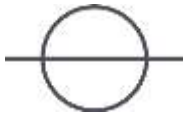
Appendix E. Other Supporting Information

Appendix E1. Water Loss Assessment



ST. MARY CANAL

WATER LOSS ASSESSMENT

Prepared by
Farmers Conservation Alliance

February 2022

Submitted to Milk River Joint Board of Control

Version: Final

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1 Introduction

Farmers Conservation Alliance (FCA) completed a water loss assessment on the St. Mary Canal between June 26 and June 28, 2021. The purpose of this assessment was to determine the potential water losses within the District's earthen canals due to subsurface infiltration, evaporation, plant and tree transpiration, or a combination of such factors, which could represent potential water savings. In addition, FCA performed an analysis of 11 years of streamflow gage data for the Upper St. Mary Canal, from the diversion dam to the St. Mary Siphon intake. These data were used to compute mean and median canal losses between Water Year (WY) 2006 and WY 2016 using the upstream and downstream USGS gages. FCA selected an assessment timeframe to coincide with near maximum diversion rates during the irrigation season, to assess losses at close to peak diversions, and to avoid uncertainty related to changes in irrigator demands that are difficult to quantify within the selected reaches of each ditch. Matt Melchiorsen, FCA Hydrologist, selected discharge measurement locations prior to data collection to identify and measure known losing reaches. US Bureau of Reclamation Engineer, Steve Darlinton, was also instrumental in planning the study, sharing his knowledge of the system with the team, and assisting with logistics. Figure 1-1 identifies the reaches and transects, along the St. Mary Canal that were included in this assessment.

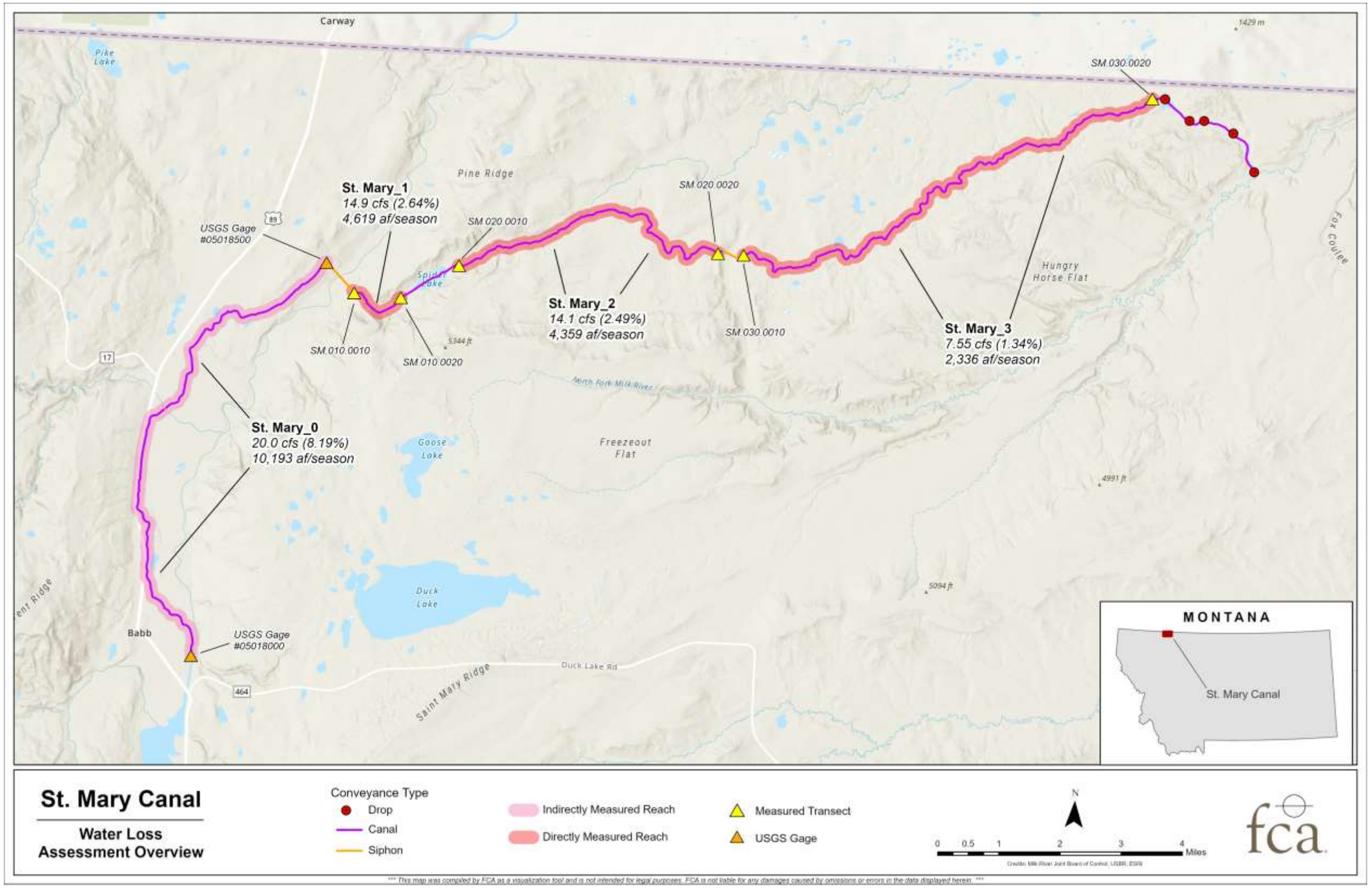

Figure 1-1. Seepage Sub-Reach Locations on St. Mary Canal, June 26-28, 2021.

2 Methodology

This section summarizes the methodologies used to conduct the field measurements for this study, along with the analyses used to evaluate the measurements and historical flow data.

2.1 FIELD MEASUREMENTS

Matt Melchiorsen, FCA Hydrologist, led and oversaw the seepage study; he has nearly 17 years of experience as a hydrographer with the U.S. Geological Survey (USGS) and FCA. Annaliese Miller, NewFields Engineer, and Todd Miller, both contractors working with FCA, assisted Matt with the fieldwork and helped to establish safety measures to accomplish the data collection.

To estimate the instantaneous losses associated with seepage on the Lower St. Mary Canal, FCA measured a total of three sub-reaches from the St. Mary Siphon outfall to just above Drop #1. These sub-reaches represent most of the Canal length below the first siphon. The remainder of the conveyances below the drops were not included, due to either time constraints or because they are natural river conveyances. Because no deliveries exist on the Upper St. Mary Canal between two USGS gages, no direct measurements were necessary to assess seepage in that reach, as described in Section 2.2.2.2.

All discharge measurements were performed in adherence with established USGS quality-assurance protocols using a SonTek RiverSurveyor M9® Acoustic Doppler Current Profiler (ADCP) (Turnipseed and Sauer 2010). An SonTek RiverSurveyor M9® ADCP, like an Acoustic Doppler Velocimeter (ADV), is a doppler-type current meter that measures velocities over a range of depths, but the meter is fastened to a small flotation device that self deploys (i.e., a moving-boat). An ADCP collects a significant number of velocity measurements simultaneously, in a vertical profile, to enhance the calculation of the discharge measurement for each transect.

Each sub-reach consisted of a measurement location (i.e., transect) at its upstream and downstream end. FCA utilized standard methodologies for the ADCP moving-boat method to estimate discharge at each transect. As a quality-assurance measure, a minimum of four measurements were made at each transect, sequentially, to verify that all measurements were within the appropriate tolerance of each other. Stage references (i.e., relative water surface elevation) were read before and after each measurement to ensure steady-state conditions, when available. Additional analyses of gage readings, from the upstream streamflow station during the fieldwork, were conducted to ensure measurements were performed under static flow conditions. There were no deliveries out of, or inflows into, the St. Mary Canal along the study reach, which eliminated uncertainties related to quantifying these changes in Canal flows. Photos and field notes associated with each transect can be found in Appendix A.

2.2 ANALYSES

2.2.1 MEASURED SEEPAGE

To estimate the loss or gain associated with each sub-reach and the corresponding discharge measurements, the following Equation 1 was used.

$$Q_{\Delta r,i} = Q_{upstream,i} + \sum_{j=1}^{n} Q_{inflow,j} - \sum_{k=1}^{m} Q_{diversion,k} - Q_{downstream,i}$$

Where:

$Q_{\Delta r,i}$ = Change in canal discharge (i.e., gain or loss) at sub-reach i

$Q_{upstream,i}$ = Average discharge at the upstream transect for sub-reach i

$Q_{downstream,i}$ = Average discharge at the downstream transect for sub-reach i

$Q_{inflow,j}$ = Inflow discharge at location j

$Q_{diversion,k}$ = Diversion discharge at location k

n = Total number of $Q_{inflow,j}$ between $Q_{upstream,i}$ and $Q_{downstream,i}$

m = Total number of $Q_{diversion,k}$ between $Q_{upstream,i}$ and $Q_{downstream,i}$

Equation 1

FCA estimated the uncertainty associated with these measurements using the USGS Discharge Measurement Quality Code (Turnipseed and Sauer 2010). Due to inherent uncertainties associated with using the ADCP moving-boat method for discharge measurements, accuracy ratings (in percent) were assigned to each measurement based on the transect quality, velocity distributions, and overall site characteristics. The accuracy ratings are defined as follows:

- A discharge measurement with an "excellent" accuracy rating is within 2 percent of the actual flow.
- A discharge measurement with a "good" accuracy rating is within 5 percent of the actual flow.
- A discharge measurement with a "fair" accuracy rating is within 8 percent of the actual flow.
- A discharge measurement with a "poor" accuracy rating is 8 percent or greater than the actual flow.

Each measured discharge was multiplied by the assigned accuracy rating to present the measurement error in flow units (cfs). For a given sub-reach, the associated propagated uncertainty, with the average discharge for either the upstream or downstream transect, was calculated using Equation 2.

$$\delta Q_{upstream} \; or \; \delta Q_{downstream} = \frac{\sqrt{(\delta Q_1)^2 + (\delta Q_2)^2}}{2}$$

Where:

$\delta Q_{upstream} \; or \; \delta Q_{downstream}$ = Propagated uncertainty for $Q_{upstream,i}$ or $Q_{dowstream,i}$

δQ_1 = Assigned accuracy rating of the first measured discharge for $Q_{upstream,i}$ or $Q_{dowstream,i}$

δQ_2 = Assigned accuracy rating of the second measured discharge for $Q_{upstream,i}$ or $Q_{dowstream,i}$

Equation 2

Using the uncertainty estimated for each upstream or downstream transect of a given sub-reach, $\delta Q_{upstream}$ or $\delta Q_{downstream}$, the overall uncertainty associated with a sub-reach's loss was estimated using Equation 3.

$$\delta Q_{\Delta R,i} = \sqrt{(\delta Q_{upstream})^2 + (\delta Q_{downstream})^2}$$

$\delta Q_{\Delta R,i}$ = Propagated uncertainty for $Q_{\Delta R,i}$ at sub-reach i

$\delta Q_{upstream,i}$ = Propagated uncertainty for $Q_{upstream,i}$ at sub-reach i

$\delta Q_{downstream,i}$ = Propagated uncertainty for $Q_{downstream,i}$ at sub-reach i

Equation 3

2.2.2 HISTORICAL SEEPAGE

2.2.2.1 Lower St. Mary Canal

FCA compiled 11 years of historic data (spanning from 2006 to 2016) from USGS gage #05018500, St. Mary Canal at St. Mary Crossing near Babb, MT, and computed median daily discharge rates for the entire date range. These median values represent baseline inflow into the St. Mary Canal at the siphon intake. Then, FCA developed a ratio between the delivery rate at the head of each sub-reach, as measured during the St. Mary Canal Water Loss Assessment (FCA 2021), and the instantaneous flow at USGS gage #05018500. This ratio was then applied to the historic median flow rate for each day of the irrigation season to estimate median daily flow in the priority reaches. The percent loss for each sub-reach that was documented during the Loss Assessment was then applied to the computed median daily flow values to estimate potential water savings that could be achieved through modernization efforts, which would eliminate seepage losses. Results from this analysis are presented in section 3.2.2.

2.2.2.2 Upper St. Mary Canal

An additional historical seepage analysis was performed for the Upper St. Mary Canal, from the diversion to the siphon intake, using historical data from USGS gage #05018000 (St. Mary Canal at intake near Babb, MT) and USGS gage #05018500 (St. Mary Canal at St. Mary Crossing near Babb, MT). Because no water deliveries exist between the gages, 11 years of continuous data between 2006 and 2016 were analyzed to compute historic seepage losses between the two gages. Results from this analysis are available below.

3 Results

3.1 SYSTEM-WIDE LOSS SUMMARY

As discussed in Section 2, a total of three sub-reaches, with six corresponding transect measurement locations, were used to estimate the losses on the Lower St. Mary Canal. Losses for the Upper St. Mary Canal were estimated using historic data. Table 3-1 presents the estimated seepage losses for each canal and its sub-reaches as flow (cfs) and seasonal water volumes (acre-feet/season[af/season]).

Table 3-1. St. Mary Canal Water Loss Summary.

Canal Name	Sub-Reach	Median Flow Loss (cfs)	Seasonal Median Loss (af/season)	Median Percent Loss
Upper St. Mary Canal	St. Mary_0	20.0	10,193	8.19%
Lower St. Mary Canal	St. Mary_1	14.9	4,619	2.64%
Lower St. Mary Canal	St. Mary_2	14.1	4,359	2.49%
Lower St. Mary Canal	St. Mary_3	7.55	2,336	1.34%
	Total:	**56.6**	**21,507**	

Notes: af/day: acre-feet per day; cfs: cubic feet per second

3.2 REACH DETAILS

This section presents the seepage losses associated with each reach that was measured and/or analyzed as part of FCA's water loss assessment. Appendix B presents the discharge measurements and uncertainty calculations associated with each transect that was measured.

3.2.1 MEASURED SEEPAGE

The measured data collected on the Lower St. Mary Canal indicated total losses of 39.0 cfs, or approximately 77.4 af/day, as summarized in Table 3-2. The largest source of loss was in sub-reach St. Mary_1. The channel along this sub-reach comprised rounded cobbles set in silt/clay and appeared similar in composition to the rest of the District. Sub-reaches that displayed lower loss amounts along this ditch tended to comprise more silts and clays and contained less alluvial material such as cobbles and gravels. While the canal remains below the surrounding land surface grade for its entire length, evidence of canal seepage was apparent throughout the study reaches. Pooled water below the canal was present in many locations, and vegetation indicative of abundant moisture was well established in many areas. These observations correlate well with the measured loss data, as there was much less evidence of seepage adjacent to the canal along sub-reach 3, compared with sub-reaches 1 and 2.

Table 3-2. Lower St. Mary Canal Measured Losses.

Sub-Reach	Description	Upstream Transect ID	Downstream Transect ID	Measured Flow Loss (cfs)	Sub-Reach Uncertainty (cfs)	Sub-Reach Loss (%)
St. Mary_1	From 200 feet below the St. Mary Siphon outfall to 1000 feet upstream from Spider Lake	SM.010.0010	SM.010.0020	16.0	21.2	2.63%
St. Mary_2	From 800 feet below Spider Lake to 200 feet upstream from Halls Coulee Siphon	SM.020.0010	SM.020.0020	15.0	21.1	2.49%
St. Mary_3	From 600 feet below Halls Coulee Siphon outfall to 1000 feet above Drop #1	SM.030.0010	SM.030.0020	8.0	20.9	1.35%
			Total:	**39.0**		

Notes: cfs: cubic feet per second

3.2.2 HISTORICAL SEEPAGE

3.2.2.1 Lower St. Mary Canal

As discussed in Section 2.2.2 above, FCA performed an analysis using 11 years of mean daily flow values from USGS gage #05018500, St. Mary Canal at St. Mary Crossing near Babb, MT. Median daily flow rates from the 11-year period were computed for estimating season-long water loss volumes. Ratios were developed between the flow rates measured at the head of each sub-reach during the seepage assessment, and the corresponding flow rates at USGS gage #05018500. This ratio was then applied to the 11-year median daily flow values. The percent of measured loss from each of the three sub-reaches included in the study were then applied to the ratio-adjusted median daily flow values. The total theoretical losses resulting from this analysis were computed as daily losses in acre-feet and are presented as total annual volumes in Table 3-3 below.

Table 3-3. Lower St. Mary Canal Theoretical Seasonal Losses.

Sub-Reach	Description	Upstream Transect ID	Downstream Transect ID	Estimated Seasonal Flow Loss (ac-ft)
St. Mary_1	From 200 feet below the St. Mary Siphon outfall to 1000 feet upstream from Spider Lake	SM.010.0010	SM.010.0020	4,619
St. Mary_2	From 800 feet below Spider Lake to 200 feet upstream from Halls Coulee Siphon	SM.020.0010	SM.020.0020	4,359

Sub-Reach	Description	Upstream Transect ID	Downstream Transect ID	Estimated Seasonal Flow Loss (ac-ft)
St. Mary_3	From 600 feet below Halls Coulee Siphon outfall to 1000 feet above Drop #1	SM.030.0010	SM.030.0020	2,336
			Total:	**11,314**

Notes: ac-ft: acre-feet

3.2.2.1 Upper St. Mary Canal

As was also discussed in Section 2, 11 years of historic data were analyzed from the upstream and downstream gages on the Upper St. Mary Canal, above the St. Mary Siphon intake. Based on differences between the upper gage (USGS #05018000) and the lower gage (USGS #05018500), theoretical losses for WYs 2006-2016 were computed. Annual losses ranged from 3,614 ac-ft during WY 2015 to 18,655 ac-ft during WY 2009. The large variation in annual losses is believed to be a product of the magnitude of diversion flow rates, weather variables, and the duration of diversions year over year. Higher diverted flow rates over a longer season typically resulted in greater overall seepage amounts. The mean and median loss volumes over the 11-year analysis period are presented in Table 3-4. Mean daily flow from both gages for individual years, in cfs, are also presented graphically in Figure 3-1 below.

Table 3-4. Upper St. Mary Canal Water Loss Analysis Summary, WYs 2006-2016.

