

SCALE: 1" = 420'
SUWAN PEAK PARKWAY

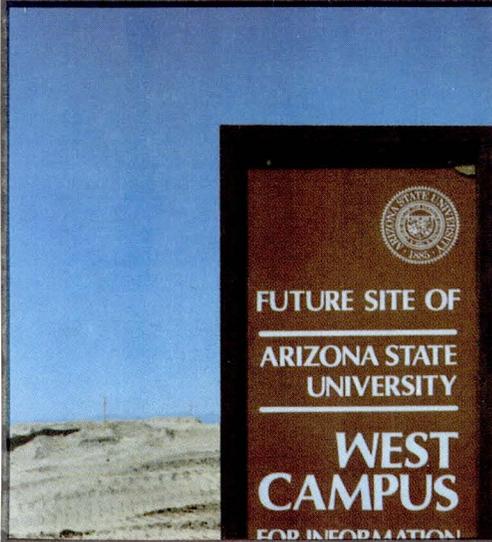
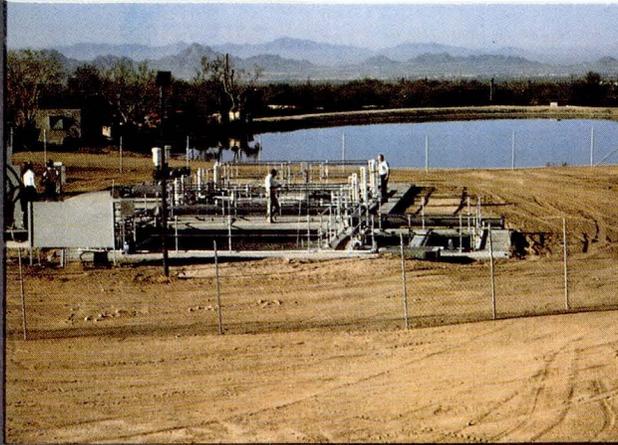


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DESIGN REPORT
SKUNK CREEK
CHANNEL IMPROVEMENTS
(Arizona Canal Diversion
Channel to New River Confluence)

for the
FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY



ellis-murphy inc.
consulting engineers / land surveyors

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DESIGN REPORT
SKUNK CREEK
CHANNEL IMPROVEMENTS
(Arizona Canal Diversion
Channel to New River Confluence)

for the
FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY

Prepared by

John A. Lewis, P.E.
ELLIS-MURPHY, INC.
7975 N. Hayden Road, Suite A-105
Scottsdale, AZ 85258

May 4, 1987

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Appendix (Separate Volume)

Report - Geotechnical and Hydrological Analyses Skunk Creek Channelization for Ellis-Murphy, Inc. by Dames and Moore, April, 1987.

List of Exhibits
(Exhibits follow Section 4)

<u>Exhibit No.</u>	<u>Title</u>
1	Drawing Set Cover Sheet
2	Horizontal and Vertical Control
3	Excavation Plan
4	Excavation Plan
5	Cross Sections
6	Cross Sections
7	Cross Sections
8	83rd Avenue Bridge and Drop Structures
9	Construction Quantity Estimate
10	Preliminary Cost Estimate

1.0 INTRODUCTION

This report presents the results of Ellis-Murphy, Inc. contract to provide hydraulic analysis and channel improvements design along a two-mile reach of Skunk Creek. The work was done under a contract with the City of Peoria and approved on November 26, 1986. Although not specifically incorporated into this contract at the time of approval, reference is also made to Intergovernmental Agreement Skunk Creek and filed with Secretary of State on December 11, 1986.

In addition to the City of Peoria as the contracting agency, the scope of work and the IGA required project coordination with the following: Maricopa County Flood Control District for overall technical direction and the 83rd Ave. bridge analysis; the Corp of Engineers for their Arizona Canal Diversion Channel Project; ADOT, their project manager and consultant for the proposed Outer Loop Bridge and channel excavation plans; City of Peoria for their sports complex and new waterline across the channel; and finally the developer of Desert Harbor subdivision for their drop structure design at the confluence of Skunk Creek and New River.

Dames and Moore served as a subconsultant to Ellis-Murphy providing geotechnical analysis, HEC-II hydraulic analysis and various recommendations. The results of their work are presented in its entirety as Appendix to this report and will be referenced where required. Appreciation is extended to Mr. John Rodriguez of Maricopa County Flood Control District and Mr. G. J. Geiser, Project Manager for Dames and Moore. Both were very helpful in the coordination and completion of this project.

