 2021.
- HDR, Kleinfelder. (2016). California Dam Assessment for Matanzas Creek Dam Sonoma County, CA. Prepared for USDA-NRCS California State Office. April 2016.
- JDE. (2021). Technical Memorandum No. 004 – *Hazard Classification*. June 2021.
- JDE. (2023a). Technical Memorandum No. 005 – *Existing Hydrology Analysis*. October 2021.
- JDE. (2023b). Technical Memorandum No. 006 – *Spillway Stability and Integrity Analysis*. March 2022.
- JDE. (2023c). Technical Memorandum No. 008 – *Flood Frequency Routing*. August 2022.
- National Resources Conservation Service (NRCS). (2019). Technical Release 210-60. *Earth Dams and Reservoirs*. U.S. Department of Agriculture. March 2019.
- NRCS. (2021). Circular 390-21-1. Title 390, National Watershed Program Manual, 4th Edition, April 2014 Part 500 – Part 506.
- U.S. Department of Agricultural (USDA). (2020). SITES Version 2005.1.11.

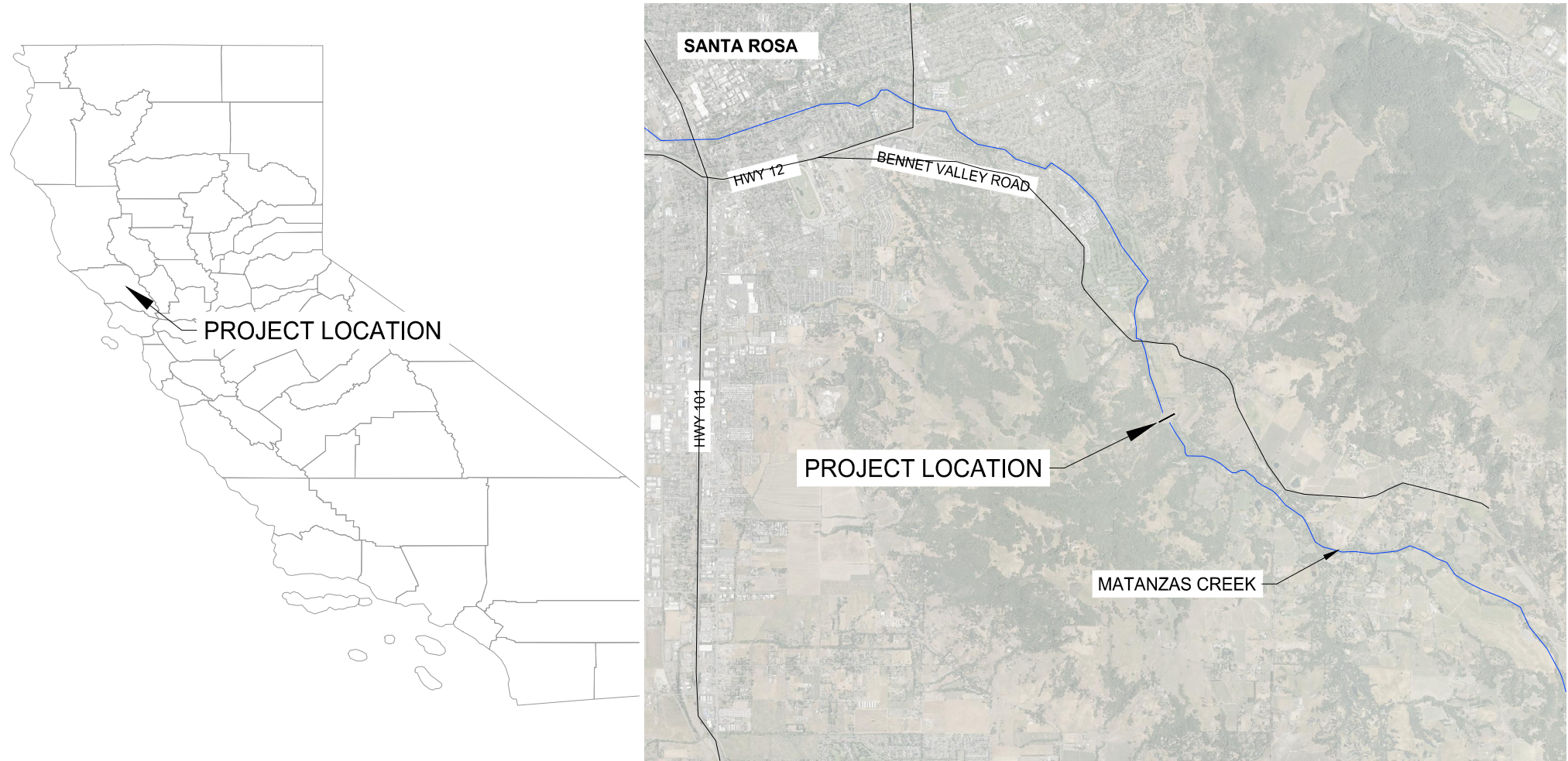
Appendix A. Summary of Hydraulic Designs Considered

Initial Alt. No.	Alternative Description	Included/Dismissed	Reasoning/Comment
1	Increase principal spillway (PS) size to a 7.5 ft x 7.5 ft box culvert with a 12 ft x 12 ft riser, no raise to auxiliary spillway (AS) and dam crests	Dismissed	Increasing PS capacity would result in increased (induced) flooding downstream of the dam. Downstream improvements not considered under dam rehab program. Costs to open cut dam would be much greater than dam raise alternatives.
2	Construct additional (dual) PS	Dismissed	Same reasoning as Alt. No. 1.
3	Utilize existing PS, but lower crest to 370 ft	Dismissed	Would not resolve PSH deficiency. Cost to resolve sediment pool deficiency increases.
4	Armor AS, maintain AS crest elevation, no raise to dam crest	Dismissed	After coordination with NWMC, armoring AS would not be considered it a structural AS. Therefore, PSH deficiency remains. Armoring mitigation cannot be considered to resolve integrity deficiency.
5	Armor AS, raise AS crest to 417.88 ft, no raise to dam crest	Dismissed	Same reasoning as Alt. No. 4. Cannot pass FBH criterion without raising dam crest.
6	Structural (labyrinth weir) AS, raise AS crest to 417.88 ft, no raise to dam crest	<u>Included</u>	Resolves PSH deficiency, while maintaining compliance with other criteria. Highest AS crest raise without need to raise dam crest. <u>This alternative further referred to as Alternative 1 in Plan-EA.</u>
7	Structural (RCC) on embankment, no raise to dam crest	Dismissed	Much higher cost than Alt. No. 6. Cannot pass FBH criterion without raising dam crest. RCC spillway on embankment not permitted (CA DSOD).
8	Structural AS next to existing AS (dual spillways)	Dismissed	Much higher cost than Alt. No. 6. Cannot pass FBH criterion without raising dam crest.
9	Structural (RCC) AS at current crest location, raise AS crest to 414 ft, no raise to dam crest	Dismissed	Much higher cost than Alt. No. 6.
10	Structural (RCC) AS at crest location further downstream (near bend), raise AS crest to 414 ft, no raise to dam crest	Dismissed	Much higher cost than Alt. No. 6.