Canal Name	Sub-Reach	Start Location ID	End Location ID	Mean Volume Loss (af/year)	Median Volume Loss (af/year)
St. Mary Canal	St. Mary_0	USGS gage #05018000	USGS gage #05018500	11,306	10,193

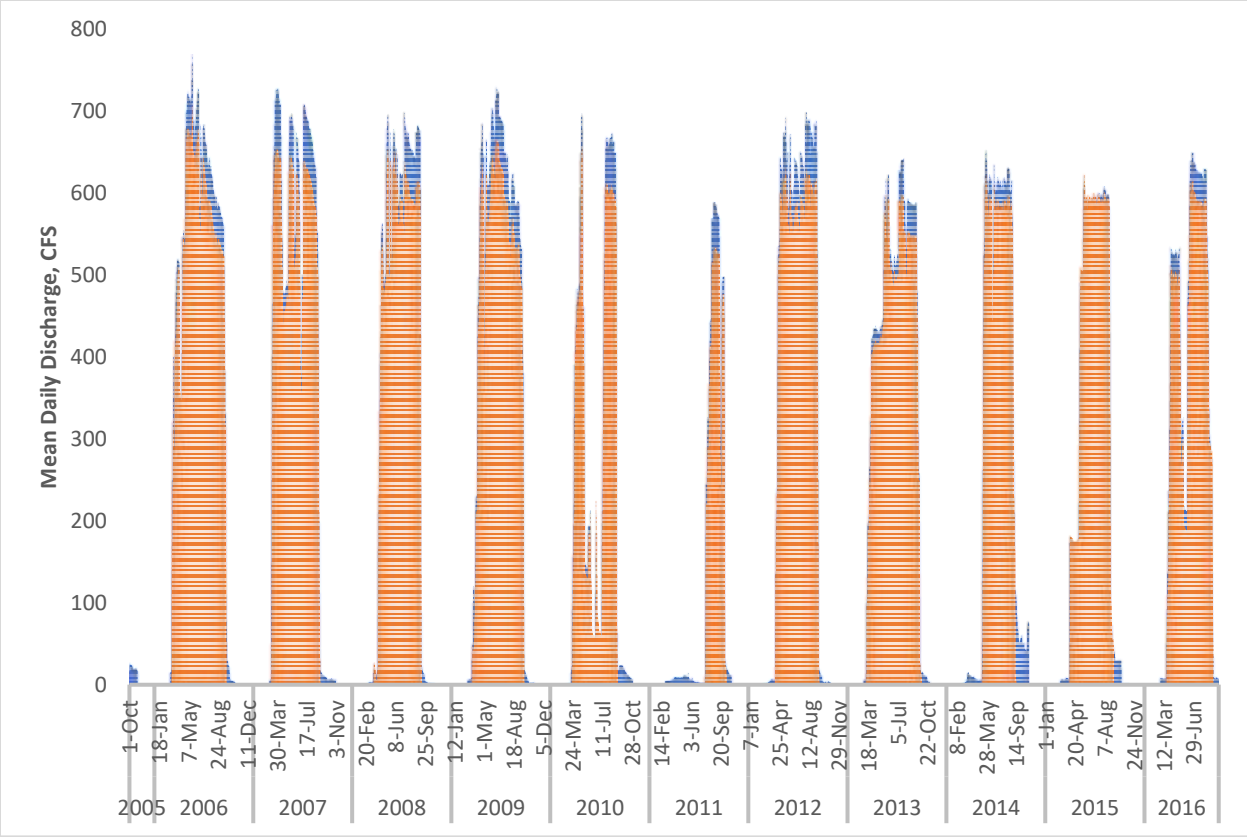

Figure 3-1. Upstream (blue) vs. Downstream (orange) Daily Flows in Upper St. Mary Canal, WYs 2006-2016.

4 Discussion and Conclusions

Water loss measurements conducted by FCA in the Lower St. Mary Canal from June 26 to June 28, 2021 indicated total near-maximum seepage losses of 39.0 cfs, from the outfall of the St. Mary Siphon to just above Drop #1. Based on historic diversion rates, these canal losses should represent overall system performance during a typical water year delivery. Drought years and seasonal variations, such as temperature and precipitation, will also influence overall system loss rates for any given season. To account for seasonal and year over year variations, an analysis of 11 years of flow data from USGS gage #05018500 was performed, as discussed in Section 3.2.2. Using percentage water loss rates as measured during the seepage study, FCA estimated median season long loss volumes. Results indicate a total potential savings of 11,314 ac-ft with modernization efforts that would eliminate water losses in the Lower St. Mary Canal.

In addition, an analysis of historic USGS gage data from October 1, 2005 to September 30, 2016 indicated mean losses of 11,306 ac-ft, and median losses of 10,193 ac-ft in the Upper St. Mary Canal from the diversion dam to the St. Mary Canal Siphon intake. Analysis of individual years in the same time period indicated losses ranging from 3,614 ac-ft to 18,655 ac-ft, associated percent losses ranged from 2 percent to 12 percent, with mean and median losses computed at 7 percent.

During field work, there were many visible observations of seepage losses, such as saturated soils, ponded water, or vegetation indicative of a high moisture content. For nearly the entire length of the canal, the left bank side (opposite the road) was below land surface grade, which often exhibited pooled water and/or established riparian species. The study was conducted during flows that were just slightly below the computed median discharge rate in the St. Mary Canal between April 1 and August 1, 2021[1], and at 96 percent of the peak diversion rate for the same monitoring period. Given that the study was conducted during relatively 'normal' flows for the season, with near typical head in the canals, the data should represent overall system operations. Temperatures during the data collection process were hot, around 90 degrees Fahrenheit, which could have contributed to increased evapotranspiration rates. Ambient seasonal temperatures, precipitation, and vegetative growth rates could also influence the variations in loss rates throughout any given season. Based on the results of this assessment, modernization of the St. Mary Canal would likely result in water savings for the Milk River Project.

[1] Notes: 1 - Data retrieved from U.S. Geological Survey gage St. Mary Canal at St. Mary Crossing near Babb, MT (#05018500)

Appendix A
Transect Summaries

A.1. ST. MARY CANAL TRANSECT SUMMARIES

PHOTO 1. TRANSECT SM.010.0010 ON THE ST. MARY CANAL, JUNE 26, 2021

Location Description	Approximately 200 feet below the St. Mary Canal Siphon outfall
Geographic Coordinates	48° 56' 23.85" N 113° 21' 53.49" W
Cross-Section Description	Silt/clay and cobble trapezoidal canal, with good velocity distribution throughout the cross section
Stability Monitoring	A reference gage (OSS) and recorder data are available at the streamflow gage near the St. Mary Siphon intake; steady-state conditions were verified by stable recorded gage heights of 7.56 feet during the four ADCP measurements.
Reach Characteristics	The ditch downstream from the transect location comprised primarily cobbles set in soil. Bank vegetation consisted of moderate emerging grasses and established riparian vegetation. The location was selected to quantify baseline inflow to the St. Mary Canal sub-reach 1.
CMM#1-4 (cfs)	612, 622, 581, 618
Mean Discharge (cfs)	608
Accuracy Rating	Measurements field rated good (+/- 5%)

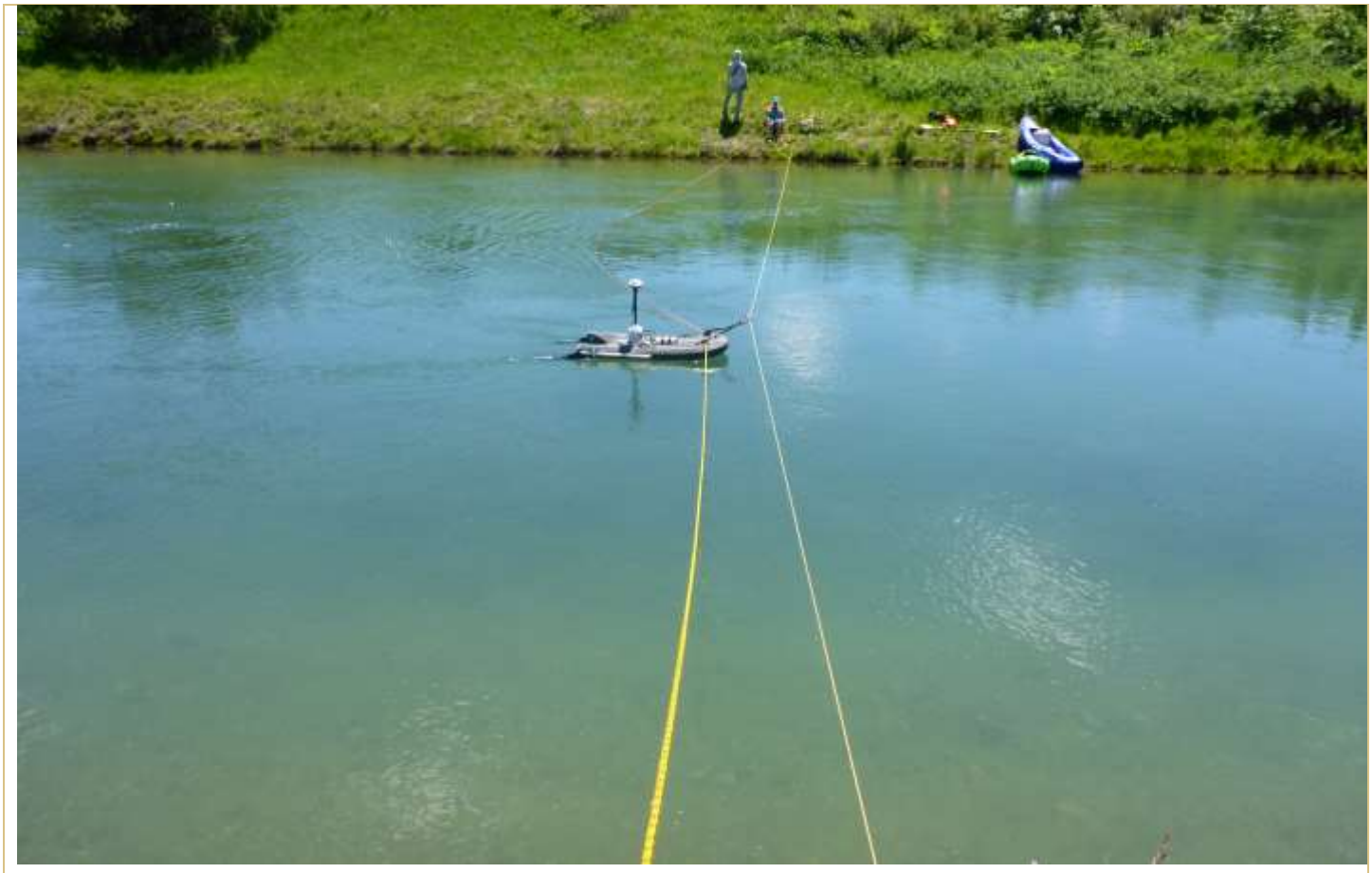

PHOTO 2. TRANSECT SM.010.0020 ON THE ST. MARY CANAL, JUNE 26, 2021

Location Description	Approximately 1000 feet upstream from where Spider Lake causes the Canal to go into backwater
Geographic Coordinates	48° 56' 22.51" N 113° 20' 51.92" W
Cross-Section Description	Cobbles set in soil, good depth and velocity distribution in cross section, no submerged vegetation noted
Stability Monitoring	A reference gage (OSS) and recorder data are available at the streamflow gage near the St. Mary Siphon intake; steady-state conditions were verified by stable recorded gage heights of 7.56 feet during the four ADCP measurements.
Reach Characteristics	The ditch both upstream and downstream from the transect location comprised primarily cobbles set in soil. Bank vegetation consisted of moderate emerging grasses and established riparian vegetation. The location was selected to close out the loss assessment on St. Mary Canal sub-reach 1.
CMM#1-4	586, 593, 589, 600
Mean Discharge (cfs)	592
Accuracy Rating	Measurements field rated good (+/- 5%)

PHOTO 3. TRANSECT SM.020.0010 ON THE ST. MARY CANAL, JUNE 27, 2021

Location Description	Approximately 800 feet below the outlet of Spider Lake
Geographic Coordinates	48° 56' 51.76" N 113° 19' 39.86" W
Cross-Section Description	Cobbles set in soil, good depth and velocity distribution in cross section, no submerged vegetation noted; wide with a smooth water surface
Stability Monitoring	A reference gage (OSS) and recorder data are available at the streamflow gage near the St Mary Siphon intake; steady-state conditions were verified by stable recorded gage heights of 7.54 feet during the four ADCP measurements.
Reach Characteristics	The ditch upstream and downstream from the transect comprised primarily cobbles set in silt/clay. Bank vegetation consisted of thick grasses. The location was selected to quantify baseline inflow into sub-reach 2 on the St. Mary Canal.
CMM#1-4 (cfs)	600, 598, 603, 611
Mean Discharge (cfs)	603
Accuracy Rating	Measurements field rated good (+/- 5%)

PHOTO 4. TRANSECT SM.020.0020 ON THE ST. MARY CANAL, JUNE 27, 2021

Location Description	Approximately 200 feet upstream from the Halls Coulee Siphon intake
Geographic Coordinates	48° 57' 12.80" N 113° 14' 6.27" W
Cross-Section Description	Cobbles set in soil, good depth and velocity distribution in cross section, no submerged vegetation noted; wide with a smooth water surface and minor angles
Stability Monitoring	A reference gage (OSS) and recorder data are available at the streamflow gage near the St. Mary Siphon intake; steady-state conditions were verified by stable recorded gage heights of 7.54 feet during the four ADCP measurements.
Reach Characteristics	The ditch upstream and downstream from the transect location comprised primarily silts and clay. Bank vegetation consisted of sparse grasses. The location was selected to close out the loss assessment on sub-reach 2 of the St. Mary Canal.
CMM#1-4 (cfs)	583, 610, 575, 585
Mean Discharge (cfs)	588
Accuracy Rating	Measurements field rated good (+/- 5%)

PHOTO 5. TRANSECT SM.030.0010 ON THE ST. MARY CANAL, JUNE 28, 2021

Location Description	Approximately 600 feet downstream from the Halls Coulee Siphon outfall
Geographic Coordinates	48° 57' 12.19" N 113° 13' 33.10" W
Cross-Section Description	Cobbles set in soil, good depth and velocity distribution in cross section, no submerged vegetation noted; narrower, with a smooth water surface
Stability Monitoring	A reference gage (OSS) and recorder data are available at the streamflow gage near the St. Mary Siphon intake; steady-state conditions were verified by stable recorded gage heights of 7.53 feet during the four ADCP measurements.
Reach Characteristics	The ditch upstream and downstream from the transect location comprised primarily cobbles set in silt/clay. Bank vegetation consisted of sparse grasses. The location was selected to establish baseline inflow into sub-reach 3 of the St. Mary Canal.
CMM#1-4 (cfs)	599, 579, 619, 580
Mean Discharge (cfs)	594
Accuracy Rating	Measurements field rated good (+/- 5%)

PHOTO 6. TRANSECT SM.030.0020 ON THE MAIN-LINE CANAL, JUNE 28, 2021

Location Description	Approximately 1000 feet upstream from Drop #1, at Hudson Bay Divide
Geographic Coordinates	48° 59' 41.63" N 113° 4' 53.45" W
Cross-Section Description	Cobbles set in soil, good depth and velocity distribution in cross section, no submerged vegetation noted; narrower, with a smooth water surface
Stability Monitoring	A reference gage (OSS) and recorder data are available at the streamflow gage near the St. Mary Siphon intake; steady-state conditions were verified by stable recorded gage heights of 7.53 feet during the four ADCP measurements.
Reach Characteristics	The ditch upstream and downstream from the transect location comprised primarily silts and clay. Bank vegetation minor emerging grasses. The location was selected to close out the loss assessment on sub-reach 3 of the St. Mary Canal.
CMM#1-4 (cfs)	584, 589, 588, 584
Mean Discharge (cfs)	586
Accuracy Rating	Measurements field rated good (+/- 5%)

Appendix B
Discharge Measurement Data and Uncertainty Calculations

Table B-1. Discharge Measurement Data for the St. Mary Canal in the Milk River Project, June 26-28, 2021.

Sub-Reach ID	Transect	Field Measurement Rating	Discharge (cfs)	Average Discharge (cfs)	Relative Uncertainty (%)	Absolute Uncertainty (cfs)	Uncertainty Paired Measurements (cfs)	Sub-Reach Loss (cfs)	Sub-Reach Uncertainty (cfs)	Sub-Reach Loss (%)
St. Mary_1	SM.010.0010	Good	612	608	5.0%	30.6	15.2	16.0	21.2	2.63%
		Good	622		5.0%	31.1				
		Good	581		5.0%	29.0				
		Good	618		5.0%	30.9				
	SM.010.0020	Good	586	592	5.0%	29.3	14.8			
		Good	593		5.0%	29.6				
		Good	589		5.0%	29.4				
		Good	600		5.0%	30.0				
St. Mary_2	SM.020.0010	Good	600	603	5.0%	30.0	15.1	15.0	21.1	2.49%
		Good	598		5.0%	29.9				
		Good	603		5.0%	30.2				
		Good	611		5.0%	30.6				
	SM.020.0020	Good	583	588	5.0%	29.2	14.7			
		Good	610		5.0%	30.5				
		Good	575		5.0%	28.8				
		Good	585		5.0%	29.2				

Sub-Reach ID	Transect	Field Measurement Rating	Discharge (cfs)	Average Discharge (cfs)	Relative Uncertainty (%)	Absolute Uncertainty (cfs)	Uncertainty Paired Measurements (cfs)	Sub-Reach Loss (cfs)	Sub-Reach Uncertainty (cfs)	Sub-Reach Loss (%)
St. Mary_3	SM.030.0010	Good	599	594	5.0%	30.0	14.9	8.00	20.9	1.35%
		Good	579		5.0%	29.0				
		Good	619		5.0%	31.0				
		Good	580		5.0%	29.0				
	SM.030.0020	Good	584	586	5.0%	29.2	14.7			
		Good	589		5.0%	29.4				
		Good	588		5.0%	29.4				
		Good	584		5.0%	29.2				

Appendix E2. MRJBOC and Reclamation Agreement

United States Department of the Interior

BUREAU OF RECLAMATION
Montana Area Office
P.O. Box 30137
Billings, MT 59107-0137

IN REPLY REFER TO:

MT-434
2.2.4.21

VIA USPS

Mr. Wade Jones
Milk River Irrigation Project
Joint Board of Control
1475 1st Avenue
Havre, MT 59501

Subject: St. Mary Canal Rehabilitation Collaboration, St. Mary Unit, Milk River Project, Montana

Dear Mr. Jones:

The Bureau of Reclamation would like to confirm our support for the Milk River Irrigation Project Joint Board of Control (MRJBOC) performing construction projects along the St. Mary Canal through Subarticle 5.a of Contract Number 19XX670073 (Contract). This Contract allows Reclamation to transfer the Operation, Maintenance, and Replacement (OM&R) responsibility to the MRJBOC for the rehabilitation of any feature along the canal (i.e., St. Mary and Halls Coulee Siphons, canal prism, hydraulic drops, wasteways, etc.) as mutually agreed upon, as was done for the Drop No. 2 and 5 replacements.