2.0 PURPOSE AND SCOPE

The need for this project developed from a number of inter-related activities which would impact upon Skunk Creek and included the Corp of Engineers Arizona Canal Diversion Channel discharging into Skunk Creek; the proposed construction of the Outer Loop

bridges across Skunk Creek; and the desire by ADOT to produce embankment material for the Outer Loop from the Skunk Creek channel excavation.

The specific scope of work objectives include:

1. From topo mapping and other material supplied by the MCFCD, the channel was modelled and using HEC-II, water surface profiles were calculated for two flow conditions of 35,000 cfs and 50,000 cfs, respectively.
2. From the results of the HEC-II analysis a new channel alignment, inverts and cross sections were developed to provide the best fit with the following constraints:
 - Corp of Engineers project including the drop structure on the ACDC and the bank protection designed for a portion of the south bank of Skunk Creek.
 - Minimum encroachment of the channel into the City of Peoria sports complex.
 - Preservation of a wet-lands area upstream of the 83rd Ave. bridge.
 - Attempt to preserve the existing 83rd Ave. bridge and extend its length as required.
 - The proposed Outer Loop bridge already designed as to channel width, free board and channel invert.
 - The proposed drop structure at the New River confluence.
 - Velocities which would not be excessively erosive.
 - That the 50,000 cfs flow water surface profile be contained in a completely incised channel below the natural bank elevations.

3. Conduct a series of geotechnical field tests and laboratory tests in order to determine bank stability, erosion protection recommendations, and foundation recommendations for any required drop structures.
4. Analyze the impact of the channel design on the 83rd Ave. bridge and make recommendations with concept design for lengthening or replacement.
5. Analyze the impact of the channel design on the proposed Outer Loop bridge and confirm the parameters used for the bridge design including free board, channel width and bank erosion protection at the bridge.
6. Prepare excavation plans and earthwork quantity estimates to be included in ADOT's bid package for the Outer Loop Bridge.
7. Prepare a cost estimate.
8. Prepare a HEC-II analysis of the reach between the ACDC confluence and Bell Road and provide preliminary recommendations for channel grading and erosion protection.
9. Prepare a complete set of channel improvement plans for MCFCD.
10. Prepare a Final Engineers Report.

3.0 DISCUSSION

Following initial setup and trial runs, the HEC-II analysis of the channel was made using 35,000 cfs and 50,000 cfs flow rates. The results of each run was compared against the objectives and subsequent modifications were made until the final result was achieved and accepted by MCFCD. The final channel configuration with two drop structures, variable width and variable invert slopes is shown on the improvement

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Skunk Creek
City of Peoria

plans. This final configuration also fitted with all the previous stated constraints. (See Appendix for HEC-II printout and further discussion.)

The ADOT, Outer Loop Bridge, was confirmed to fit within the channel design and was confirmed to DeLeuw Cather in our letter dated February 12, 1987. With a channel bottom width of 257', 1:1 side slopes, channel slope of 0.019 1/1, top width of 300', and for a flow rate of 50,000 cfs, the freeboard to the lower cord is 9.5'. Average channel velocities at the bridge were determined to be 18 fps. These results were reviewed by DeLeuw Cather engineers at a meeting with Ellis-Murphy on March 24, 1987, and were considered to be acceptable. Because the design invert is lower than the assumed invert for the initial bridge design, DeLeuw Cather decided to lower the foundations and erosion protection toe down to conform with the new invert. The bridge abutment erosion protection of soil cement was considered suitable for the design velocities.

In order to preserve the wetland area and the other constraints of the channel design, the channel top width at the 83rd Avenue bridge alignment will be in the order of 460 ft. Although, there is sufficient freeboard with the existing bridge, MCFCD did not consider it feasible to extend the existing bridge to the length required. Therefore, we were directed to assume a new replacement bridge at 83rd Avenue to fit the channel design. A concept design for the new bridge is shown on Sheet 8 of the improvement plans.

As shown on the plans, there is a small encroachment of the channel into the City of Peoria Sports Complex. MCFCD intends to review the encroachment with the City of Peoria for final approval.

The channel design, as previously stated, includes two new drop structures, one at station 24+50 and the second ^{UP}downstream at station 69+80. Concept designs for the drop structures are shown on Sheet 8 of the plans and further discussed in Appendix.