Initial Alt. No.	Alternative Description	Included/Dismissed	Reasoning/Comment
11	Smaller structural AS sized to pass PSH (lower crest), maintain existing earthen AS crest, no raise to dam crest	Dismissed	Much higher cost than Alt. No. 6. Increased (induced) flooding downstream of dam.
12	Structural (RCC) AS, raise AS crest to 420 ft, raise dam crest to 430 ft. Increase dam's ability to route 50-yr storm event without engaging AS (increase downstream flood protection)	Dismissed	Much higher cost than Alt. No. 6 and 14. With a AS crest this high, a structural spillway is not needed to pass PSH. Cannot pass FBH criterion without raising dam crest higher.
13	Structural (labyrinth weir) AS, raise AS crest to 420 ft, raise dam crest to 430 ft. Increase dam's ability to route 50-yr storm event without engaging AS (increase downstream flood protection)	Dismissed	Much higher cost than Alt. No. 6 and 14. With a AS crest this high, a structural spillway is not needed to pass PSH.
14	Raise earthen AS crest to 420 ft, raise dam crest to 431 ft. Increase dam's ability to route 50-year storm event without engaging AS (increase downstream flood protection)	<u>Included</u>	Resolves PSH deficiency while maintain compliance with other criteria. Lowest cost alternative. Opportunity for downstream flood benefits. <u>This alternative further referred to as Alternative 2 in Plan-EA.</u>
15	Raise earthen AS crest to 424 ft, raise dam crest to 435 ft. Increase dam's ability to route 100-year storm event without engaging AS (increase downstream flood protection)	<u>Included</u>	Resolves PSH deficiency while maintain compliance with other criteria. Lower cost alternative than Alt. No. 6. Greatest opportunity for downstream flood benefits. <u>This alternative further referred to as Alternative 3 in Plan-EA.</u>
16	Structural (RCC) embankment, raise AS and dam crests	Dismissed	Much higher cost than Alt. No. 6. RCC spillway on embankment no permitted (CA DSOD).
17	Structural AS next to existing AS (dual spillways), raise AS and dam crests	Dismissed	Same as Alt. No. 6.

Appendix B. Conceptual Design Drawings

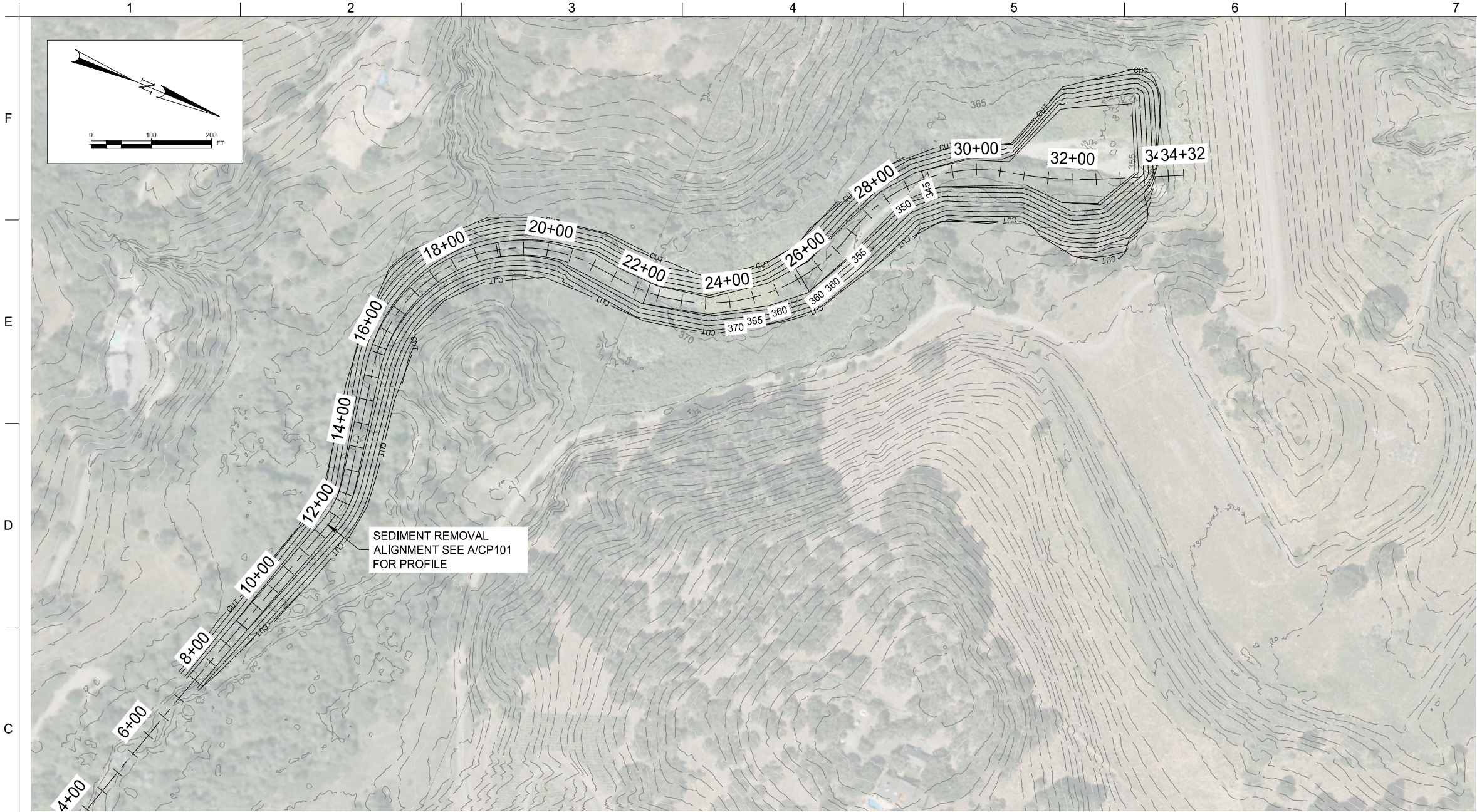
MATANZAS CREEK DAM WATERSHED PLAN
STRUCTURAL REHABILITATION ALTERNATIVE DRAWINGS
SONOMA COUNTY ARIZONA
2022