The St. Mary Diversion Dam and Canal was constructed by Reclamation in the early 1900s to divert flows from the St. Mary River to the Milk River Basin. Most of the water supply for the Milk River Project originates in the St. Mary River watershed. The St. Mary Unit has had several large projects planned in recent years as most of the infrastructure is at the end of its service life. Current appraisal level replacement costs along the full unit are approximately $275M. Reclamation will continue to work closely with the MRJBOC to address affordability, since 73.96 percent of all costs associated with the St. Mary Unit are your responsibility.

Following the successful construction of the Drop 2 and Drop 5 replacement project through the partnership and collaboration of Reclamation, the MRJBOC, the State of Montana, and the Blackfeet Tribe, the Bureau of Reclamation fully supports any efforts made to repair or replace features along the St. Mary Canal.

The ability to ensure the continued water supply for the Milk River Project should be pursued through all venues and will benefit other project benefits such as irrigation, municipal water, recreation, and fish and wildlife. If you are deaf, hard of hearing, or have a speech disability please dial 7-1-1 to access telecommunications relay services

Sincerely,

Ryan Newman
Area Manger

Appendix E3. USFWS IPaC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Montana Ecological Services Field Office
585 Shephard Way, Suite 1
Helena, MT 59601-6287
Phone: (406) 449-5225 Fax: (406) 449-5339

In Reply Refer To: 08/27/2024 16:42:21 UTC
Project Code: 2024-0078954
Project Name: St. Mary Canal Rehabilitation Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through IPaC by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see Migratory Bird Permit | What We Do | U.S. Fish & Wildlife Service (fws.gov).

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Montana Ecological Services Field Office
585 Shephard Way, Suite 1
Helena, MT 59601-6287
(406) 449-5225

PROJECT SUMMARY

Project Code: 2024-0078954
Project Name: St. Mary Canal Rehabilitation Project
Project Type: Irrigation
Project Description: Rehabilitation of the St. Mary Canal
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@48.92495115,-113.39438038987595,14z

Counties: Glacier County, Montana

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Grizzly Bear *Ursus arctos horribilis* Population: U.S.A., conterminous (lower 48) States, except where listed as an experimental population There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/7642	Threatened
North American Wolverine *Gulo gulo luscus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5123	Threatened

FISHES

NAME	STATUS
Bull Trout *Salvelinus confluentus* Population: U.S.A., coterminous, lower 48 states There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8212	Threatened

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CONIFERS AND CYCADS

NAME	STATUS
Whitebark Pine *Pinus albicaulis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1748	Threatened

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bull Trout *Salvelinus confluentus* https://ecos.fws.gov/ecp/species/8212#crithab	Final

IPAC USER CONTACT INFORMATION

Agency: Bureau of Reclamation
Name: Lauri Teig
Address: 2900 4th Ave North Suite 501
City: Billings
State: MT
Zip: 59107
Email lteig@usbr.gov
Phone: 4062477668

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Natural Resources Conservation Service

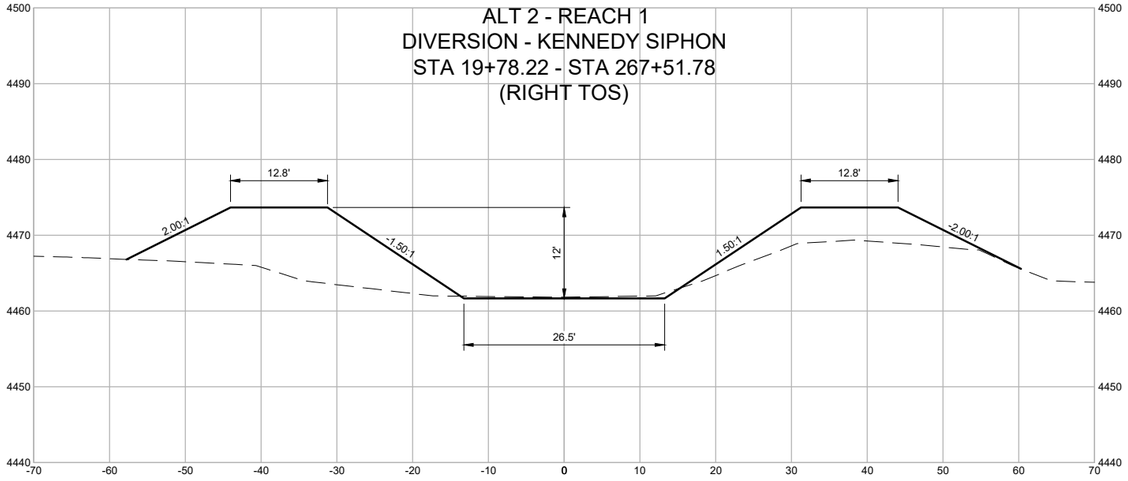
You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

Appendix E4. Plan and Profile

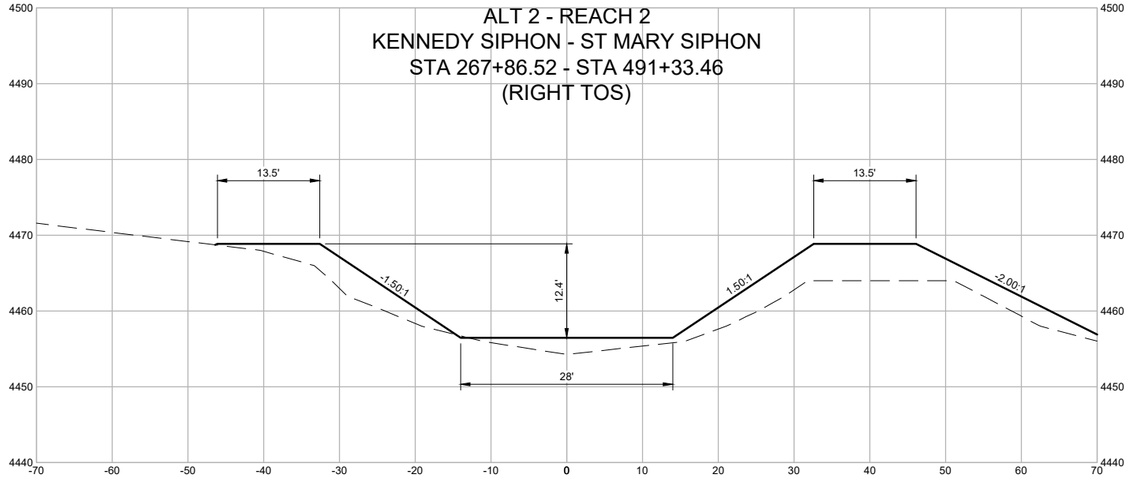
100+00

ALT 2 - REACH 1
DIVERSION - KENNEDY SIPHON
STA 19+78.22 - STA 267+51.78
(RIGHT TOS)



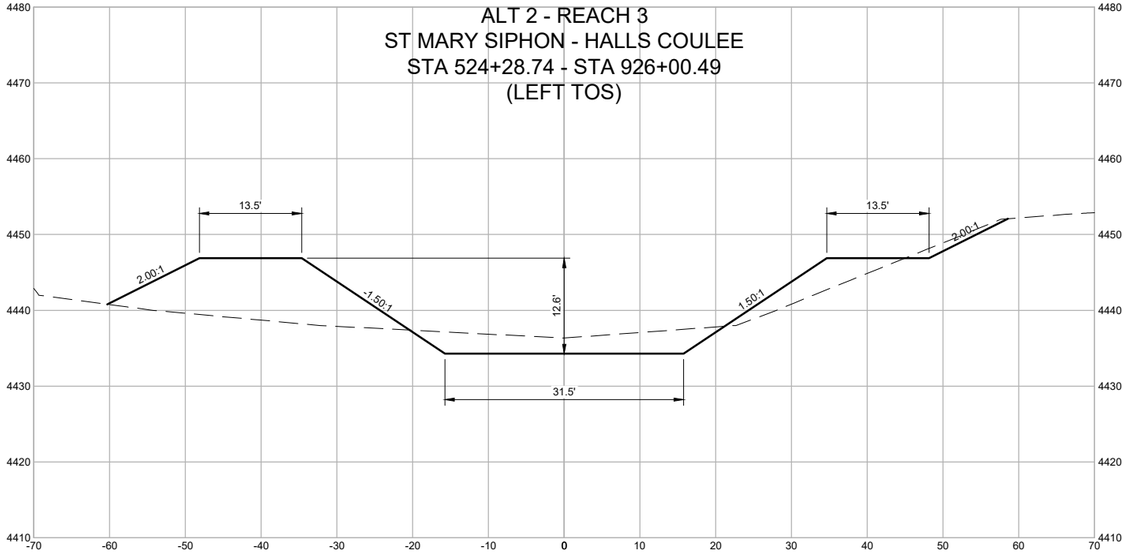
341+00

ALT 2 - REACH 2
KENNEDY SIPHON - ST MARY SIPHON
STA 267+86.52 - STA 491+33.46
(RIGHT TOS)



621+00

ALT 2 - REACH 3
ST MARY SIPHON - HALLS COULEE
STA 524+28.74 - STA 926+00.49
(LEFT TOS)



1125+50

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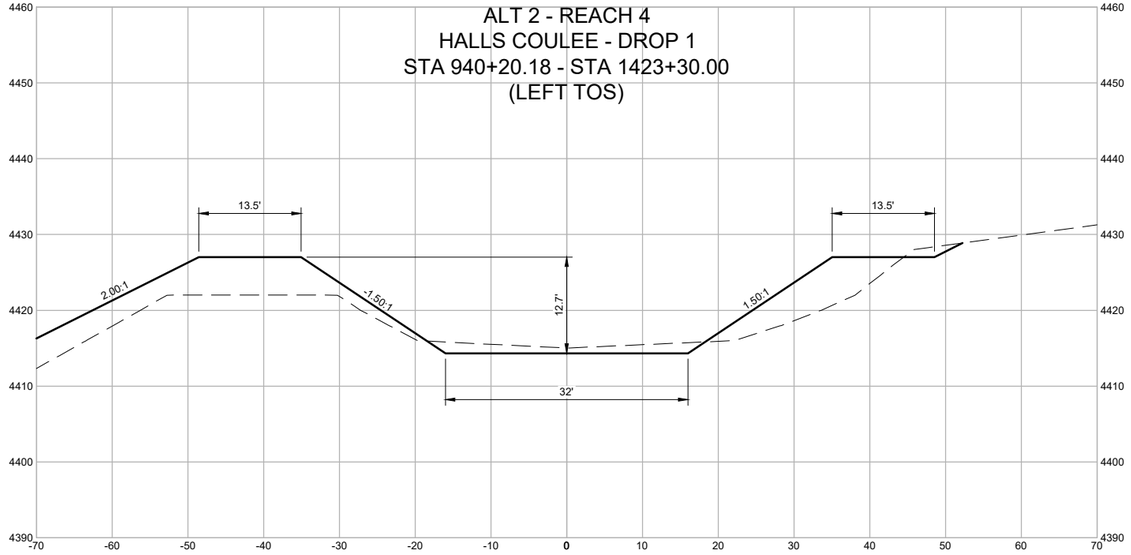
(LEFT TOS)



10 0 10 20
SCALE IN FEET

ISSUE	DATE	DESCRIPTION
1	NOV 2022	10% DESIGN

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10337597

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

FARMERS CONSERVATION ALLIANCE
ST MARY CANAL SIP

0 1" 2"

FILENAME

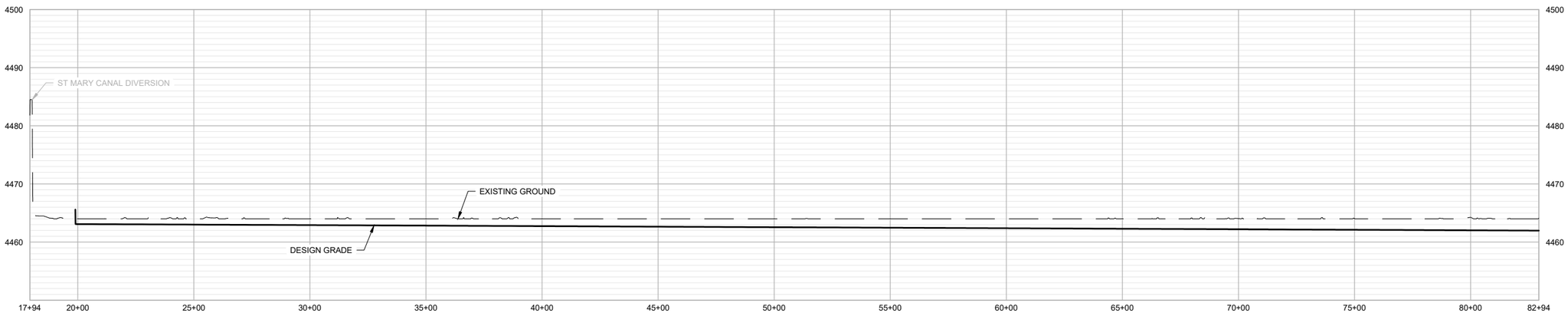
SCALE

SHEET

PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
3. ALTERNATIVE 3: NO LINER TO BE INSTALLED



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

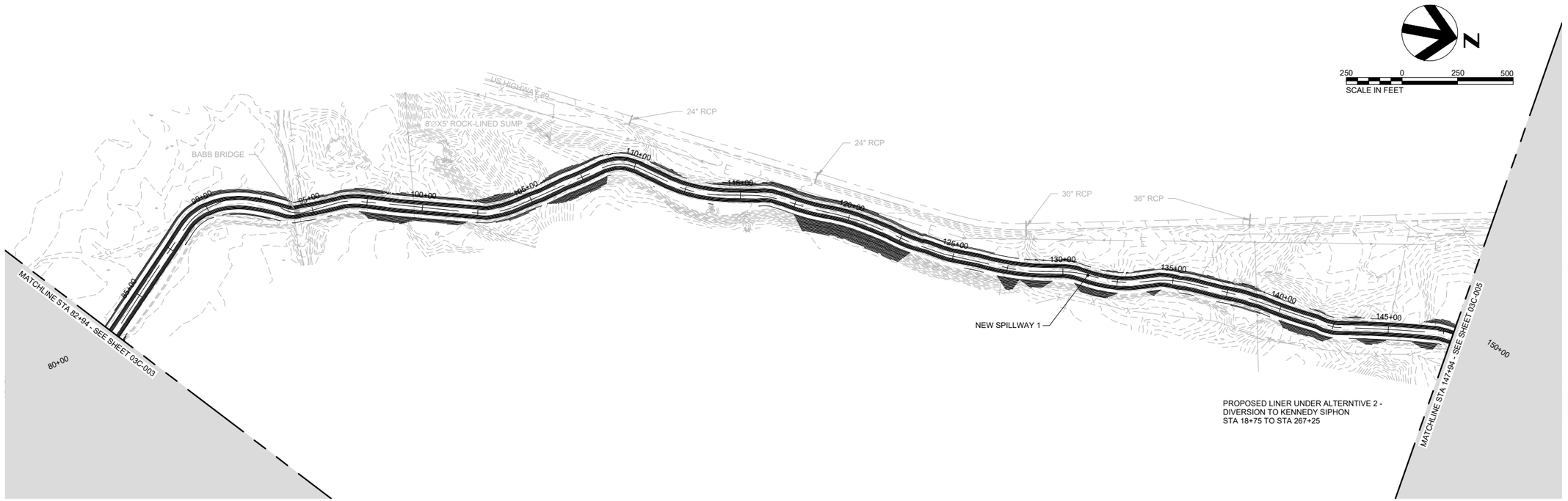
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 17+94 TO STA 82+94

0 1" 2"

FILENAME 03C-003.DWG
SCALE AS NOTED

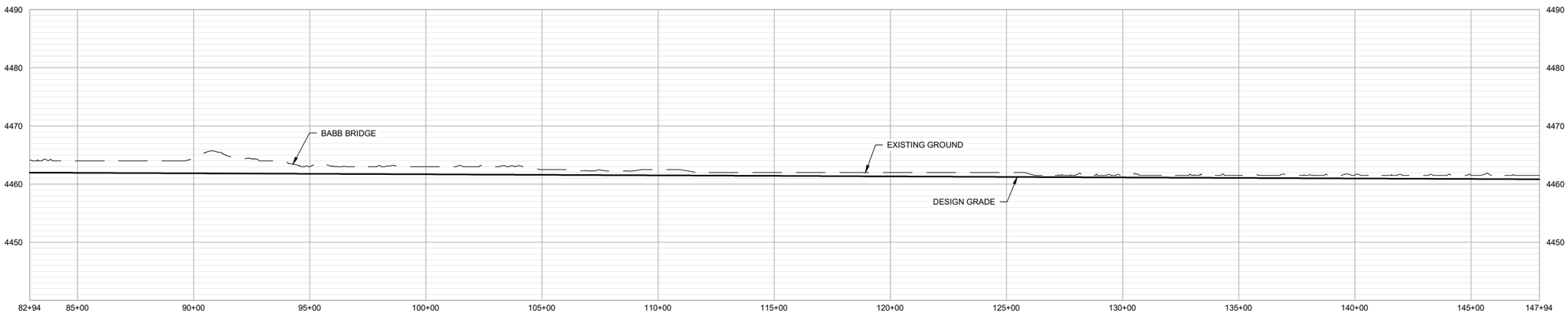
SHEET **03C-003**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
3. ALTERNATIVE 3: NO LINER TO BE INSTALLED



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

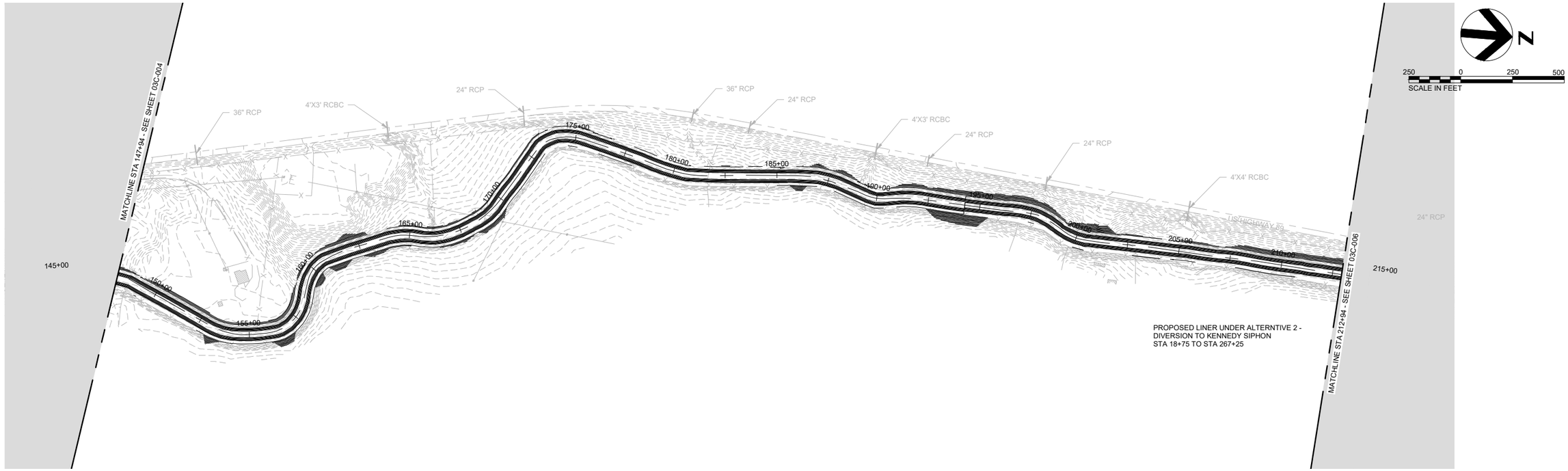
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 82+84 TO 147+94