May 4, 1987

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Skunk Creek
City of Peoria

The Corp of Engineers' bank protection design along the south side of the channel is adversely affected by the channel design and specifically the top and toe down elevations because of the effect of the drop structures on the channel inverts. It is the intention of MCFCD to present our design to the Corp of Engineers, and it is expected that they will amend their plans to have the top and toe down elevations fit the channel elevations. The Corp will also use our channel alignment to finalize their design for bank protection on the northside of the ACDC/Skunk Creek confluence.

Following the final channel design, the plans were cross sectioned at 200 ft. intervals and the amount of earth available for excavation was calculated. This quantity, a copy of the cross sections and a reproduceable set of channel design plans were provided to DeLeuw Cather to incorporate into their Outer Loop bid package.

It should be noted that the excavation plans have hold limits north and south of the existing 83rd Ave. bridge.

Because the plans for the drop structure at Desert Harbor were prepared based on a natural channel along Skunk Creek, they will now need to be adjusted to reflect the Skunk Creek channel design. This will actually be favorable to the developer in that it will reduce the amount of erosion protection originally shown upstream of his structure. A copy of our plans will be made available for Desert Harbor to make their changes. MCFCD will also have to resolve the access question where the Skunk Creek channel crosses into the Desert Harbor property.

A new 16" water transmission line is being designed by NBS/Lowry and to cross under Skunk Creek along the east side of the 83rd Avenue bridge. Designs were exchanged in order to have the channel design and pipeline design compatible with each other.

Erosion protection analysis and recommendations for the channel banks were major parts of Dames and Moore geotechnical work and is discussed in detail in Appendix. In summary four-types of erosion protection were considered and in consultation with MCFCD, it was decided that soil-cement bank protection would meet the velocity

requirements, and be most feasible from an economic and in-situ soil analysis standpoint. A minimum of 8' of toe down is recommended. It is also recommended that the bank protection include 4 feet of free board above the design flow water surface elevation for 35,000 cfs. Because the MCFCD does not wish to incorporate levees as part of the design, the channel the free board will be somewhat less than the recommended 4' along some sections of the south bank. This was pointed out to the MCFCD, and they have decided to accept this risk. The Dames & Moore report also recommends the bank protection be constructed in its entirety with a priority list for initial construction. The sections and priorities are detailed in Appendix.

The final objective of the project was to provide a HEC-II analysis and preliminary grading recommendation of the reach from ACDC confluence to Bell Road. As of this date, MCFCD has been advised that the topo mapping provided is not sufficiently accurate due to past grading and dumping along this area. MCFCD has requested a proposal to remap this area. If the proposal is approved, the mapping and analysis will be carried out and an amendment to this report will be prepared.

4.0 RESULTS

The results of the analysis and design for this project are fully presented in the following:

1. Drawing set for channel excavation provided to DeLeuw Cather for the ADOT Outer Loop bridge project,
2. Drawing set for overall channel improvements provided to MCFCD, and shown on Exhibits 1 to 8 inclusive.
3. Construction Quantity estimate shown on Exhibit 9.
4. Preliminary cost estimate shown on Exhibit 10.
5. Dames and Moore report (Appendix).

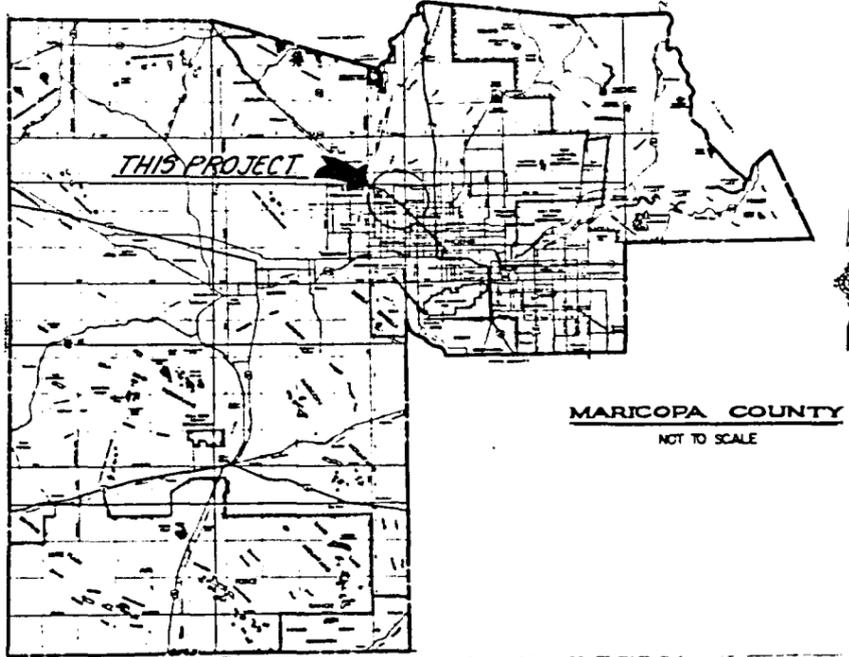
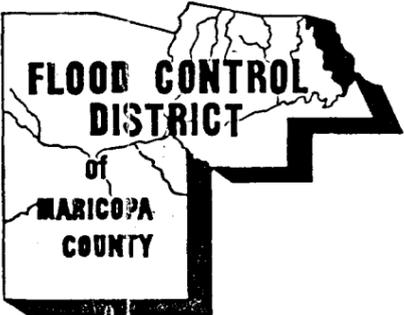
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CONSTRUCTION PLANS