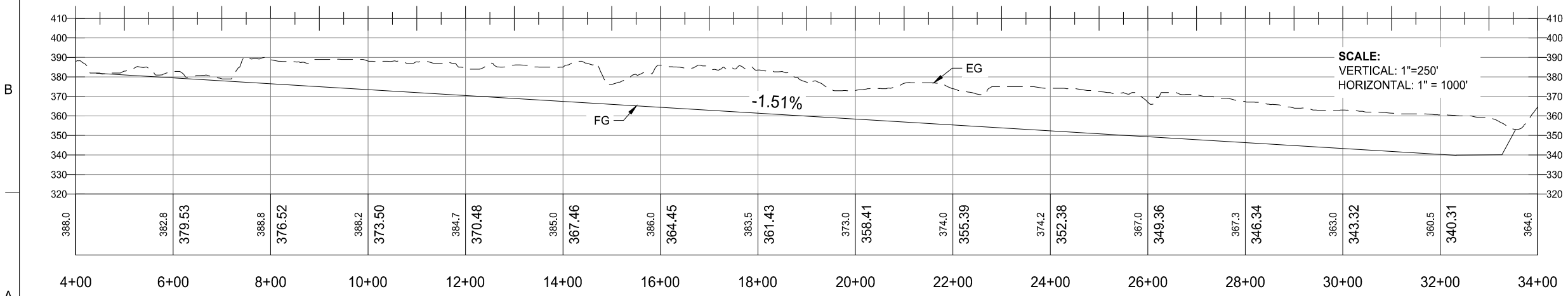
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SHEET NUMBER	SHEET DESCRIPTION
G001	TITLE PAGE
CP101	SEDIMENT REMOVAL
A1CP102	ALT 1 AUXILIARY SPILLWAY
A1CP103	ALT 1 STRUCTURE REHAB
A1CP501	ALT 1 LABYRINTH WEIR
A1CP502	ALT 1 DAM RAISE AND STAB. BERMS
A2CP102	ALT 2 AUXILIARY SPILLWAY
A2CP103	ALT 2 STRUCTURE REHAB
A2CP501	ALT 2 DAM RAISE AND STAB. BUTTRESS
A3CP102	ALT 3 AUXILIARY SPILLWAY
A3CP103	ALT 3 STRUCTURE REHAB
A3CP501	ALT 3 DAM RAISE AND STAB. BUTRESSES

VICINITY MAP

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION



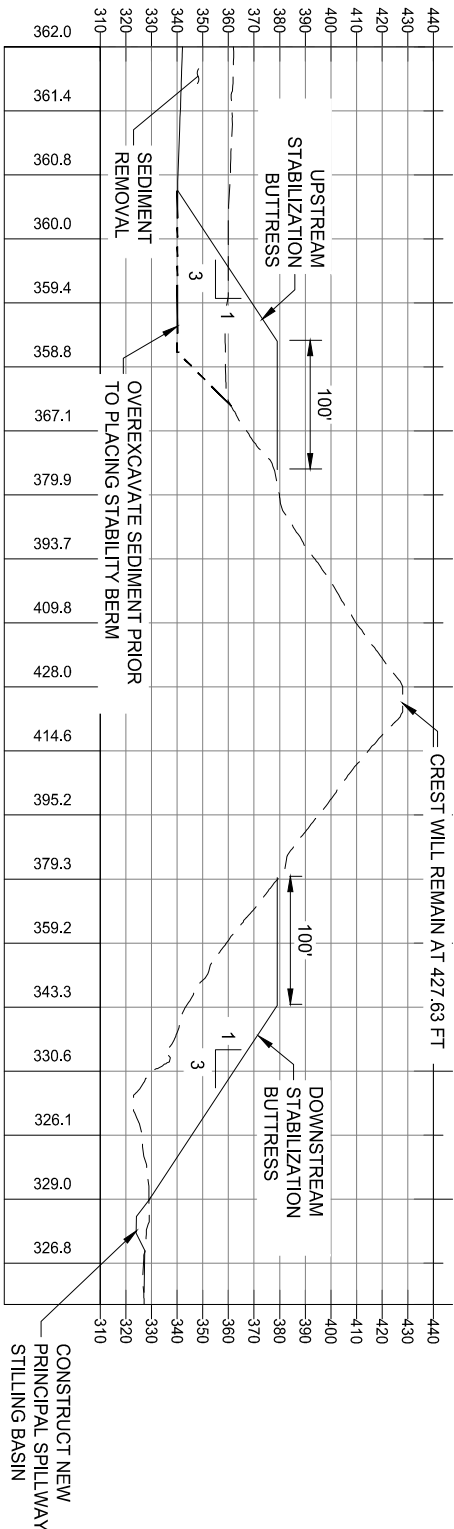
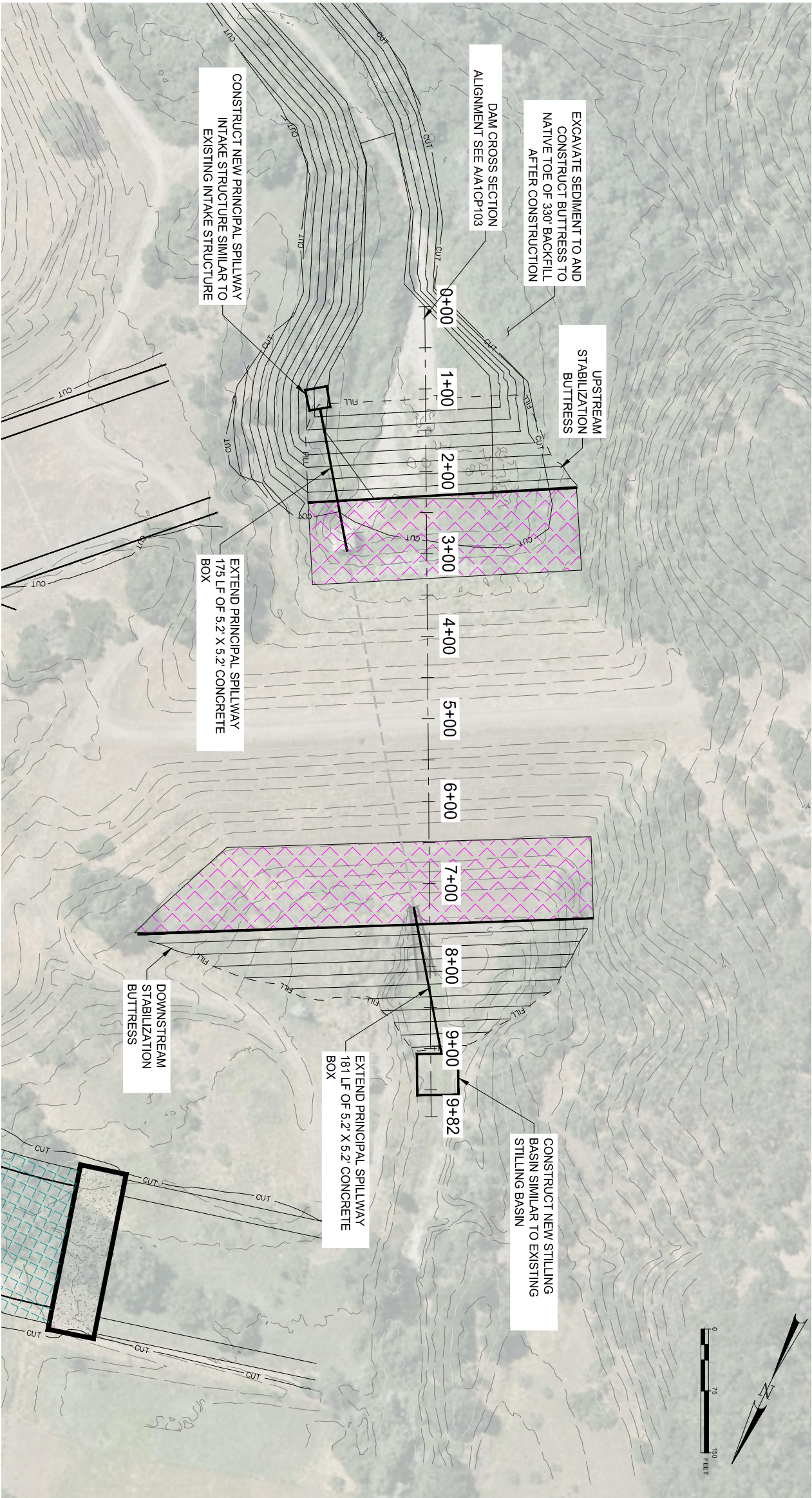
- GENERAL NOTES
1. SEDIMENT EXCAVATION IS INCLUDED IN EACH ALTERNATIVE PROPOSED IN THE WATERSHED PLAN.
 2. THE EXTENTS OF EXCAVATION AND VOLUME OF SEDIMENT REMOVED IS THE SAME FOR EACH PROPOSED ALTERNATIVE