0 1" 2"

FILENAME	03C-004.DWG
SCALE	AS NOTED

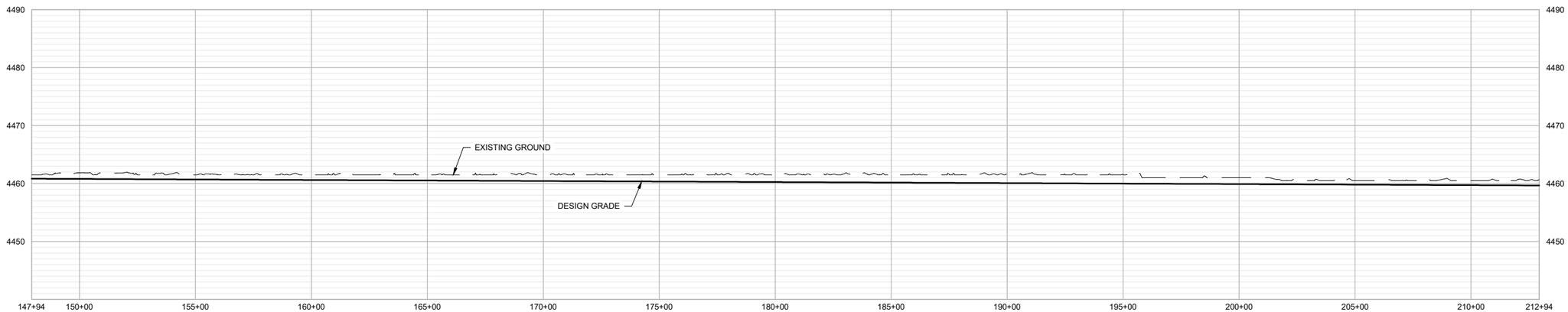
SHEET
03C-004



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
3. ALTERNATIVE 3: NO LINER TO BE INSTALLED



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

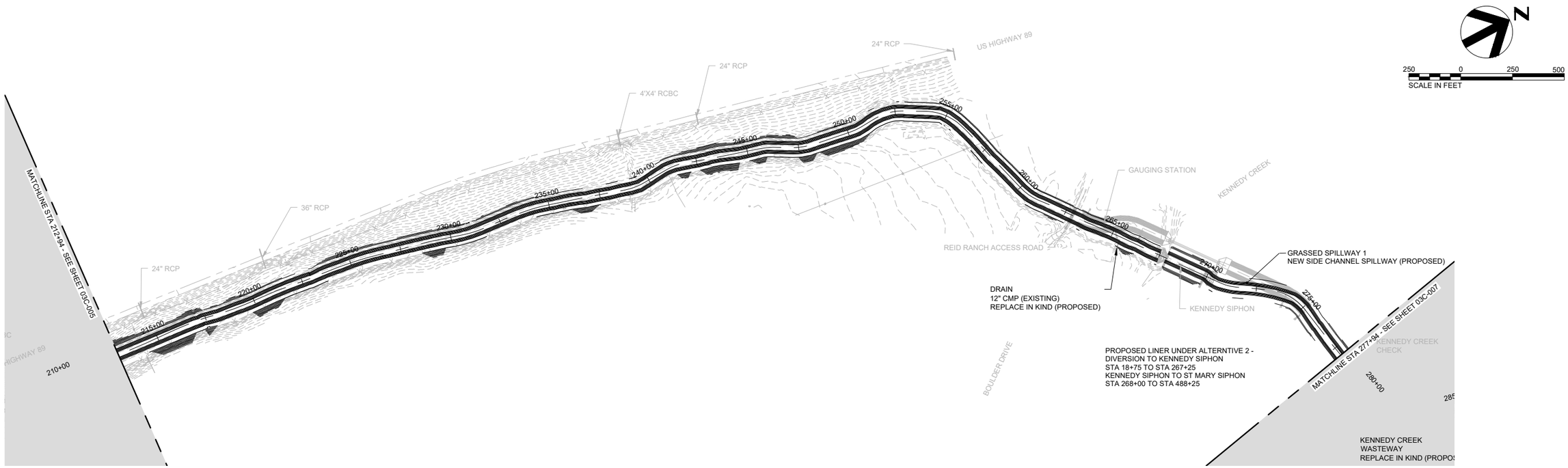
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 147+94 TO 212+94

0 1" 2"

FILENAME	03C-005.DWG
SCALE	AS NOTED

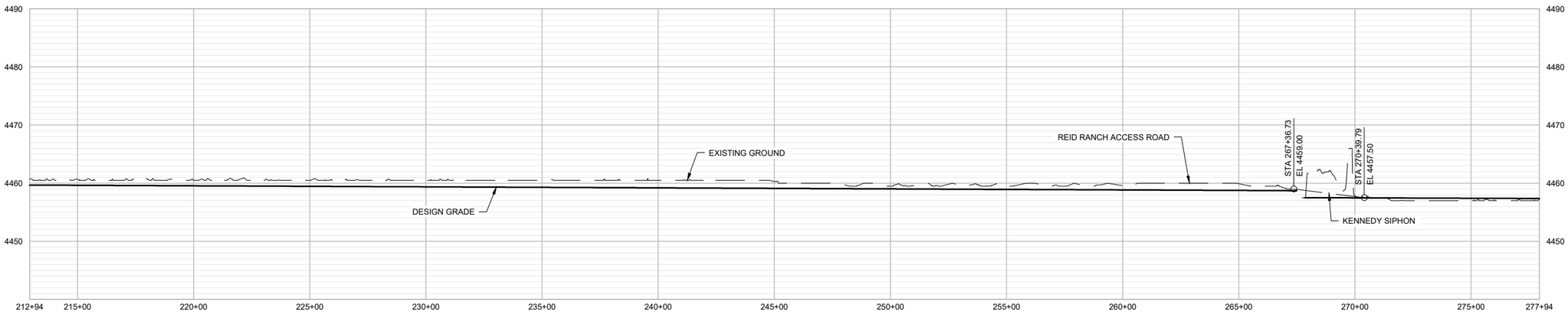
SHEET
03C-005



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
3. ALTERNATIVE 3: NO LINER TO BE INSTALLED



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

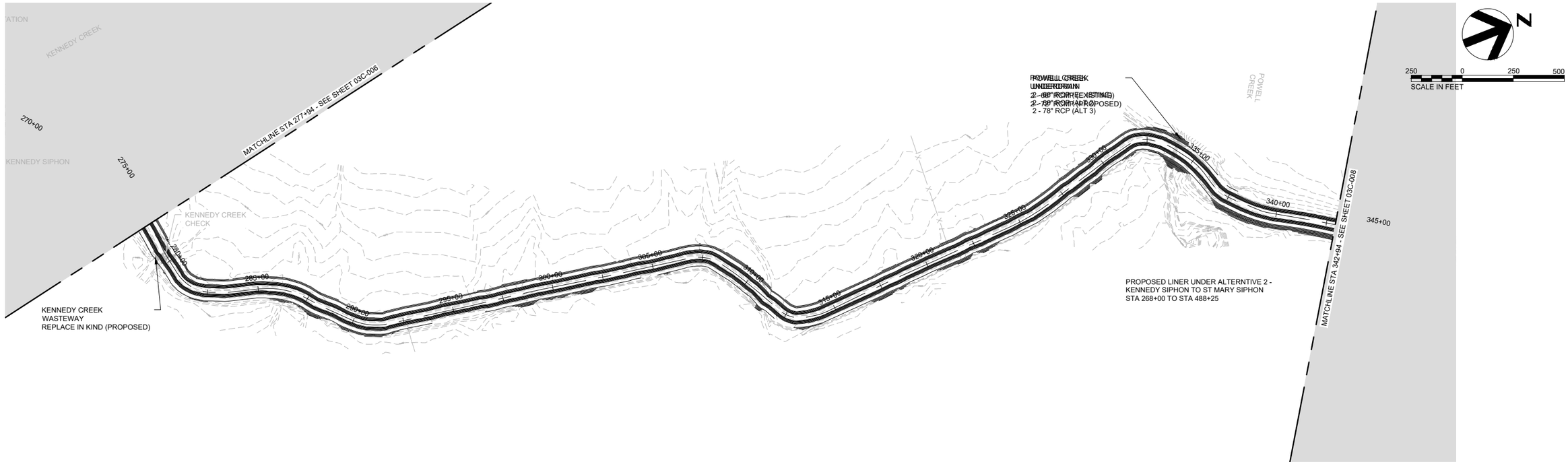
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 212+94 TO 277+94

0 1" 2"

FILENAME	03C-006.DWG
SCALE	AS NOTED

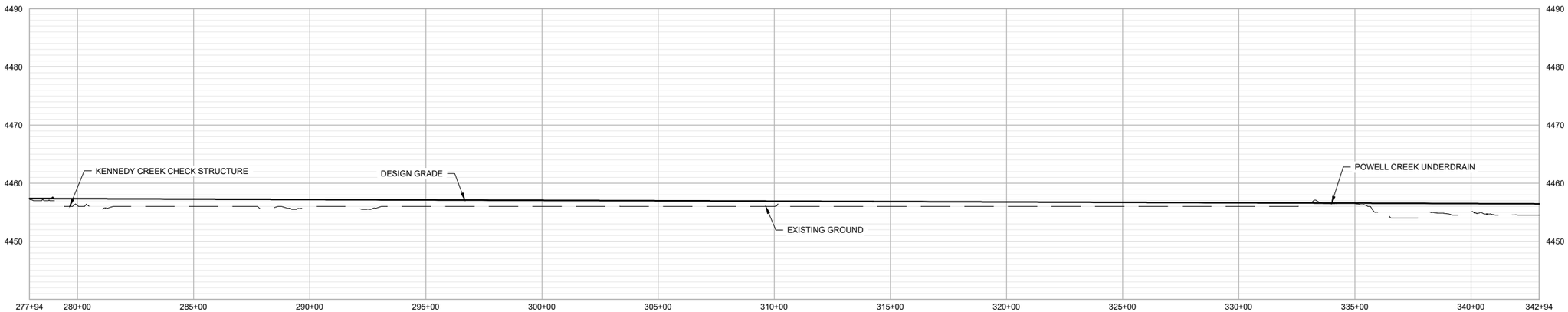
SHEET
03C-006



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
3. ALTERNATIVE 3: NO LINER TO BE INSTALLED



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 277-94 TO STA 342+94

0 1" 2"

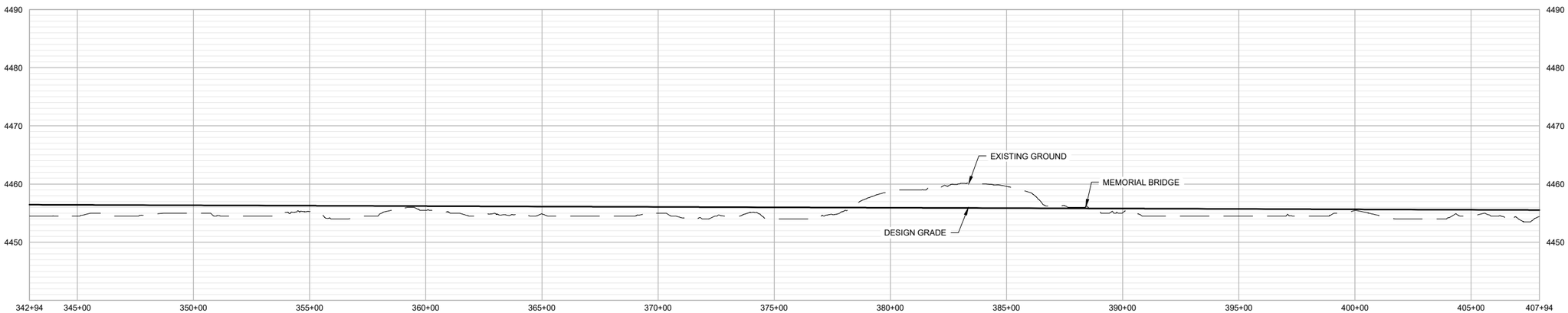
FILENAME	03C-007.DWG
SCALE	AS NOTED

SHEET
03C-007

PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
3. ALTERNATIVE 3: NO LINER TO BE INSTALLED



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 342+94 TO STA 407+94

0 1" 2"

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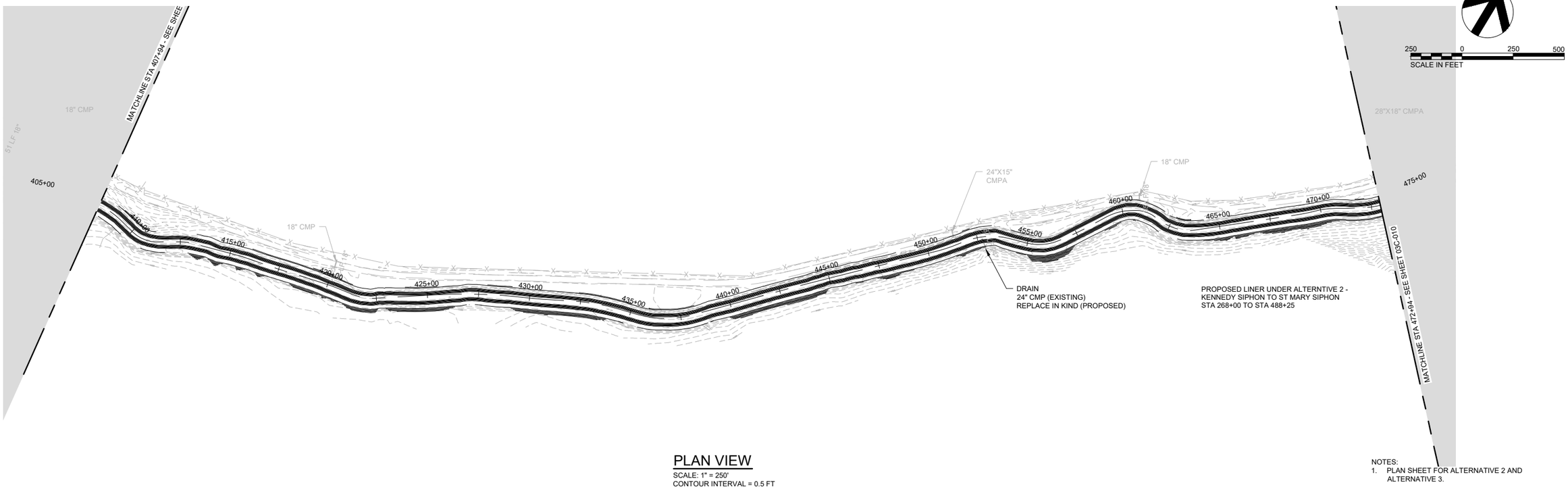
SCALE	AS NOTED

SHEET **03C-008**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.
2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
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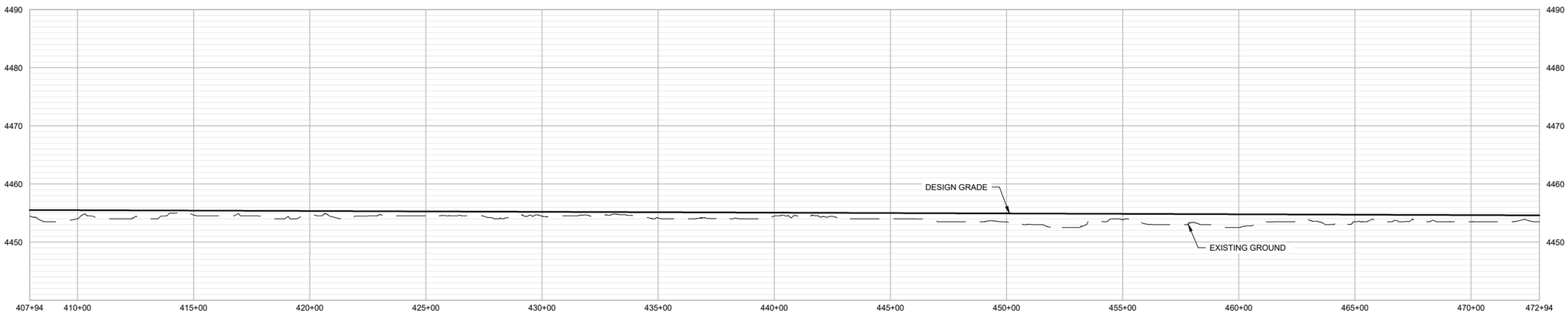


PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

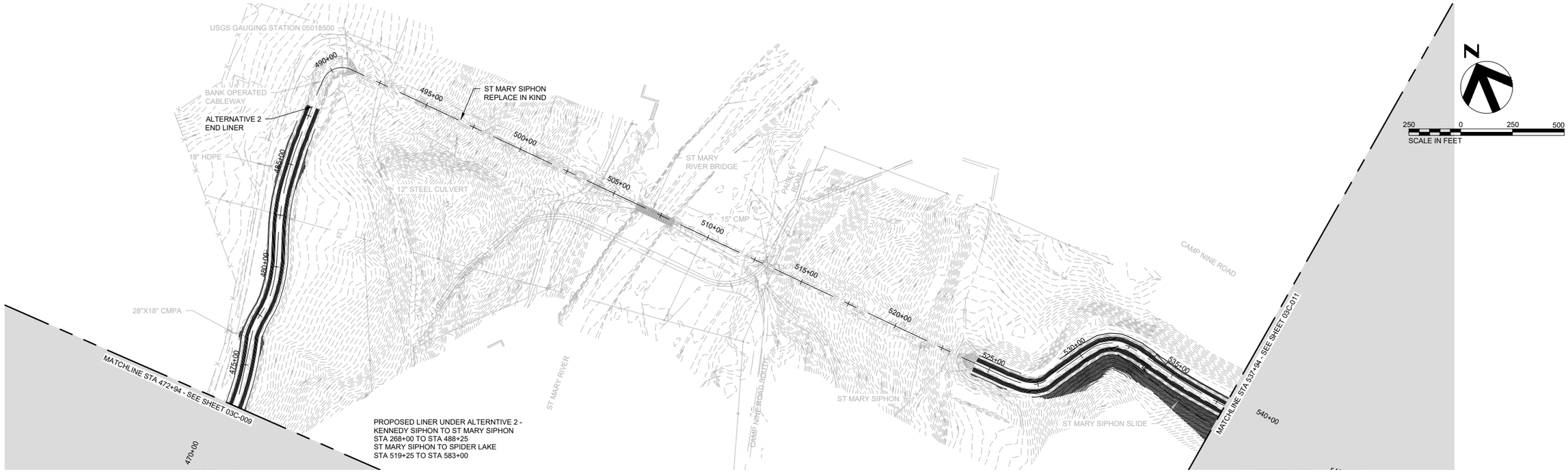
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 407+94 TO STA 472+94