FOR

SKUNK CREEK CHANNEL IMPROVEMENTS

(ARIZONA CANAL DIVERSION CHANNEL TO NEW RIVER CONFLUENCE)



D. E. SAGRAMOSO P. E.
CHIEF ENGINEER & GENERAL MANAGER

F.C.D. CONTRACT NO.

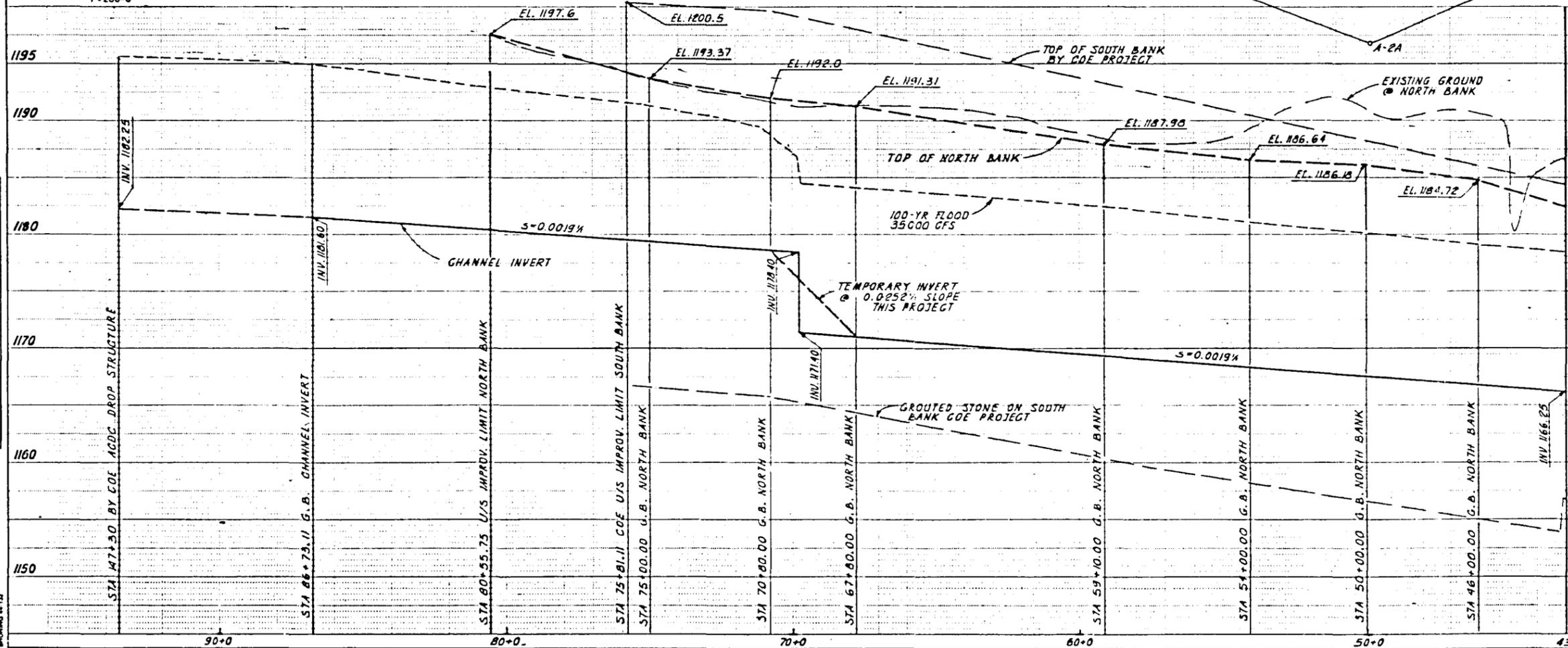
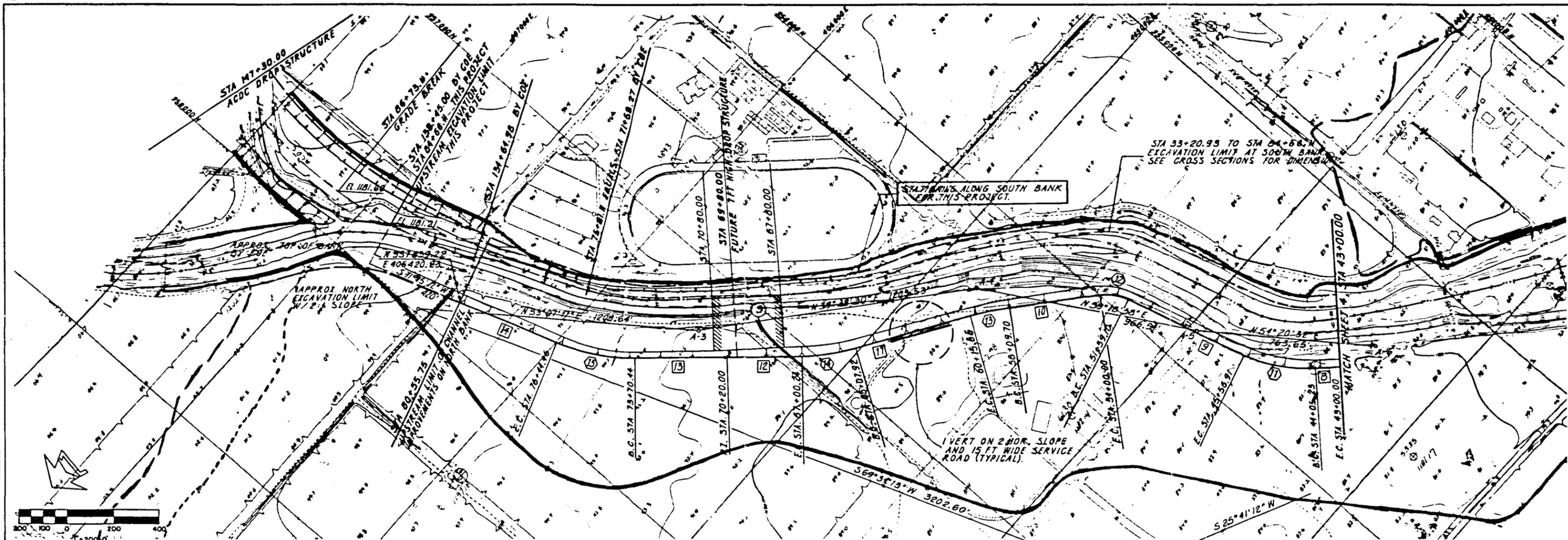


DESIGN			BY	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DESIGN CHK.					SKUNK CREEK CHANNEL IMPROVEMENTS	
PLANS					RECOMMENDED BY: _____ DATE _____ SHEET	
PLANS CHK.					APPROVED BY: _____ DATE _____ 1 of 8	
SUBMITTED BY:					CHIEF ENGINEER & GENERAL MANAGER	

EXHIBIT 1

PLAN	DATE
REVISED	
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BY	
DATE	

PROFILE	DATE
REVISED	
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DATE	



CONSTRUCTION NOTES

③ 300 FT LONG TEMPORARY TRANSITION ZONE AT FUTURE DROP STRUCTURE SITE.

EXCAVATION QUANTITY ESTIMATE
 1190 STA 0+00 TO STA 25+00 305,400 CU-YDS
 STA 38+50 TO STA 84+66 465,800 CU-YDS

LEGEND
 (14) CURVE
 (9) TANGENT

NOTE: FOR CURVE AND DISTANCE DATA SEE SHEET 1.