A/CP101 SEDIMENT REMOVAL PROFILE

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

		APPROVAL		REVISIONS		DATE	NO.	DATE
		RECOMM.	DESIGN	DATE	NO.	DATE		
NRCs		SEDIMENT REMOVAL		DWG NAME		1" = 250'		8/29/2022
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SUBMITTAL: REVIEW - NOT FOR CONSTRUCTION		SONOMA COUNTY		SHEET NO. CP101				

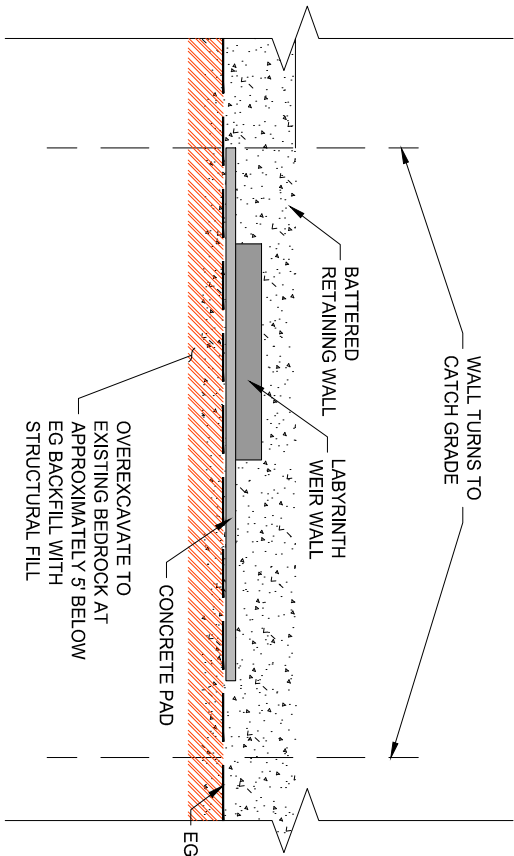
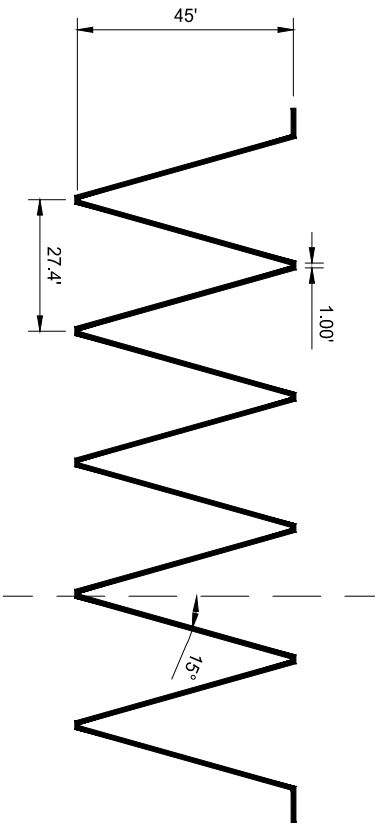
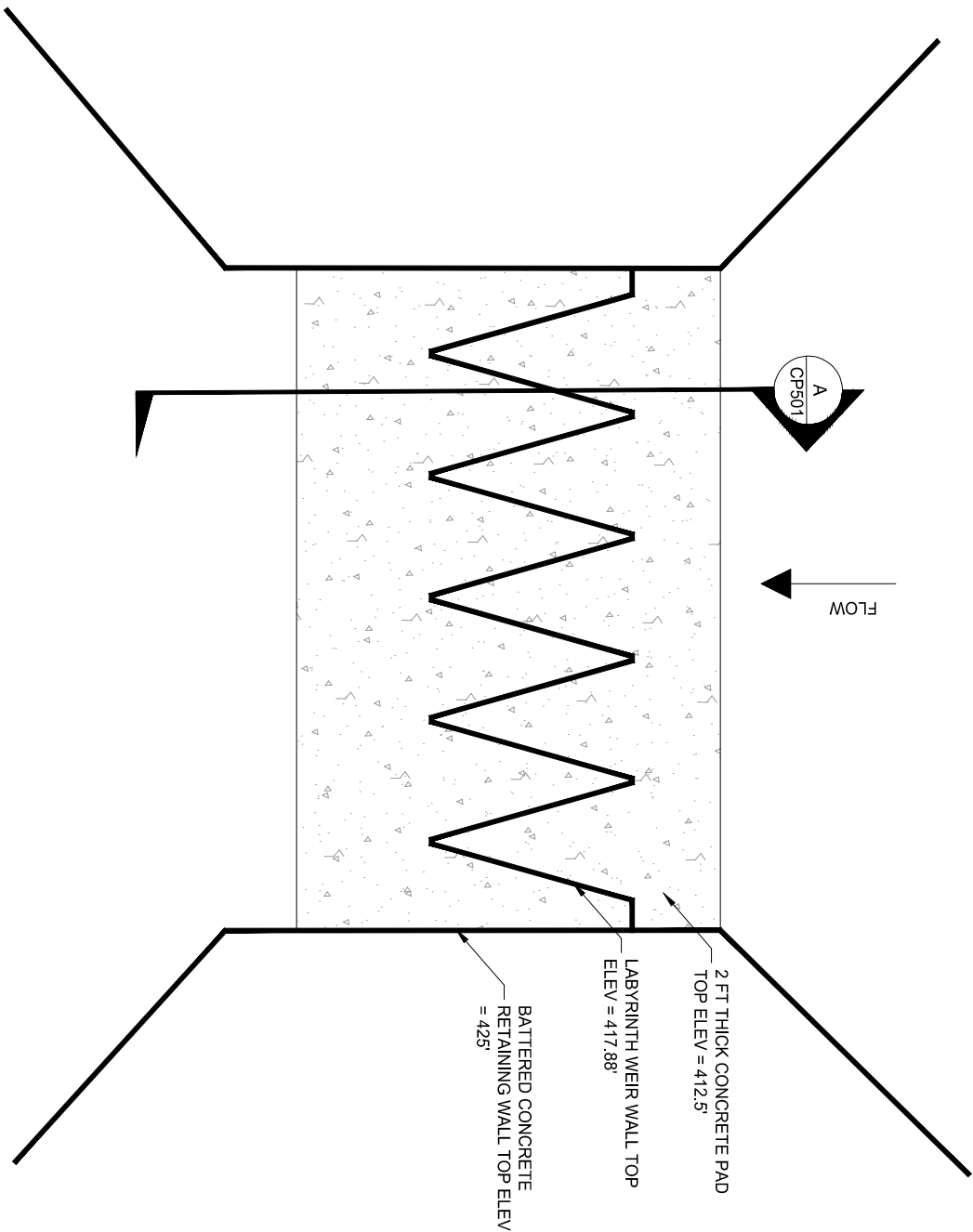