0 1" 2"

FILENAME	03C-009.DWG
SCALE	AS NOTED

SHEET **03C-009**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
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2. ALTERNATIVE 2: LINER TO BE INSTALLED ON THE FIRST 9 MILES OF CANAL.
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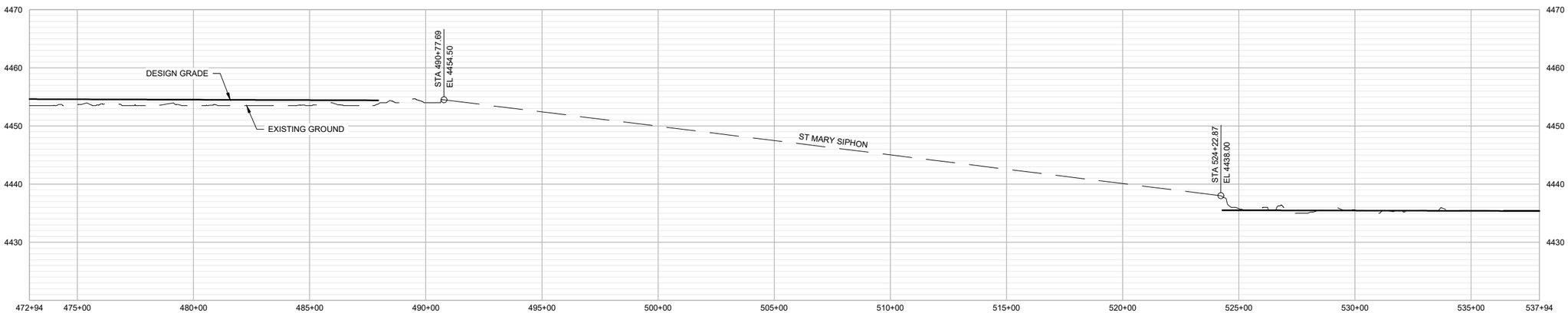


PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

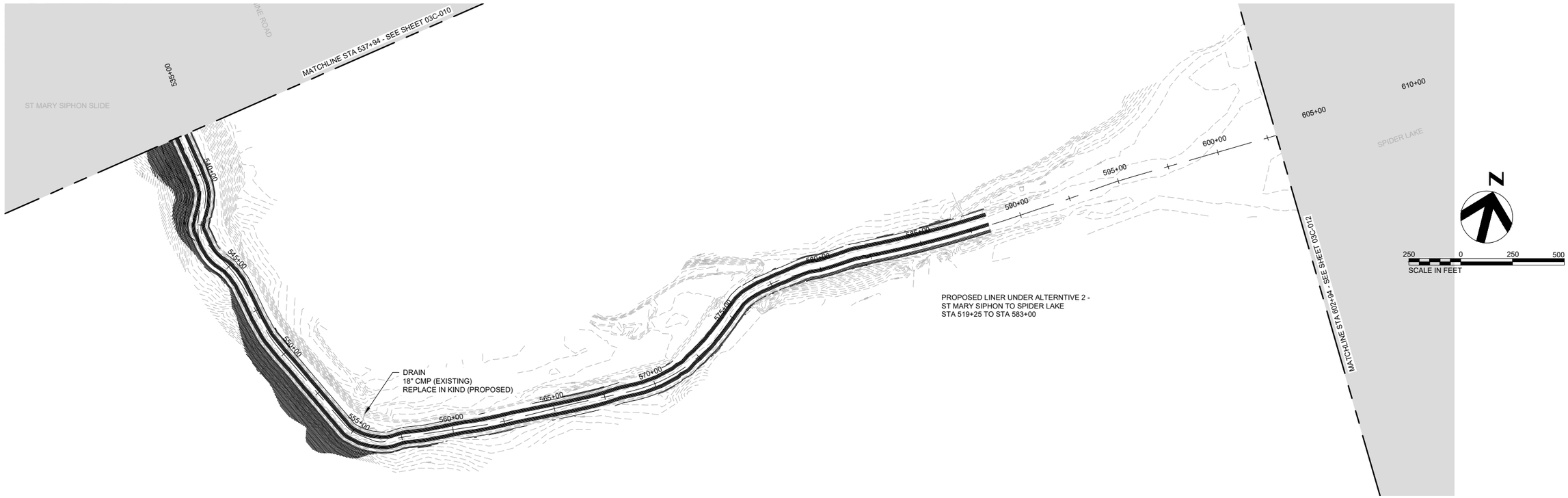
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 472+94 TO 537+94

0 1" 2"

FILENAME	03C-010.DWG
SCALE	AS NOTED

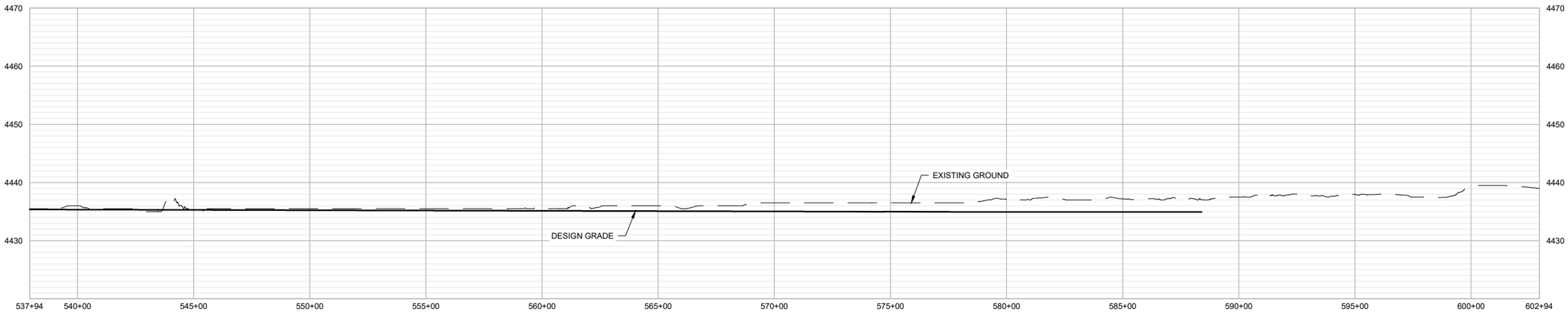
SHEET **03C-010**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

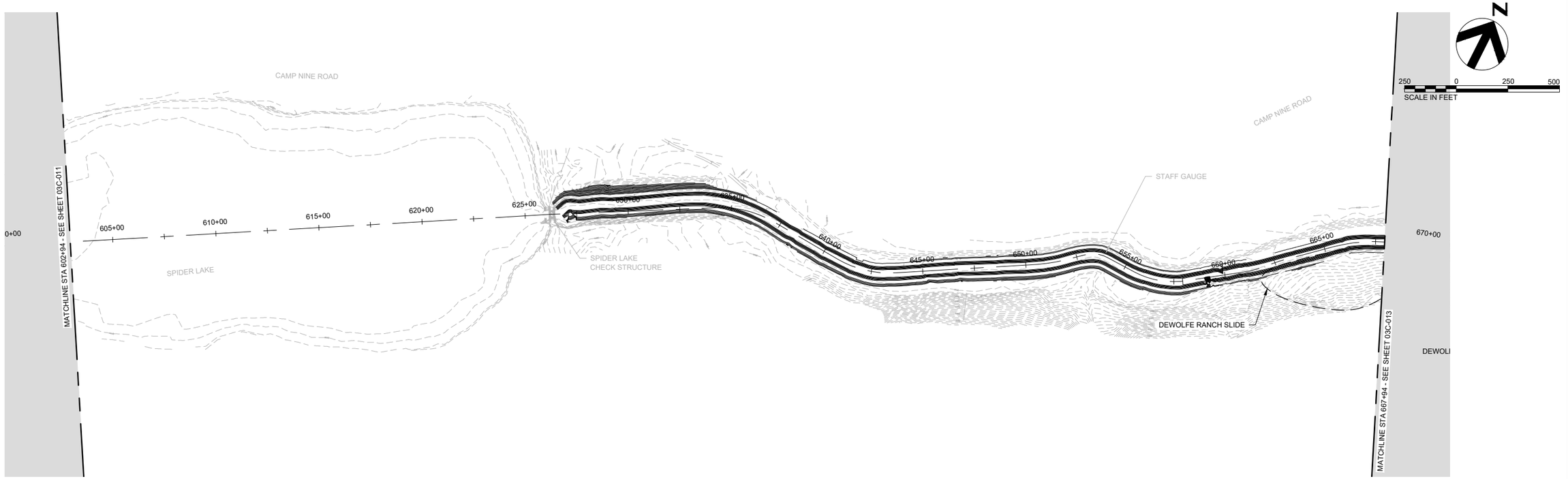
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 537+94 TO 602+94

0 1" 2"

FILENAME 03C-011.DWG
SCALE AS NOTED

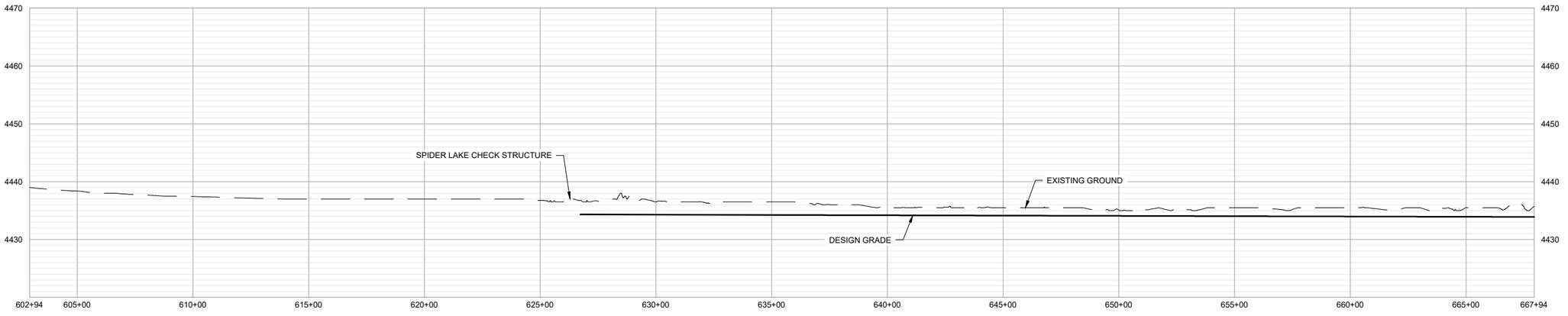
SHEET **03C-011**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

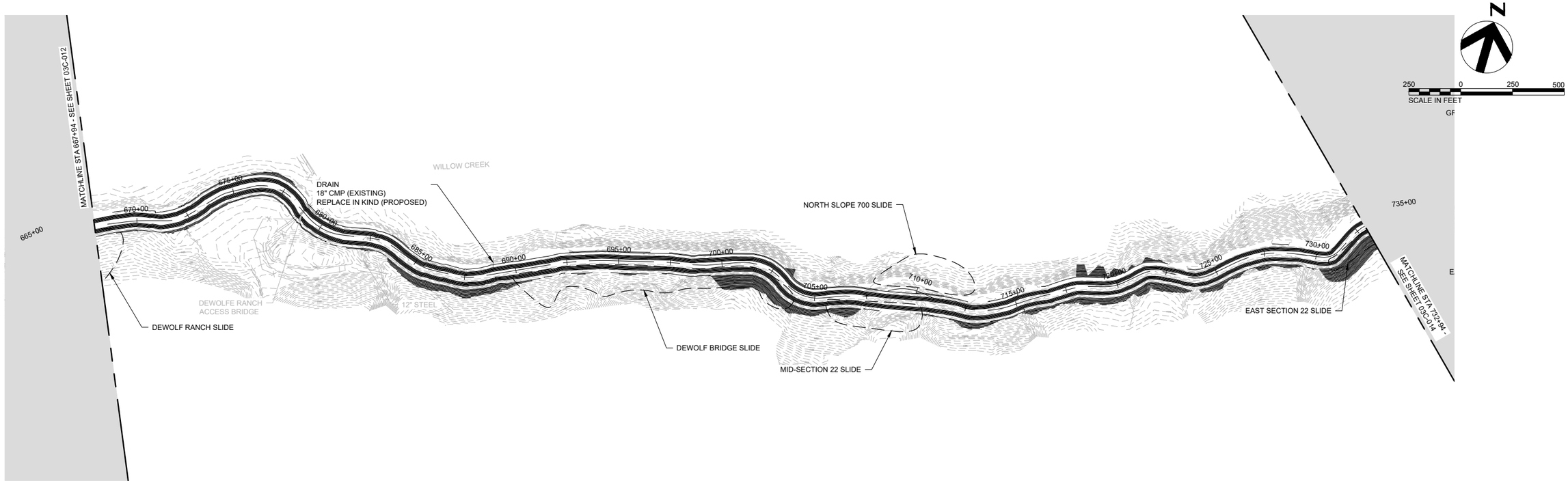
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 602+94 TO 667+94

0 1" 2"

FILENAME 03C-012.DWG
SCALE AS NOTED

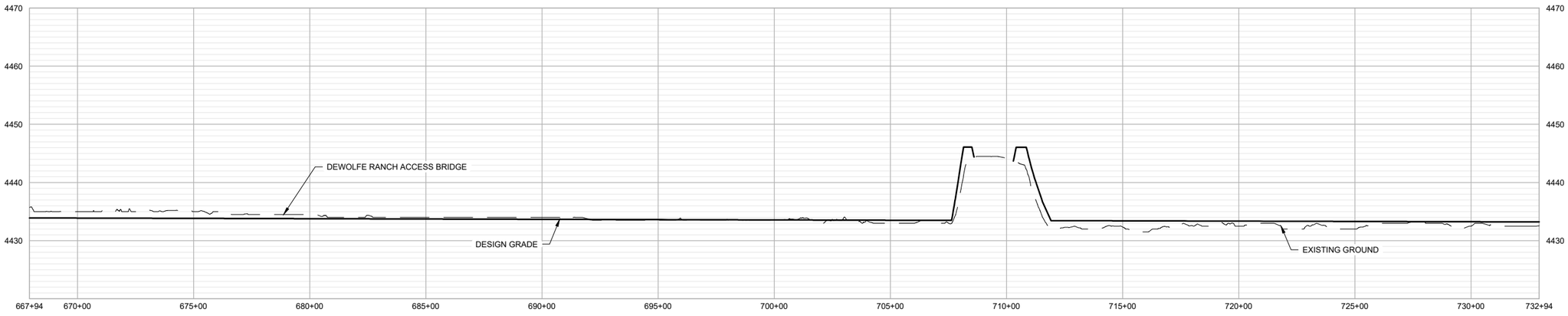
SHEET **03C-012**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 667+94 TO STA 732+94

0 1" 2"

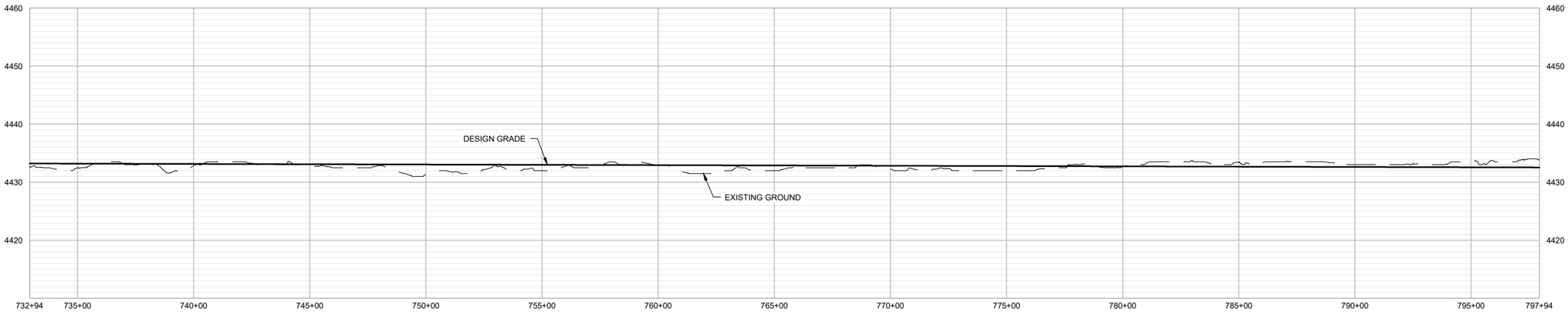
FILENAME	03C-013.DWG
SCALE	AS NOTED

SHEET
03C-013

PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

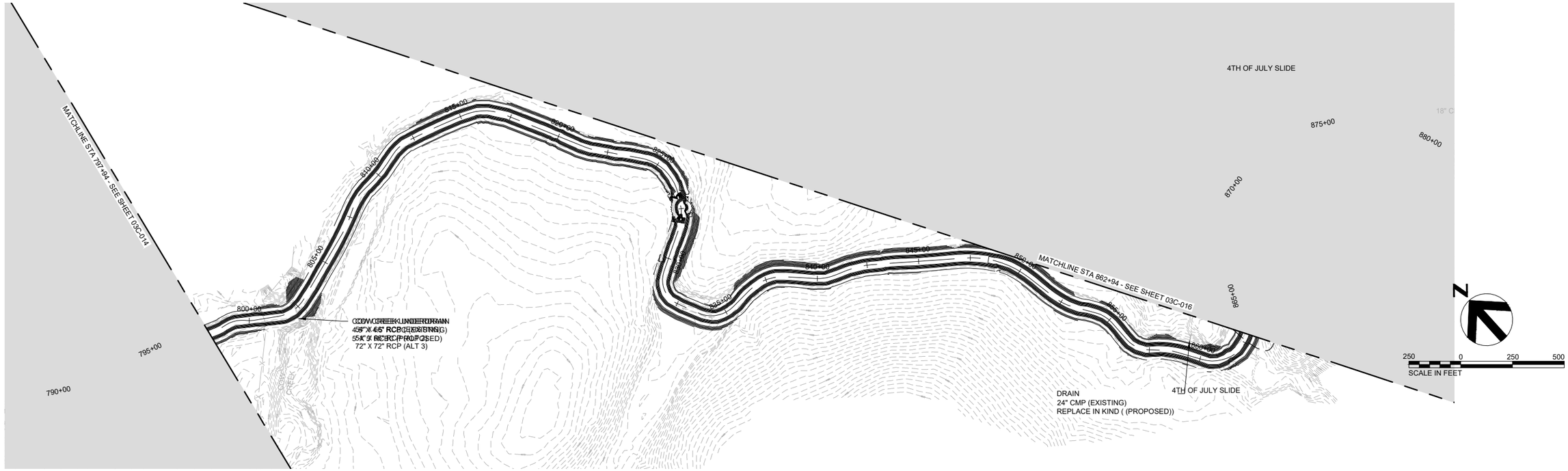
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 732+94 TO STA 797+94