PRELIMINARY PLAN
 NOT FOR CONSTRUCTION

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DESIGN	3-87	ZMK
DRAFTING	3-87	ZMK

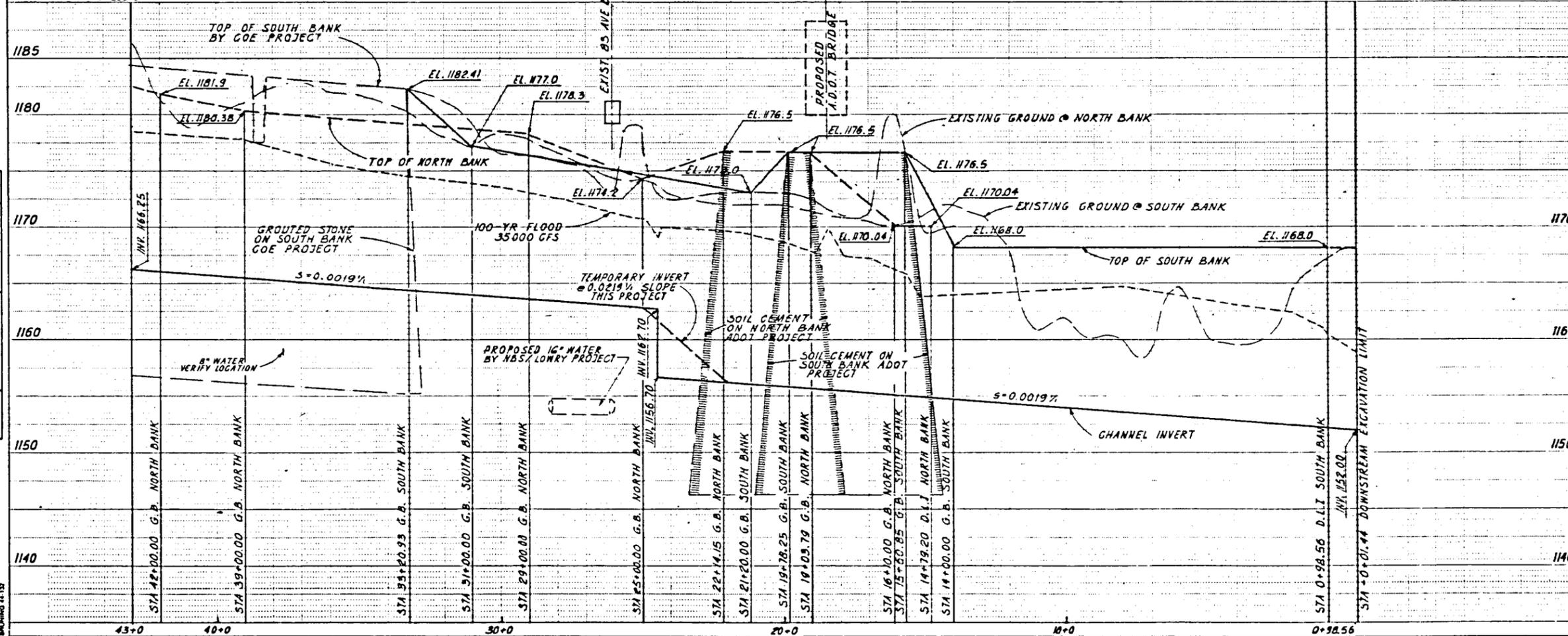
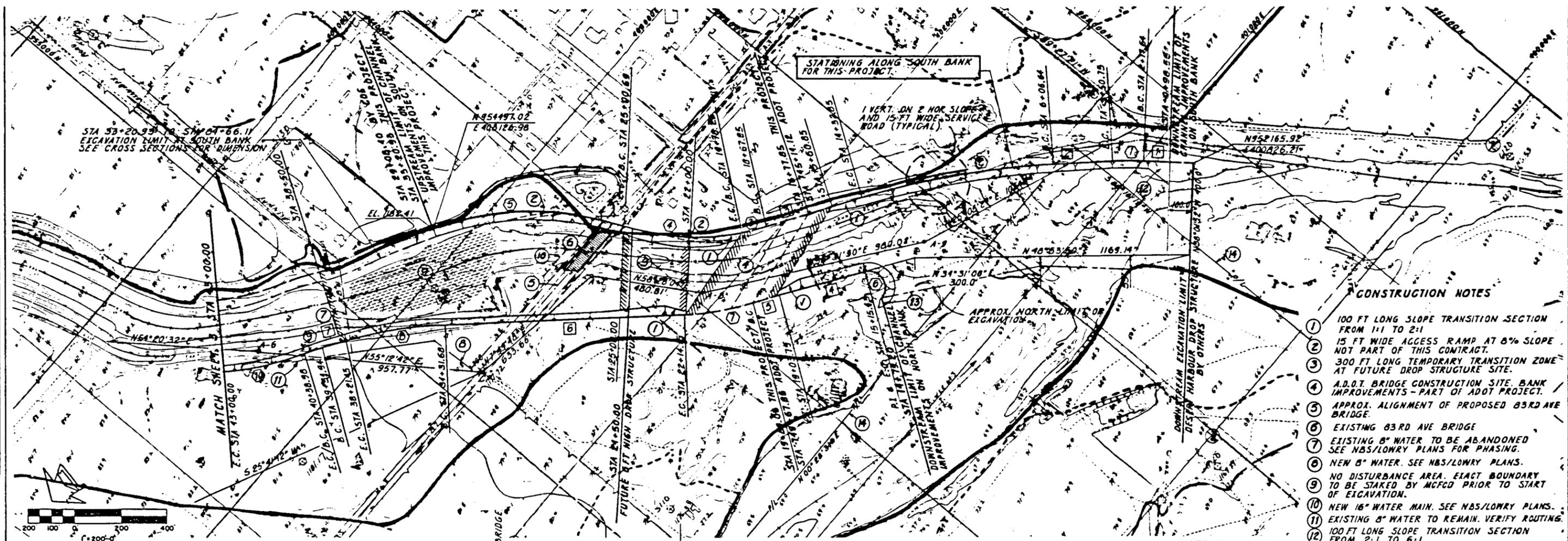
SKUNK CREEK
CHANNEL IMPROVEMENTS