A/A1CP103 - DAM CROSS SECTION

SCALE: HORIZ. 1" = 150', VERT. 1"=75'

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

SHEET NO. A1CP103	SONOMA COUNTY	NRCS		 Jones & DeMille Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com					
		MATANZAS REHABILITATION ALTERNATIVES							
		ALTERNATIVE 1 - STRUCTURE REHAB PLAN			APPROVAL RECOMM: _____	NO.	DATE	REMARKS	
					PROJECT DESIGN ENGINEER _____ DATE _____	REVISIONS			
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			QUALITY MANAGEMENT REVIEW _____ DATE _____						



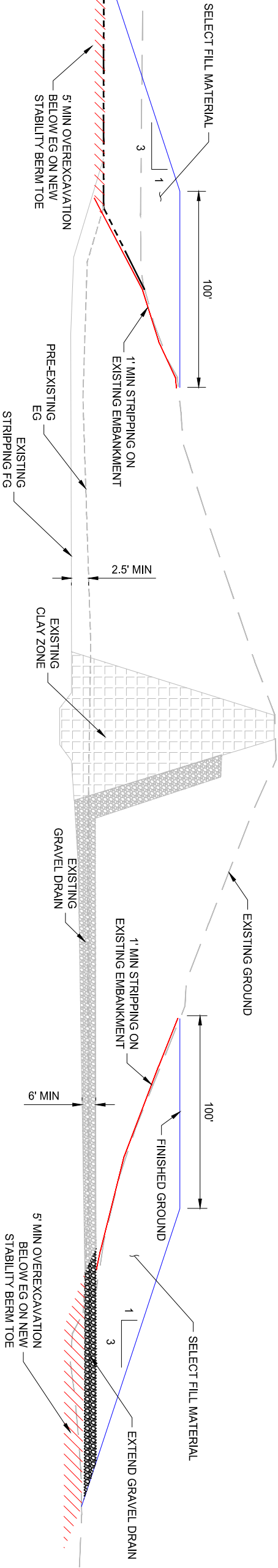
SHEET NO. A1CP501	SONOMA COUNTY	NRCS			Jones & DeMille Engineering, Inc.					
		MATANZAS REHABILITATION ALTERNATIVES			CIVIL & STRUCTURAL ENGINEERING - SURVEYING GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com					
		ALTERNATIVE 1 - LABYRINTH WEIR			APPROVAL RECOMM: _____		NO.		DATE	
					PROJECT DESIGN ENGINEER _____ DATE _____		REMARKS			
SUBMITTAL: REVIEW - NOT FOR CONSTRUCTION		PROJECT NUMBER: 2006-048	APPROVED _____		SCALE: 1" = 40'		DWG NAME: h:\JD\Proj\2006-048\dwg\preferred alternatives\A1 CP501-CP50X.dwg		UPDATED: 8/29/2022 PLOTTED: 1/24/2023	
			QUALITY MANAGEMENT REVIEW _____ DATE _____		REVISIONS					

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

SHEET NO. A1CP501

SONOMA COUNTY

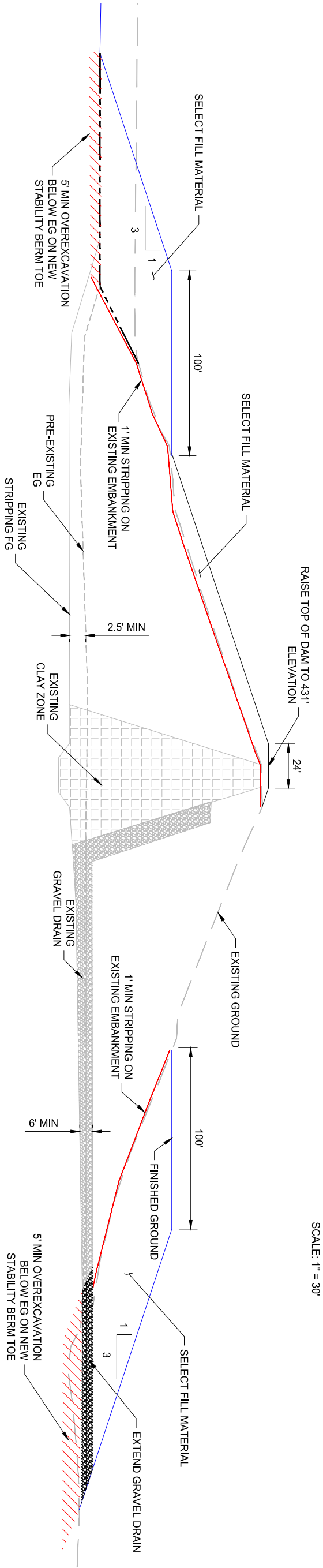
12345678



SCALE: 1" = 30'