0 1" 2"

FILENAME 03C-014.DWG
SCALE AS NOTED

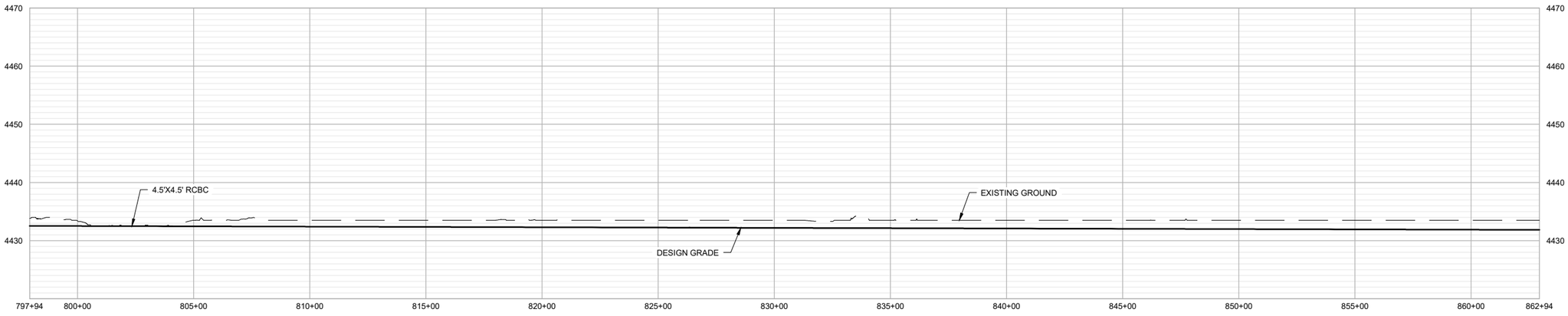
SHEET **03C-014**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

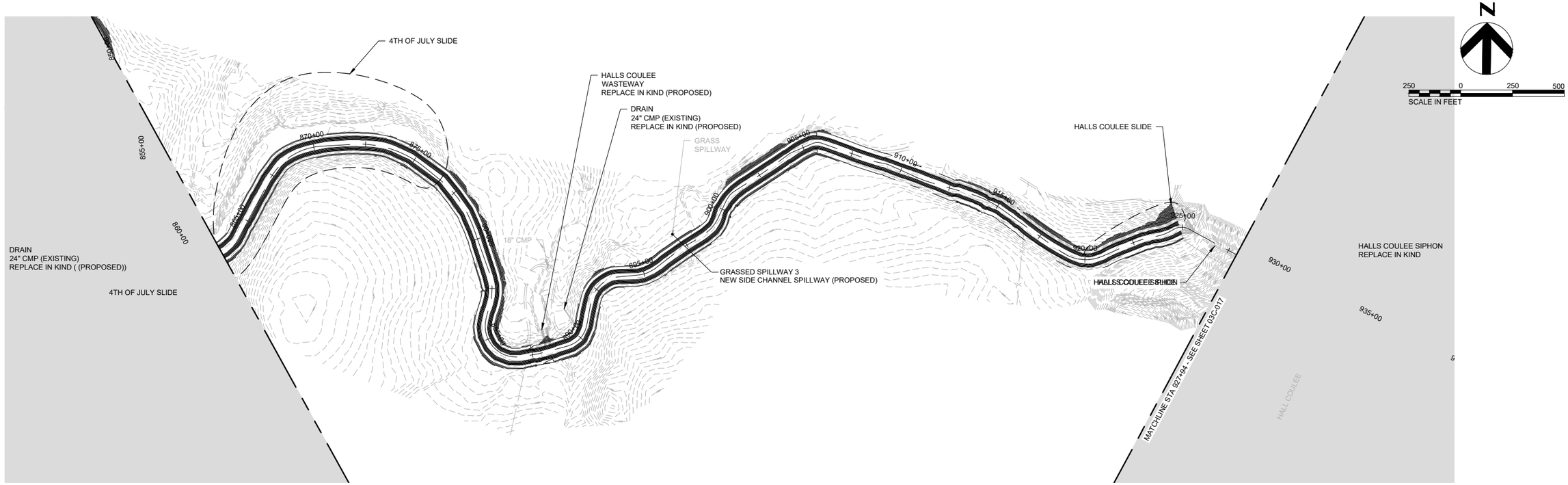
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 797+94 TO STA 862+94

0 1" 2"

FILENAME 03C-015.DWG
SCALE AS NOTED

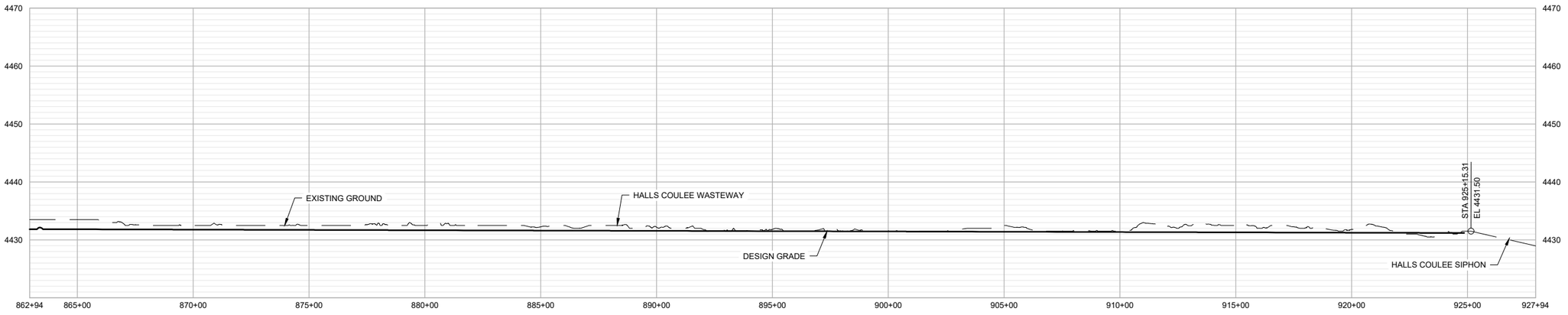
SHEET **03C-015**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
1	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

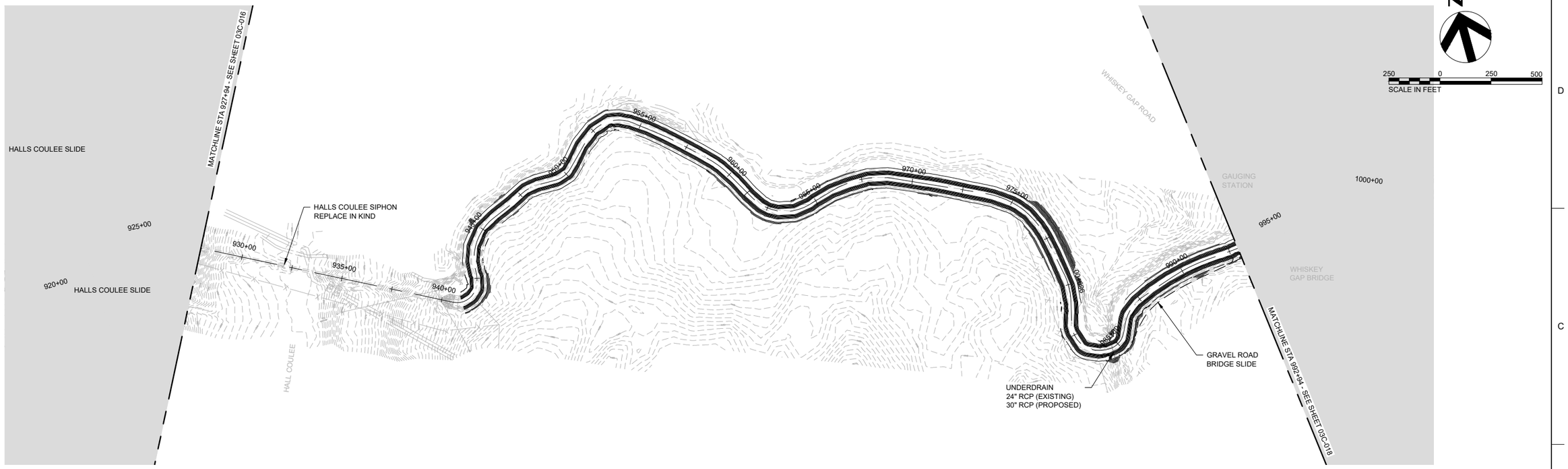
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 862+94 TO STA 927+94

0 1" 2"

FILENAME	03C-016.DWG
SCALE	AS NOTED

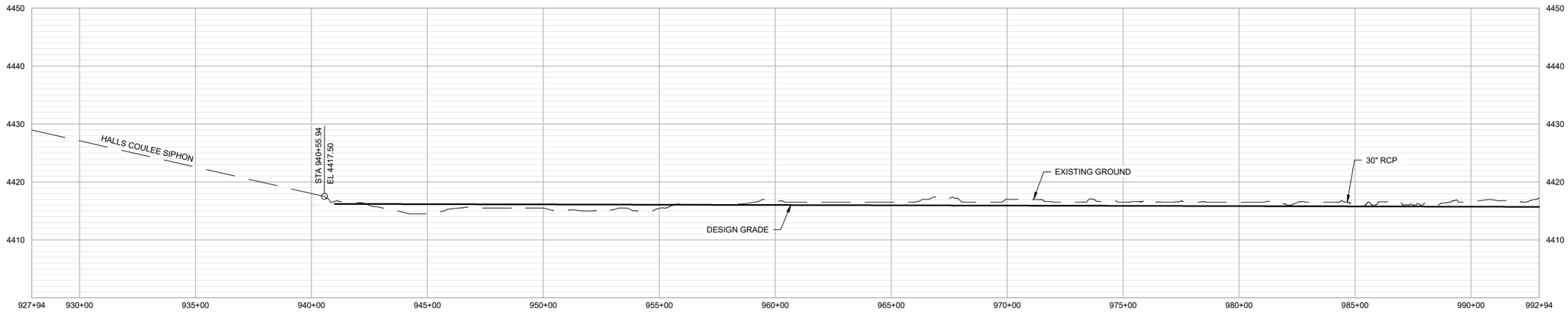
SHEET
03C-016



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

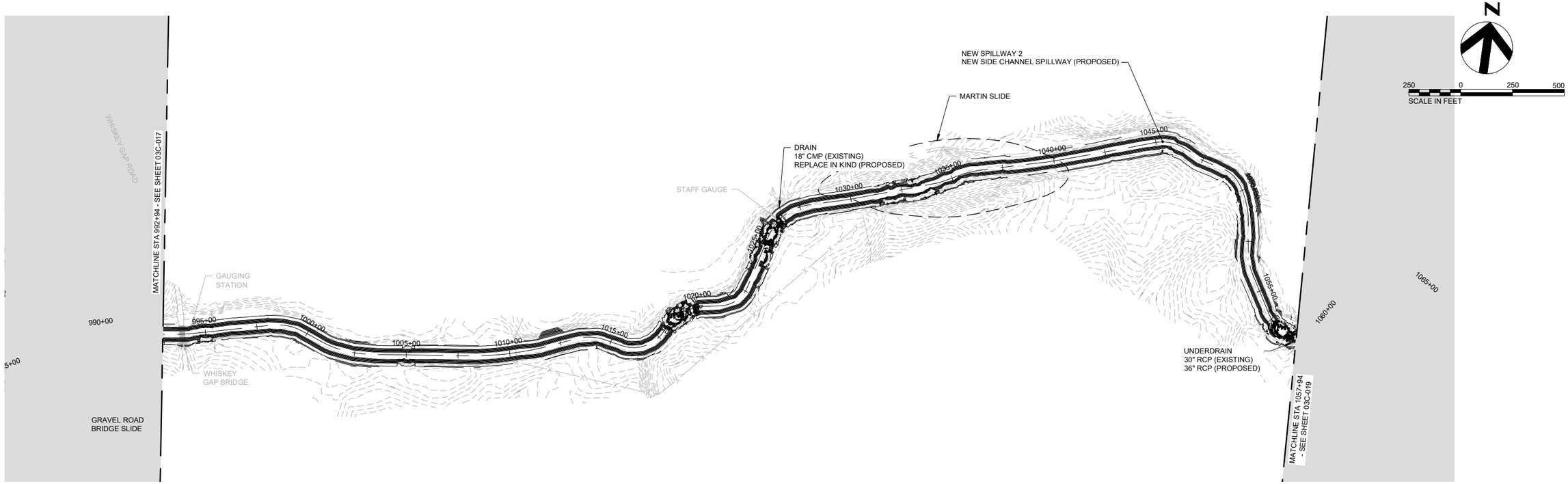
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 927+94 TO STA 992+94

0 1" 2"

FILENAME 03C-017.DWG
SCALE AS NOTED

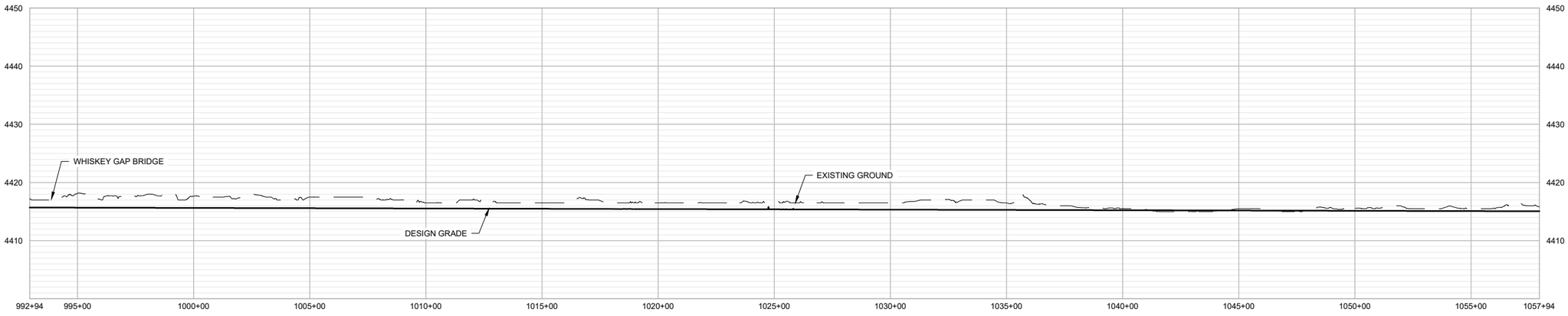
SHEET **03C-017**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

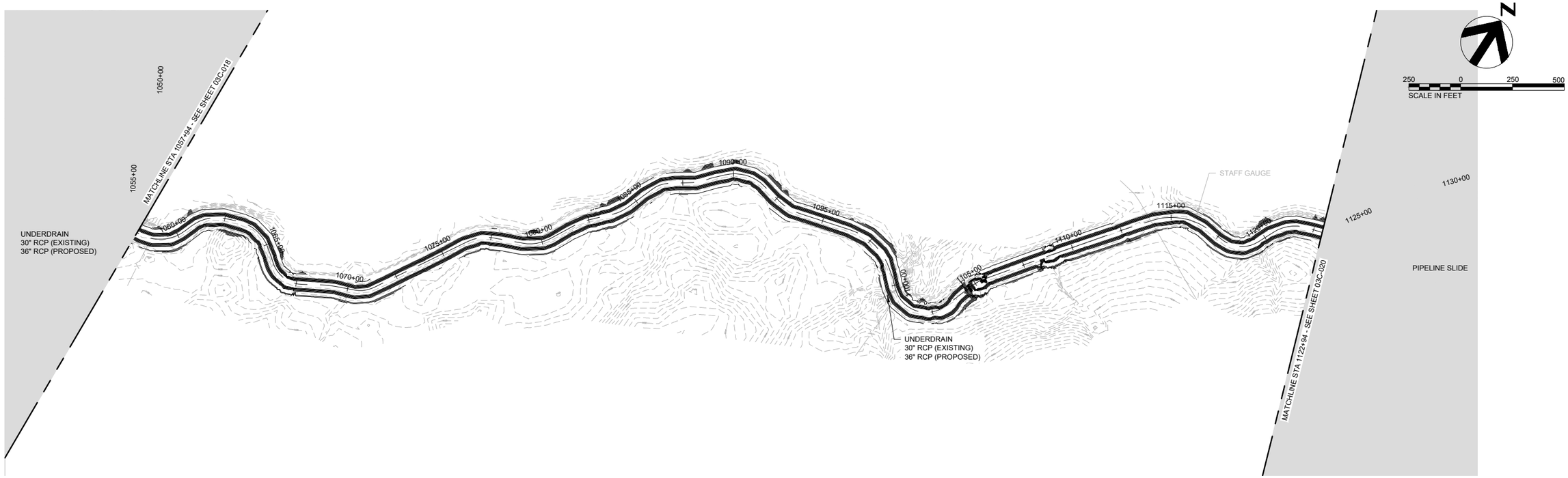
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 992+94 TO STA 1057+94

0 1" 2"