EXCAVATION PLAN

SCALE: HORIZ. 1" = 200' VERT. 1" = 5'
 JOB NO. 24723 DATE 3-87 SHEET 3 OF 8
 ellis-murphy, inc.
 consulting engineers and architects

PLAN
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REVISIONS



- CONSTRUCTION NOTES**
- ① 100 FT LONG SLOPE TRANSITION SECTION FROM 1:1 TO 2:1
 - ② 15 FT WIDE ACCESS RAMP AT 8% SLOPE NOT PART OF THIS CONTRACT.
 - ③ 300 FT LONG TEMPORARY TRANSITION ZONE AT FUTURE DROP STRUCTURE SITE.
 - ④ A.D.O.T. BRIDGE CONSTRUCTION SITE. BANK IMPROVEMENTS - PART OF ADOT PROJECT.
 - ⑤ APPROX. ALIGNMENT OF PROPOSED 83RD AVE BRIDGE.
 - ⑥ EXISTING 83RD AVE BRIDGE
 - ⑦ EXISTING 8" WATER TO BE ABANDONED SEE NBS/LOWRY PLANS FOR PHASING.
 - ⑧ NEW 8" WATER. SEE NBS/LOWRY PLANS.
 - ⑨ NO DISTURBANCE AREA. EXACT BOUNDARY TO BE STAKED BY MCFGD PRIOR TO START OF EXCAVATION.
 - ⑩ NEW 16" WATER MAIN. SEE NBS/LOWRY PLANS.
 - ⑪ EXISTING 8" WATER TO REMAIN. VERIFY ROUTING.
 - ⑫ 100 FT LONG SLOPE TRANSITION SECTION FROM 2:1 TO 6:1
 - ⑬ GUT TO MEET EXISTING GROUND SURFACE.
 - ⑭ DESERT HARBOUR PROPERTY LINE

EXCAVATION QUANTITY ESTIMATE

STA 0+00 TO STA 25+00	305,400 CU-YDS
STA 38+50 TO STA 84+66	465,800 CU-YDS

- LEGEND**
- ④ CURVE
 - ⑤ TANGENT

NOTE: FOR CURVE AND DISTANCE DATA SEE SHEET 1.