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

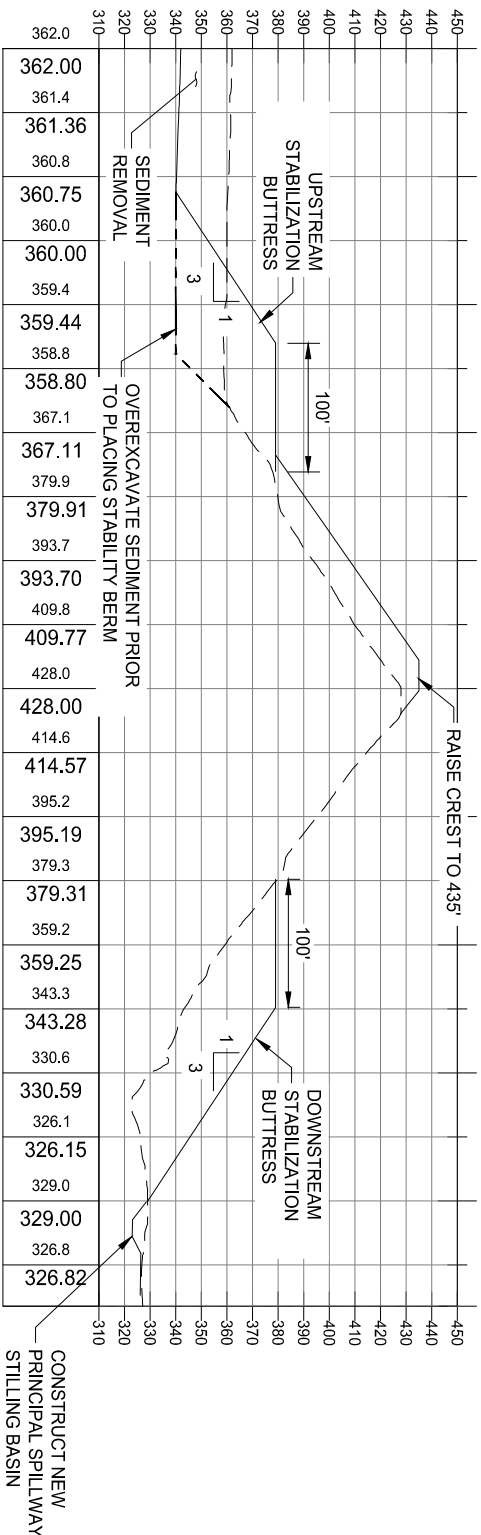
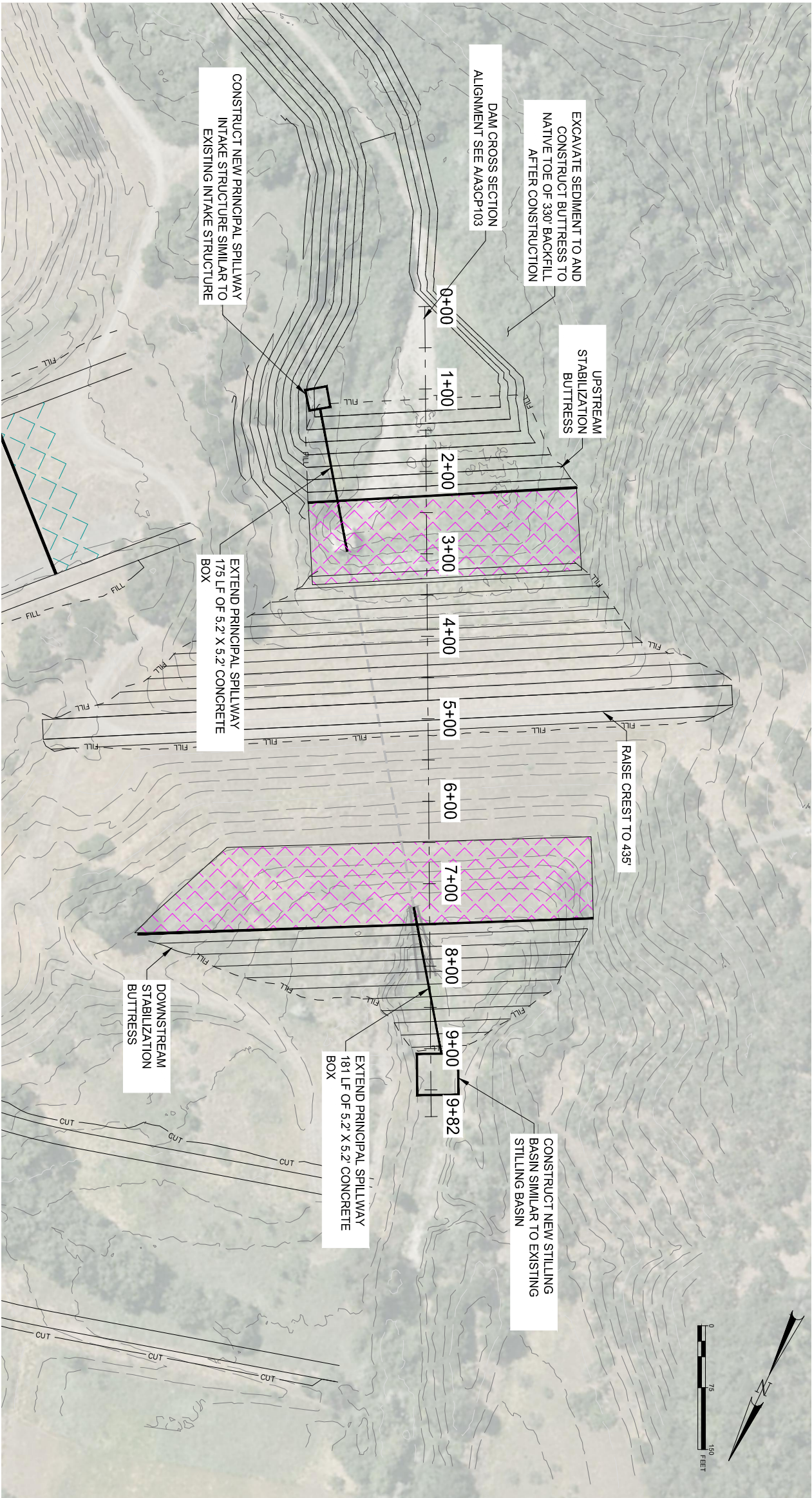
SHEET NO. A1CP502	SONOMA COUNTY	NRCS		 Jones & DeMille Engineering, Inc. CIVIL & STRUCTURAL ENGINEERING - SURVEYING GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com				
		MATANZAS REHABILITATION ALTERNATIVES						
		ALTERNATIVE 1 - DAM DETAILS			APPROVAL RECOMM: _____	NO.	DATE	REMARKS
					PROJECT DESIGN ENGINEER _____ DATE _____	REVISIONS		
		SUBMITTAL: REVIEW - NOT FOR CONSTRUCTION	PROJECT NUMBER: 2006-048	APPROVED _____	SCALE: 1"=30'	DWG NAME: h:\JDI\Proj\2006-048\dwg\preferred alternatives\A1 CP501-CP50X.dwg	UPDATED: 8/29/2022 PLOTTED: 1/24/2023	
				QUALITY MANAGEMENT REVIEW _____ DATE _____				