FILENAME 03C-018.DWG
SCALE AS NOTED

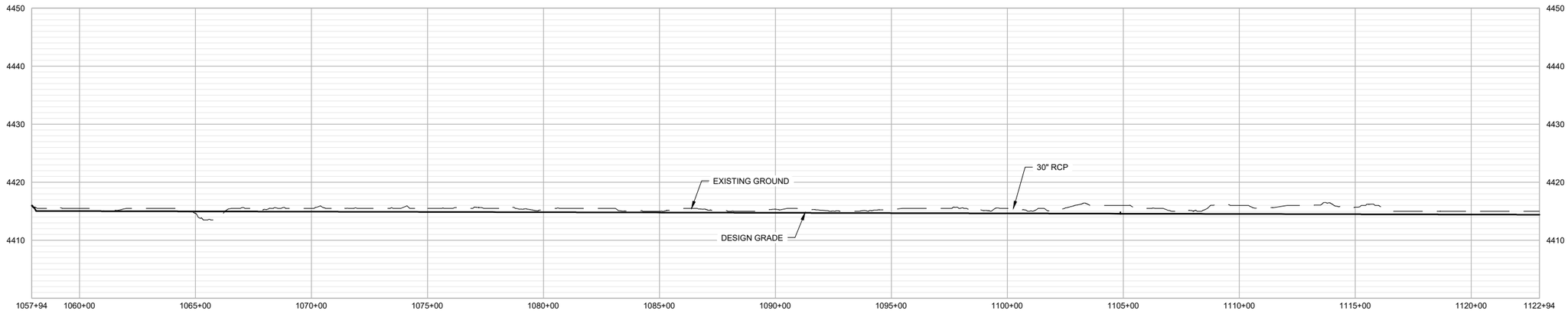
SHEET **03C-018**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

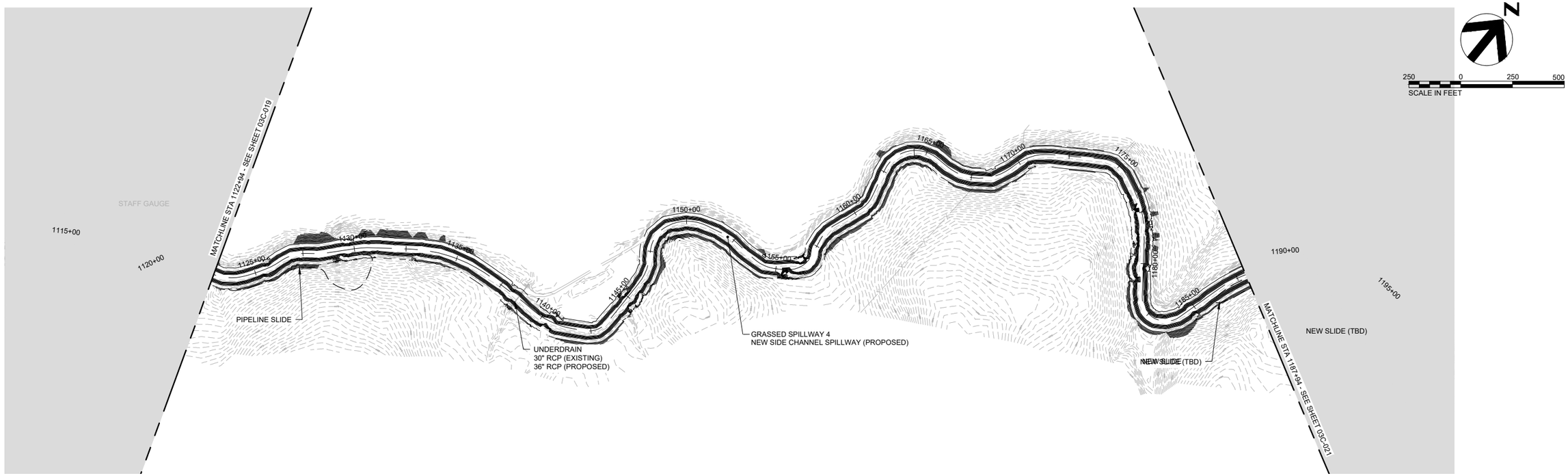
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 1057+94 TO STA 1122+94

0 1" 2"

FILENAME 03C-019.DWG
SCALE AS NOTED

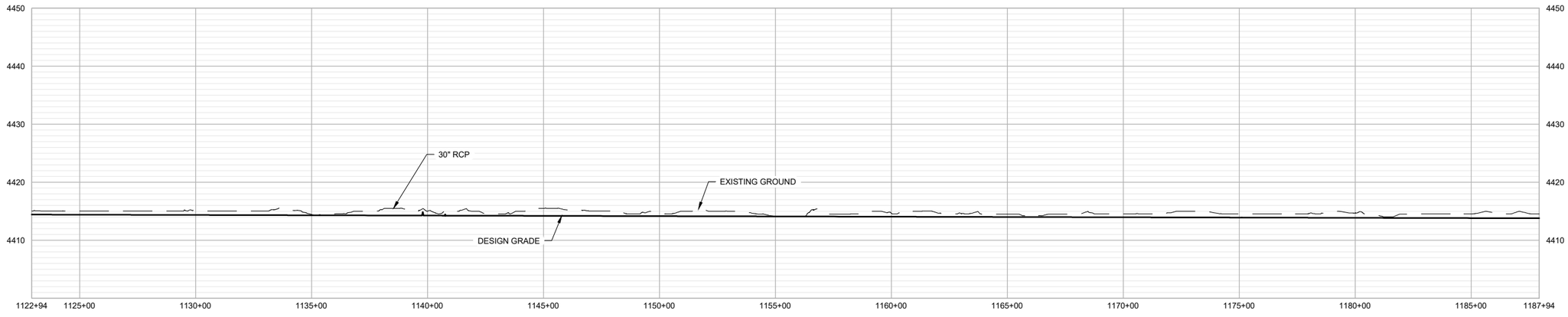
SHEET **03C-019**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

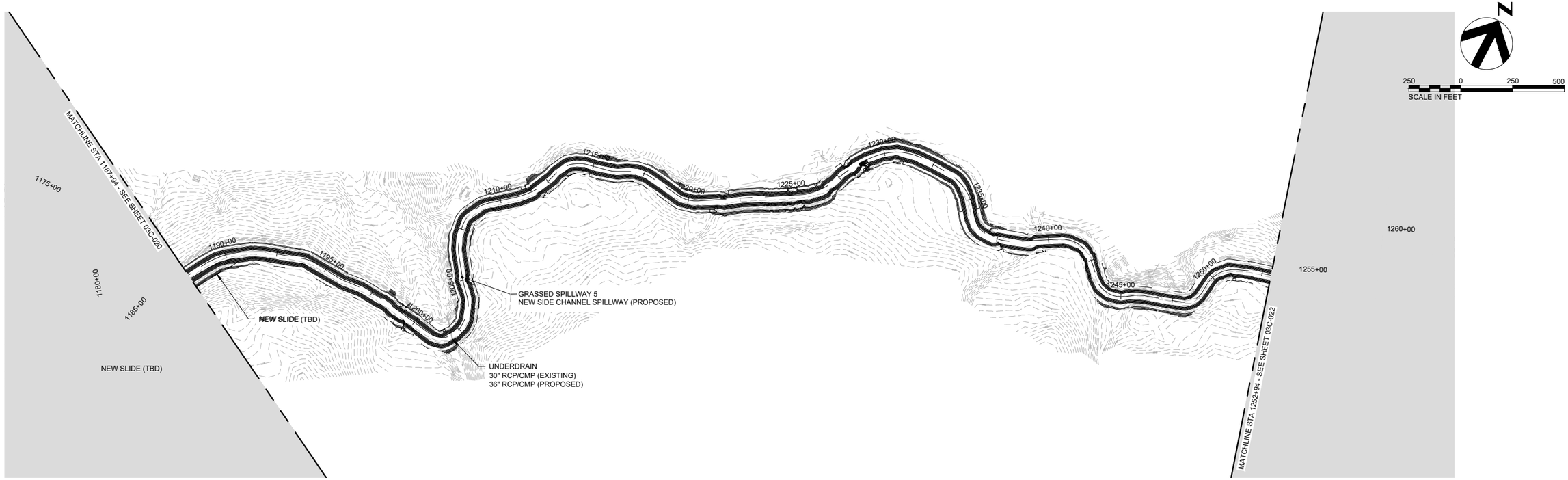
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 1122+94 TO STA 1187+94

0 1" 2"

FILENAME 03C-020.DWG
SCALE AS NOTED

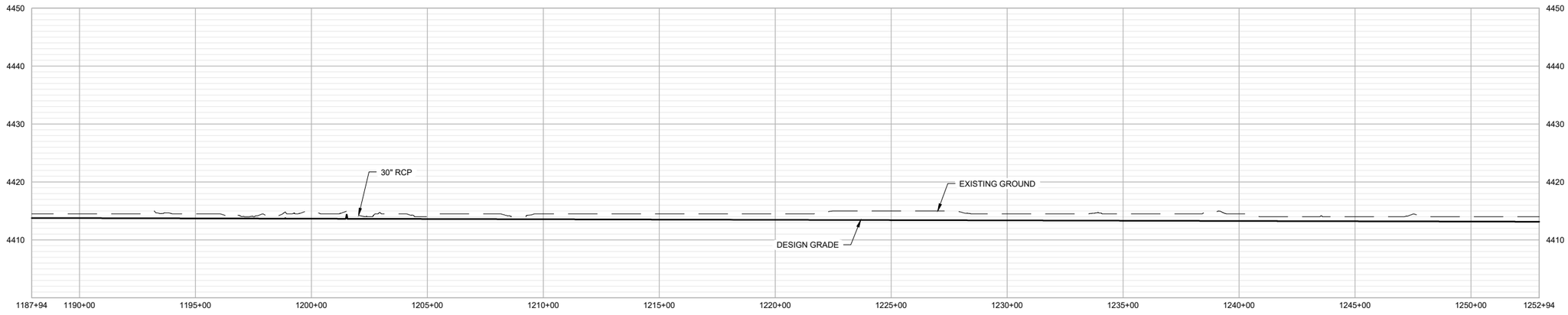
SHEET **03C-020**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

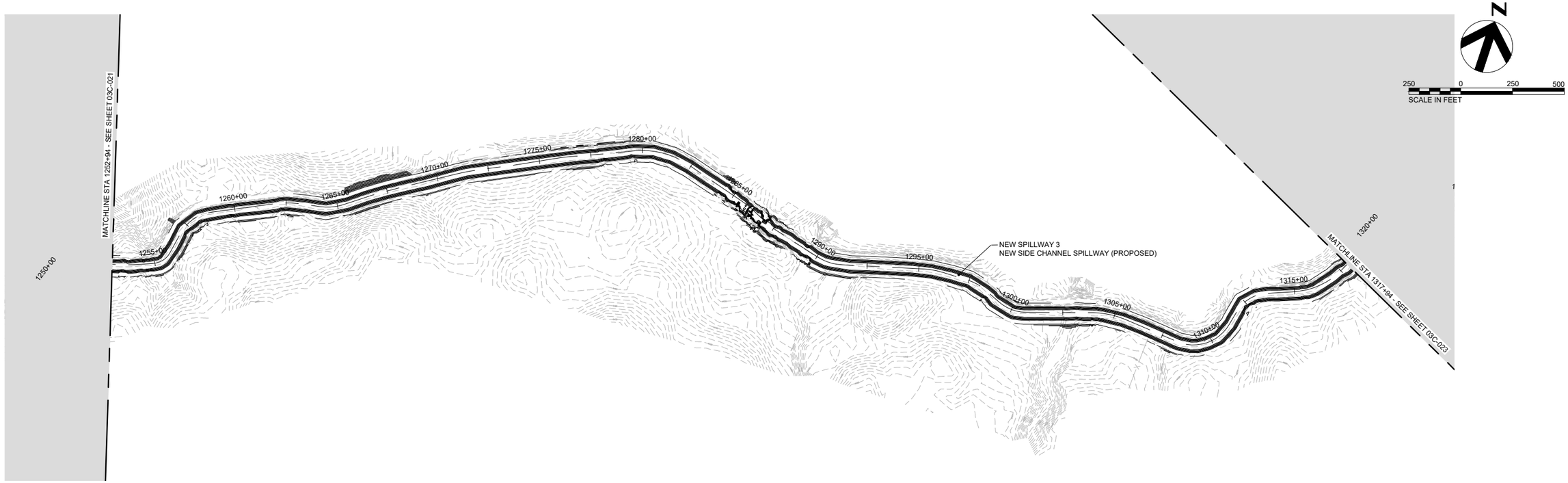
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 1187+94 TO STA 1252+94

0 1" 2"

FILENAME 03C-021.DWG
SCALE AS NOTED

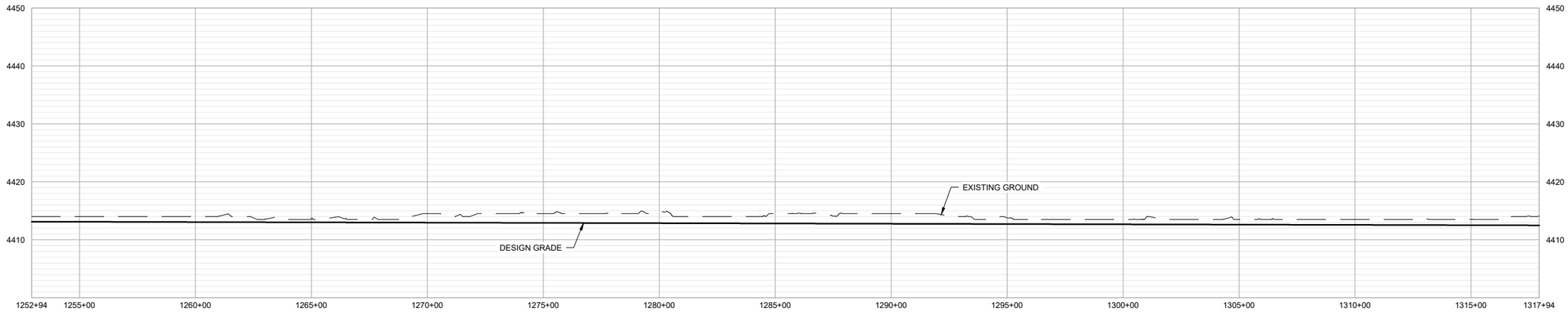
SHEET **03C-021**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

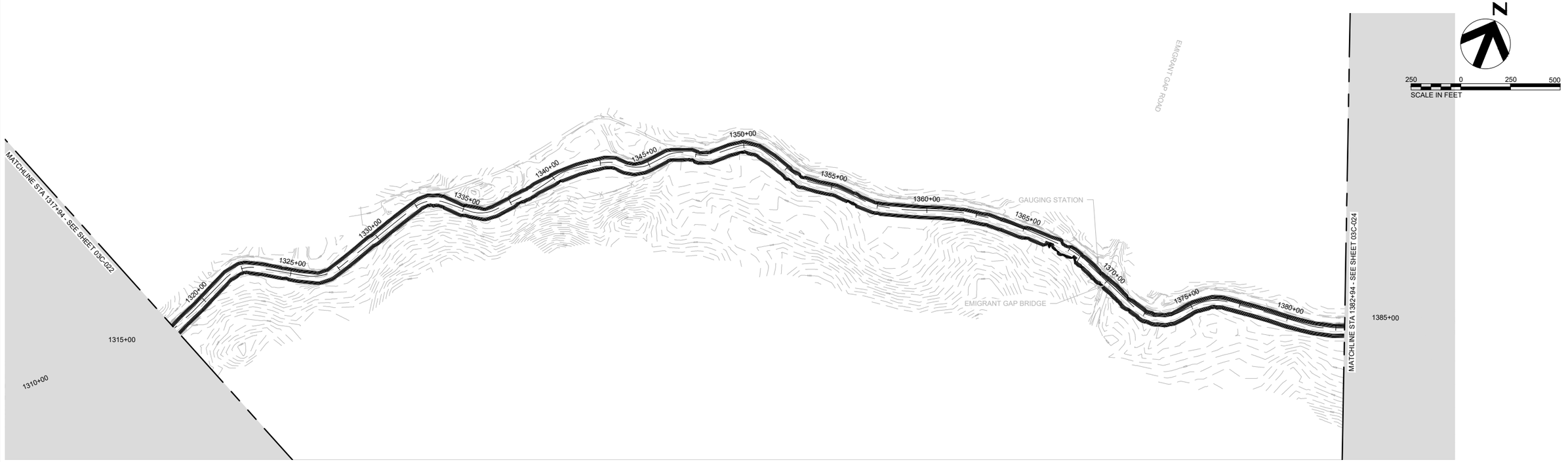
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 1252+94 TO STA 1317+94

0 1" 2"

FILENAME 03C-022.DWG
SCALE AS NOTED

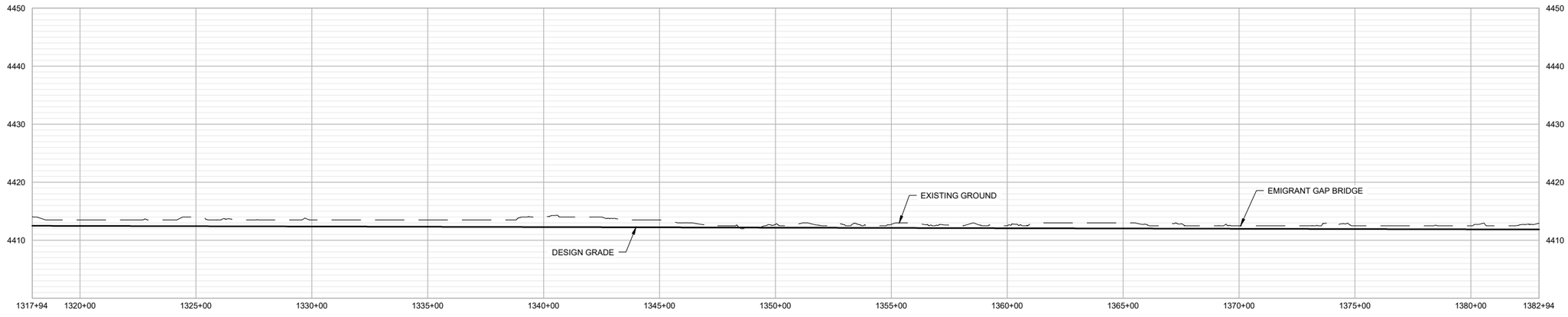
SHEET **03C-022**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