SCALE: 1" = 30'

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

SHEET NO. A2CP501	SONOMA COUNTY	NRCS			Jones & DeMille Engineering, Inc.					
		MATANZAS REHABILITATION ALTERNATIVES			CIVIL & STRUCTURAL ENGINEERING - SURVEYING GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com					
		ALTERNATIVE 2 - DAM DETAILS			APPROVAL RECOMM:		NO.	DATE	REMARKS	
						PROJECT DESIGN ENGINEER	DATE	REVISIONS		
					APPROVED			SCALE: 1"=30'	DWG NAME: h:\JD\Proj\2006-048\dwg\preferred alternatives\A2 CP501-CP50X.dwg	UPDATED: PLOTTED:
SUBMITTAL: REVIEW - NOT FOR CONSTRUCTION		PROJECT NUMBER: 2006-048			QUALITY MANAGEMENT REVIEW		DATE			



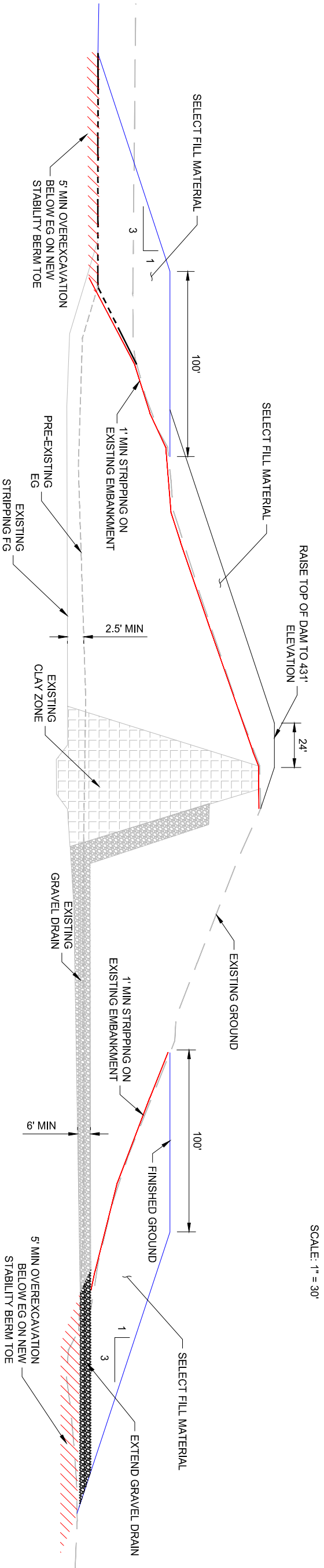
A/A3CP103 - DAM CROSS SECTION

SCALE: HORIZ. 1" = 150', VERT. 1"=75'

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

SHEET NO. A3CP103	SONOMA COUNTY	NRCS			Jones & DeMille Engineering, Inc.						
		MATANZAS REHABILITATION ALTERNATIVES			CIVIL & STRUCTURAL ENGINEERING - SURVEYING						
					GIS - ENVIRONMENTAL - MATERIALS TESTING						
					1.800.748.5275 www.jonesanddemille.com						
ALTERNATIVE 3 - STRUCTURE REHAB PLAN		APPROVAL RECOMM: _____				NO. DATE REMARKS					
		PROJECT DESIGN ENGINEER DATE									
SUBMITTAL: REVIEW - NOT FOR CONSTRUCTION		PROJECT NUMBER: 2006-048		APPROVED _____		SCALE: 1" = 150'		DWG NAME: h:\JD\Proj\2006-048\dwg\preferred alternatives\A3CP103.dwg		UPDATED: 8/29/2022	
				QUALITY MANAGEMENT REVIEW DATE						PLOTTED: 1/24/2023	

SONOMA COUNTY
SHEET NO. A3CP103



SCALE: 1" = 30'

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

SHEET NO. A3CP501	SONOMA COUNTY	NRCS			Jones & DeMille Engineering, Inc.				
		MATANZAS REHABILITATION ALTERNATIVES			CIVIL & STRUCTURAL ENGINEERING - SURVEYING GIS - ENVIRONMENTAL - MATERIALS TESTING 1.800.748.5275 www.jonesanddemille.com				
		ALTERNATIVE 3 - DAM DETAILS			APPROVAL RECOMM:		NO.	DATE	REMARKS
							REVISIONS		
SUBMITTAL: REVIEW - NOT FOR CONSTRUCTION		PROJECT NUMBER: 2006-048	APPROVED	PROJECT DESIGN ENGINEER	DATE	SCALE: 1" = 30'	DWG NAME: h:\JDI\Proj\2006-048\dwg\preferred alternatives\A3 CP501-CP50X.dwg	UPDATED: 8/29/2022	
				QUALITY MANAGEMENT REVIEW	DATE			PLOTTED: 1/24/2023	

Appendix C. Cost Estimates

Owner: NRCS
Project: Matanzas Creek Dam Rehabilitation
Project #: 2006-048
PM: Darin Robinson
Date: 1/24/2024