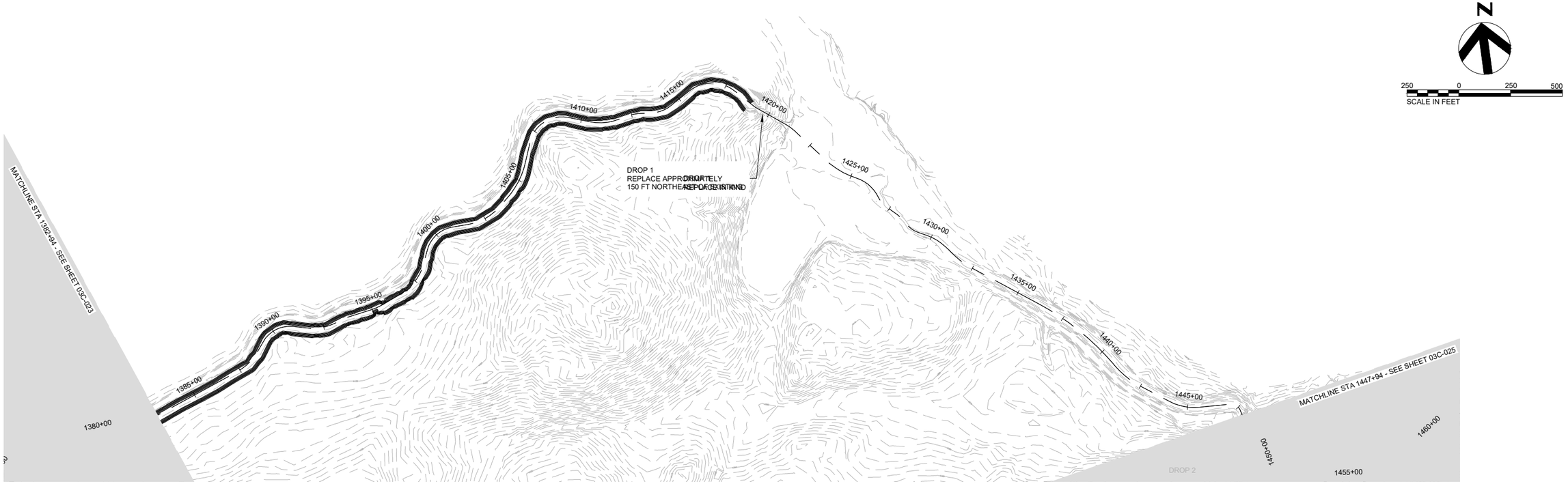
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
PLAN AND PROFILE
STA 1317+94 TO 1382+94

0 1" 2"

FILENAME 03C-023.DWG
SCALE AS NOTED

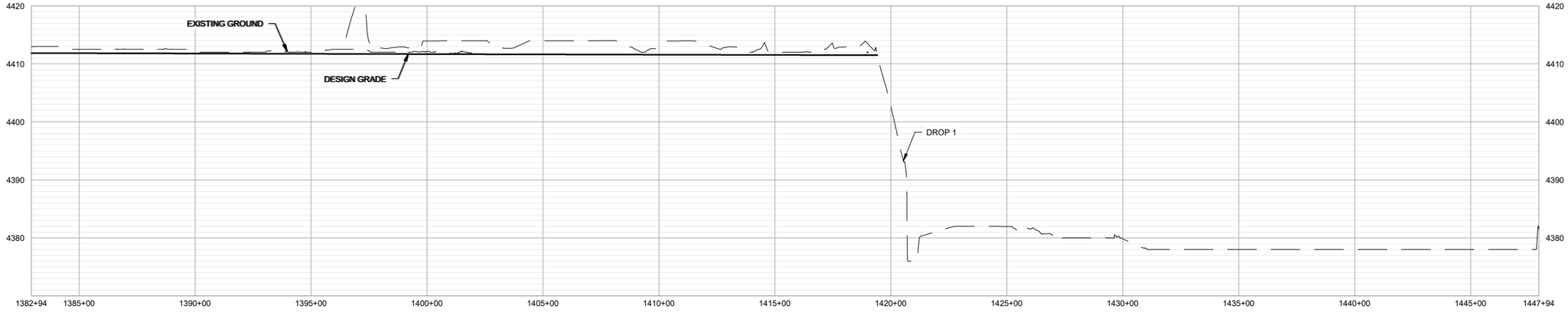
SHEET **03C-023**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

ISSUE	DATE	DESCRIPTION
1	09/30/2022	60% DESIGN

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10337597

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

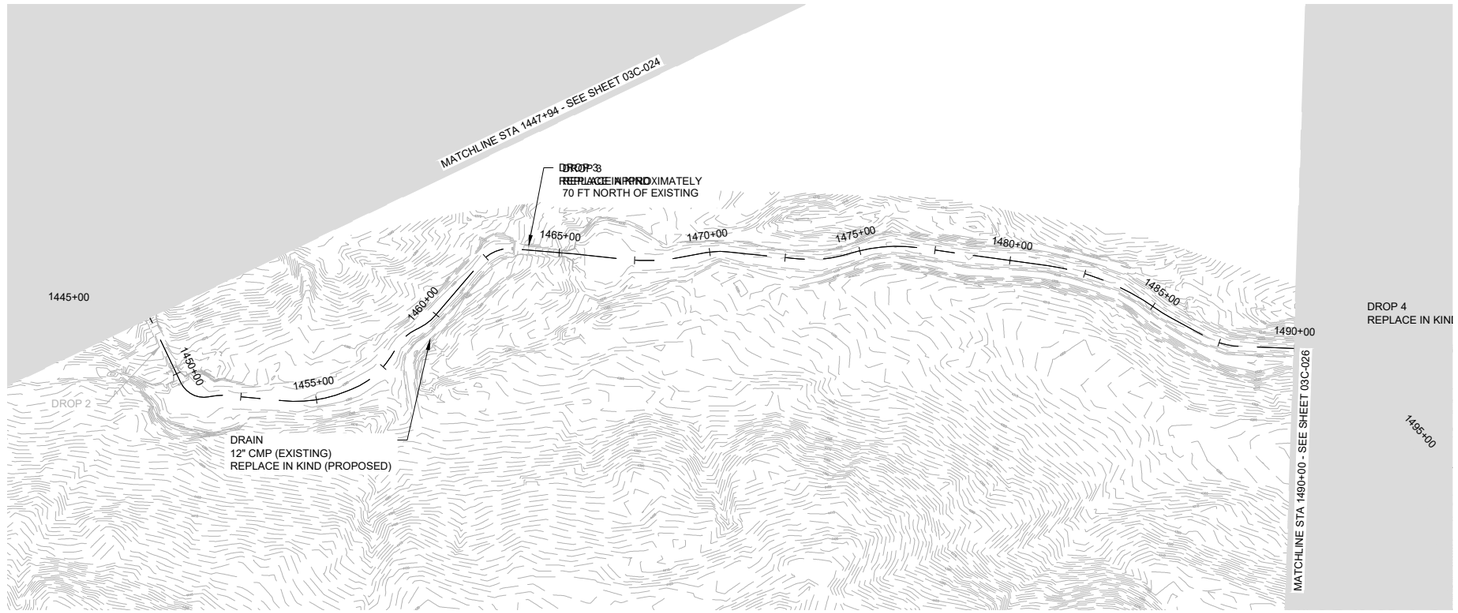
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL SIP

CIVIL
PLAN AND PROFILE
STA 1382+94 TO STA 1447+94

0 1" 2"

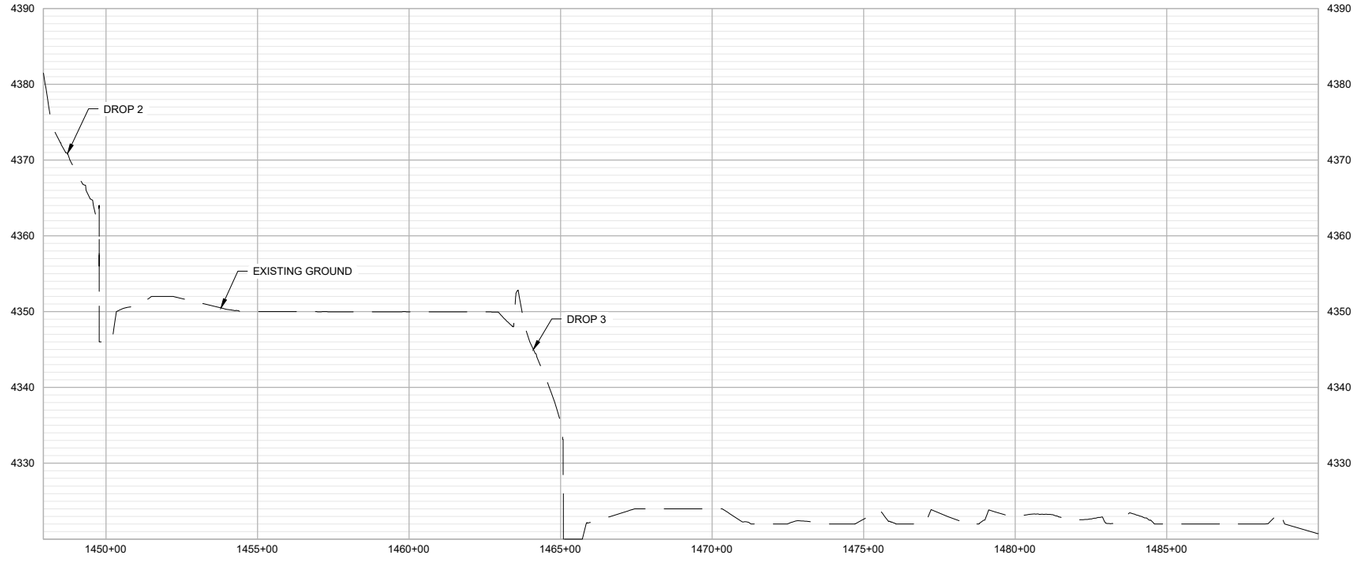
FILENAME	03C-024.DWG
SCALE	AS NOTED

SHEET 03C-024



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT



PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.

ISSUE	DATE	DESCRIPTION
1	DEC 2022	60% DESIGN

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10337597

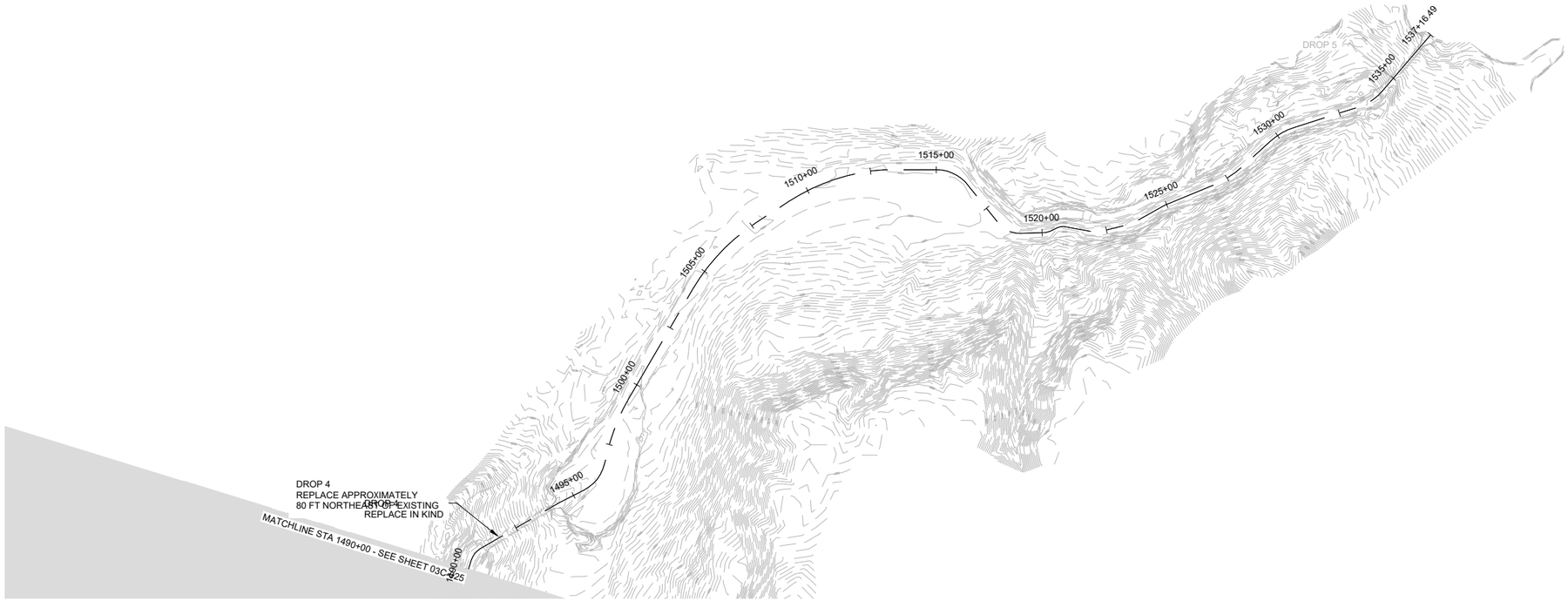
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

FARMERS CONSERVATION ALLIANCE
ST MARY CANAL SIP

CIVIL
PLAN AND PROFILE
STA 1447+94 TO 1490+00

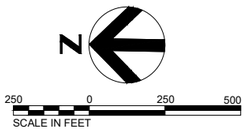
FILENAME 03C-025.DWG
SCALE AS NOTED

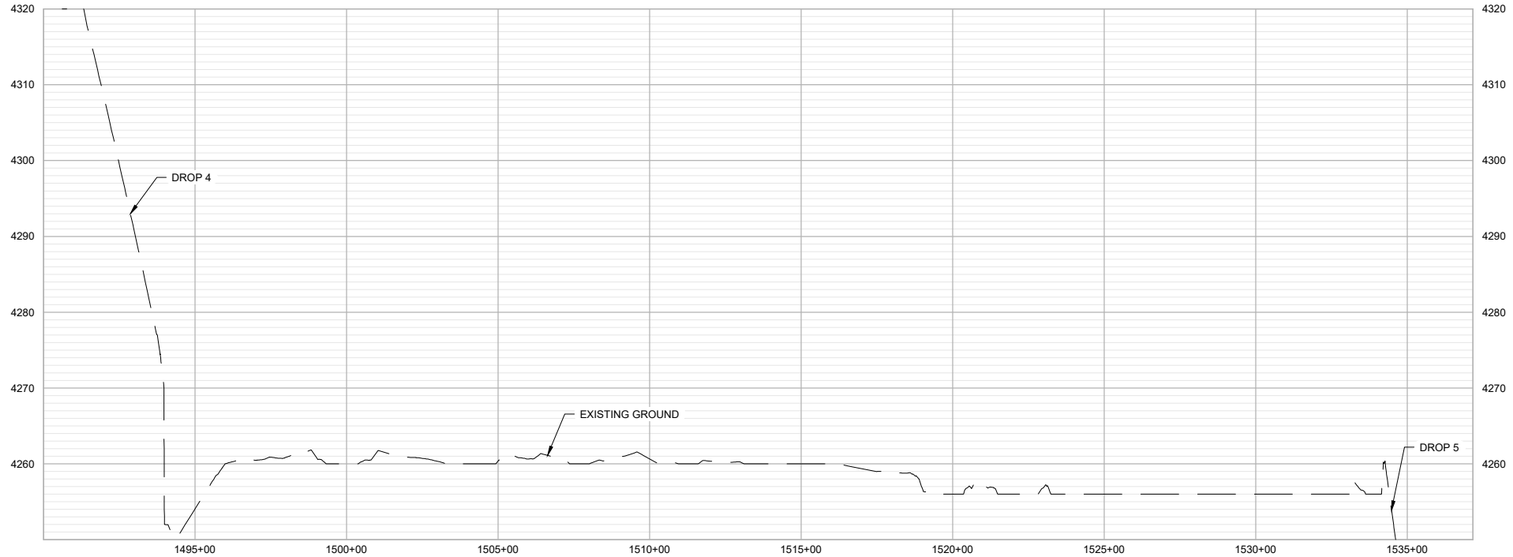
SHEET **03C-025**



PLAN VIEW

SCALE: 1" = 250'
CONTOUR INTERVAL = 0.5 FT





PROFILE VIEW

HORIZ SCALE: 1" = 250'
VERT SCALE: 1" = 20'

NOTES:
1. PLAN SHEET FOR ALTERNATIVE 2 AND ALTERNATIVE 3.

ISSUE	DATE	DESCRIPTION
1	DEC 2021	60% DESIGN

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10337597

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

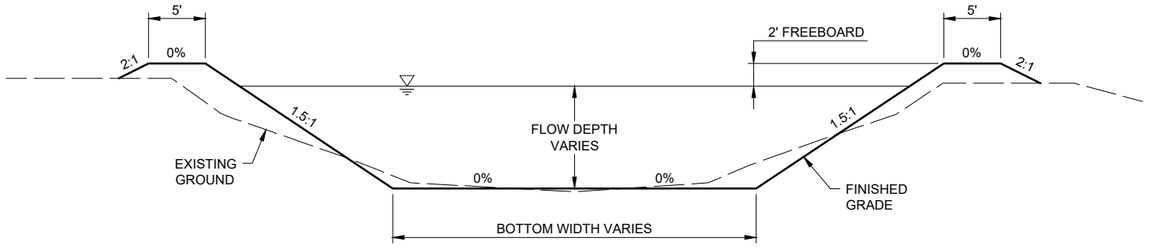
FARMERS CONSERVATION ALLIANCE
ST MARY CANAL SIP

CIVIL
PLAN AND PROFILE
STA 1490+00 TO 1537+16.49

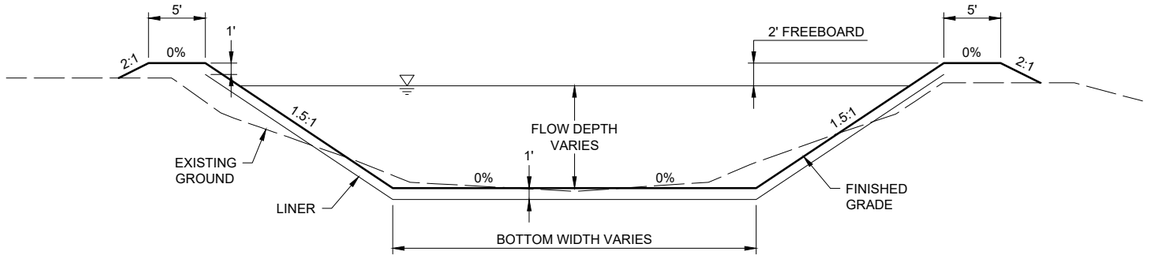
0 1" 2"

FILENAME	03C-026.DWG
SCALE	AS NOTED

SHEET
03C-026



A — TYPICAL SECTION FOR ST MARY CANAL - ALTERNATIVE 2 (RESHAPED/UNLINED)
SCALE: NTS



B — TYPICAL SECTION FOR ST MARY CANAL - ALTERNATIVE 2 (RESHAPED/LINED)
SCALE: NTS

ISSUE	DATE	DESCRIPTION
-	DEC 2024	EIS

PROJECT MANAGER	S. SCHWEISSING
DESIGNER 1	
DRAWN BY	
CHECKED BY	
PROJECT NUMBER	10365494

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

FARMERS CONSERVATION ALLIANCE
ST MARY CANAL EIS

CIVIL
CANAL LINER AREAS
TYPICAL SECTION VIEWS

0 1" 2"

FILENAME 03C-027.DWG
SCALE AS SHOWN

SHEET
03C-027