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ENGINEER'S OPINION OF PROBABLE COST -- ALTERNATIVE 1					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
CONSTRUCTION					
0	Mobilization	LS	1	\$ 2,213,000.00	\$ 2,213,000.00
1	Excavation - Sediment	CY	175,000	\$ 14.00	\$ 2,450,000.00
2	Excavation - Auxiliary Spillway	CY	87,000	\$ 14.00	\$ 1,218,000.00
3	Stripping and Overexcavation	CY	59,334	\$ 14.00	\$ 831,000.00
4	Select Backfill	CY	59,334	\$ 55.00	\$ 3,263,000.00
5	Select Fill Stability Berms	CY	95,000	\$ 55.00	\$ 5,225,000.00
6	Gravel Drain Extension	CY	16,491	\$ 120.00	\$ 1,979,000.00
8	Topsoil	CY	24,562	\$ 25.00	\$ 614,000.00
9	Reseeding	AC	15	\$ 2,500.00	\$ 38,000.00
10	Concrete - Auxiliary Spillway Armoring	CY	8,715	\$ 950.00	\$ 8,279,000.00
11	Concrete - Stilling Basin	CY	863	\$ 950.00	\$ 820,000.00
12	Concrete - Vertical Work, Weir	CY	257	\$ 2,000.00	\$ 515,000.00
13	Concrete - Slab, Weir	CY	1,001	\$ 950.00	\$ 951,000.00
14	Concrete - Cutoff Wall	CY	222	\$ 1,500.00	\$ 333,000.00
15	Concrete - PS Conduit Extension	CY	192	\$ 2,100.00	\$ 403,000.00
16	Principal Spillway Intake Structure	LS	1	\$ 455,000.00	\$ 455,000.00
17	Principal Spillway Stilling Basin	LS	1	\$ 288,200.00	\$ 288,000.00
Construction Subtotal					\$ 27,662,000.00
Construction Contingency (40%)					\$ 11,065,000.00
TOTAL PROBABLE CONSTRUCTION COST					\$ 38,727,000.00
ENGINEERING SERVICES					
1	Design Engineering	LS	1	\$ 2,213,000.00	\$ 2,213,000.00
2	Construction Management	LS	1	\$ 1,936,000.00	\$ 1,936,000.00
Engineering Subtotal					\$ 4,149,000.00
ENVIRONMENTAL PERMITTING					
1	Environmental Permitting	LS	1	\$ 830,000.00	\$ 830,000.00
Environmental Permitting Subtotal					\$ 830,000.00
Total Probable Project Cost					\$ 43,706,000.00

Owner: NRCS
Project: Matanzas Creek Dam Rehabilitation
Project #: 2006-048
PM: Darin Robinson
Date: 1/24/2024



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ENGINEER'S OPINION OF PROBABLE COST -- ALTERNATIVE 2					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
CONSTRUCTION					
0	Mobilization	LS	1	\$ 1,487,000.00	\$ 1,487,000.00
1	Excavation - Sediment	CY	175,000	\$ 14.00	\$ 2,450,000.00
2	Excavation - Auxiliary Spillway	CY	139,379	\$ 14.00	\$ 1,951,000.00
3	Stripping and Overexcavation	CY	42,876	\$ 14.00	\$ 600,000.00
4	Select Backfill	CY	42,876	\$ 55.00	\$ 2,358,000.00
5	General Backfill	CY	21,000	\$ 15.00	\$ 315,000.00
6	Select Fill Stability Berms	CY	95,000	\$ 55.00	\$ 5,225,000.00
7	Select Fill Dam Raise	CY	20,500	\$ 55.00	\$ 1,128,000.00
8	Gravel Drain Extension	CY	16,491	\$ 120.00	\$ 1,979,000.00
10	Topsoil	CY	24,562	\$ 25.00	\$ 614,000.00
11	Reseeding	AC	15	\$ 2,500.00	\$ 38,000.00
12	Concrete - RCC on Crest	CY	479	\$ 950.00	\$ 455,000.00
13	Concrete - Cutoff Wall	CY	222	\$ 1,500.00	\$ 333,000.00
14	Concrete - PS Conduit Extension	CY	192	\$ 2,100.00	\$ 403,000.00
15	Principal Spillway Intake Structure	LS	1	\$ 455,000.00	\$ 455,000.00
16	Principal Spillway Stilling Basin	LS	1	\$ 288,200.00	\$ 288,000.00
Construction Subtotal					\$ 18,592,000.00
Construction Contingency (40%)					\$ 7,437,000.00
TOTAL PROBABLE CONSTRUCTION COST					\$ 26,029,000.00
ENGINEERING SERVICES					
1	Design Engineering	LS	1	\$ 1,487,000.00	\$ 1,487,000.00
2	Construction Management	LS	1	\$ 1,301,000.00	\$ 1,301,000.00
Engineering Subtotal					\$ 2,788,000.00
ENVIRONMENTAL PERMITTING					
1	Environmental Permitting	LS	1	\$ 830,000.00	\$ 830,000.00
Environmental Permitting Subtotal					\$ 830,000.00
Total Probable Project Cost					\$ 29,647,000.00

Owner: NRCS
Project: Matanzas Creek Dam Rehabilitation
Project #: 2006-048
PM: Darin Robinson
Date: 1/24/2024



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ENGINEER'S OPINION OF PROBABLE COST -- ALTERNATIVE 3					
Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Price
CONSTRUCTION					
0	Mobilization	LS	1	\$ 1,592,000.00	\$ 1,592,000.00
1	Excavation - Sediment	CY	175,000	\$ 14.00	\$ 2,450,000.00
2	Excavation - Auxiliary Spillway	CY	115,882	\$ 14.00	\$ 1,622,000.00
3	Stripping and Overexcavation	CY	42,876	\$ 14.00	\$ 600,000.00
4	Select Backfill	CY	42,876	\$ 55.00	\$ 2,358,000.00
5	General Backfill	CY	33,000	\$ 15.00	\$ 495,000.00
6	Select Fill Stability Berms	CY	95,000	\$ 55.00	\$ 5,225,000.00
7	Select Fill Dam Raise	CY	47,000	\$ 55.00	\$ 2,585,000.00
8	Gravel Drain Extension	CY	16,491	\$ 120.00	\$ 1,979,000.00
10	Topsoil	CY	24,562	\$ 25.00	\$ 614,000.00
11	Reseeding	AC	15	\$ 2,500.00	\$ 38,000.00
12	Concrete - RCC on Crest	CY	479	\$ 950.00	\$ 455,000.00
13	Concrete - Cutoff Wall	CY	222	\$ 1,500.00	\$ 333,000.00
14	Concrete - PS Conduit Extension	CY	192	\$ 2,100.00	\$ 403,000.00
15	Principal Spillway Intake Structure	LS	1	\$ 455,000.00	\$ 455,000.00
16	Principal Spillway Stilling Basin	LS	1	\$ 288,200.00	\$ 288,000.00
Construction Subtotal					\$ 19,900,000.00
Construction Contingency (40%)					\$ 7,960,000.00
TOTAL PROBABLE CONSTRUCTION COST					\$ 27,860,000.00
ENGINEERING SERVICES					
1	Design Engineering	LS	1	\$ 1,592,000.00	\$ 1,592,000.00
2	Construction Management	LS	1	\$ 1,393,000.00	\$ 1,393,000.00
Engineering Subtotal					\$ 2,985,000.00
ENVIRONMENTAL PERMITTING					
1	Environmental Permitting	LS	1	\$ 830,000.00	\$ 830,000.00
Environmental Permitting Subtotal					\$ 830,000.00
REAL PROPERTY & EASEMENTS					
1	Reservoir Flood Easement	LS	1	\$ 350,000.00	\$ 350,000.00
Real Property Subtotal					\$ 350,000.00
Total Probable Project Cost					\$ 32,025,000.00