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

TASK	DATE	SIGNATURE
CHECKED	3-87	JAL
DESIGN	3-87	ZMK
DRAFTING	3-87	ZMK

SKUNK CREEK CHANNEL IMPROVEMENTS

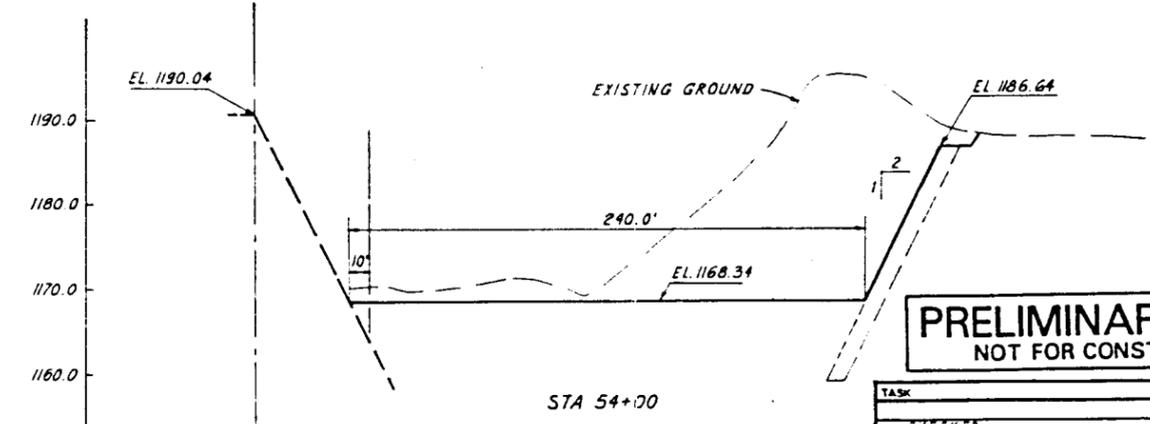
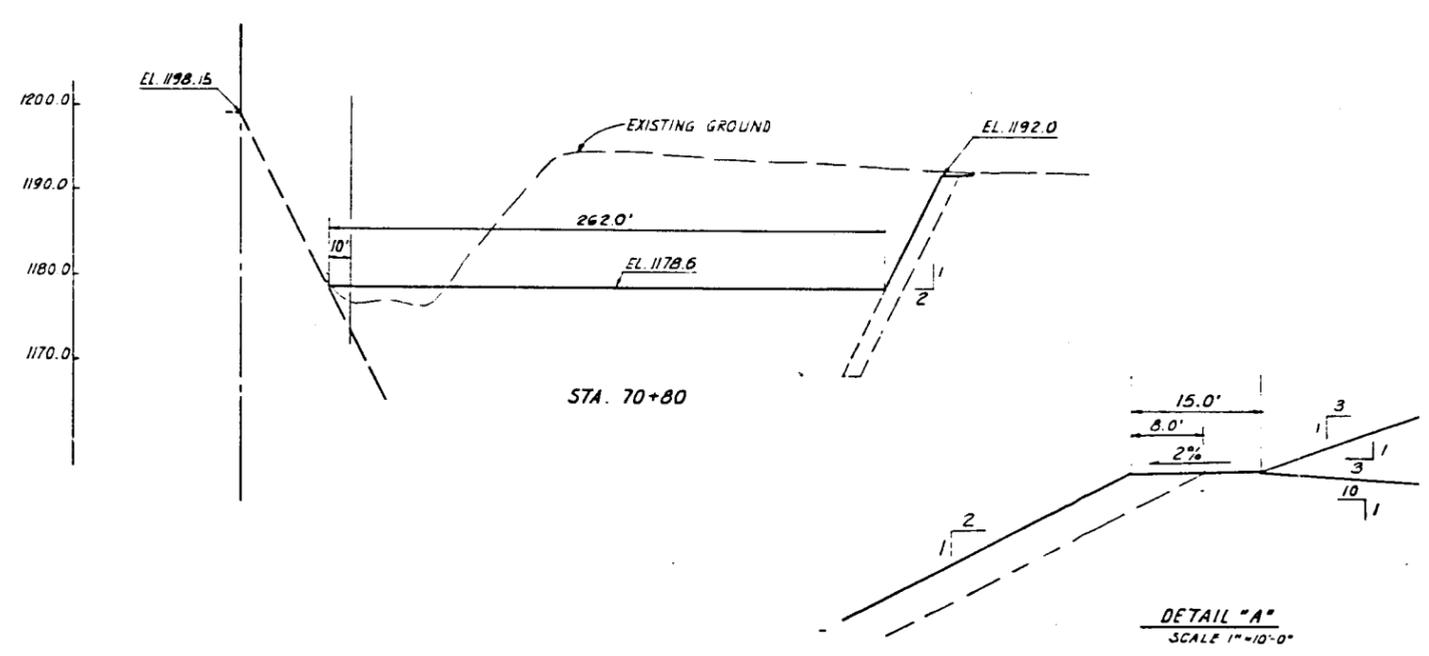
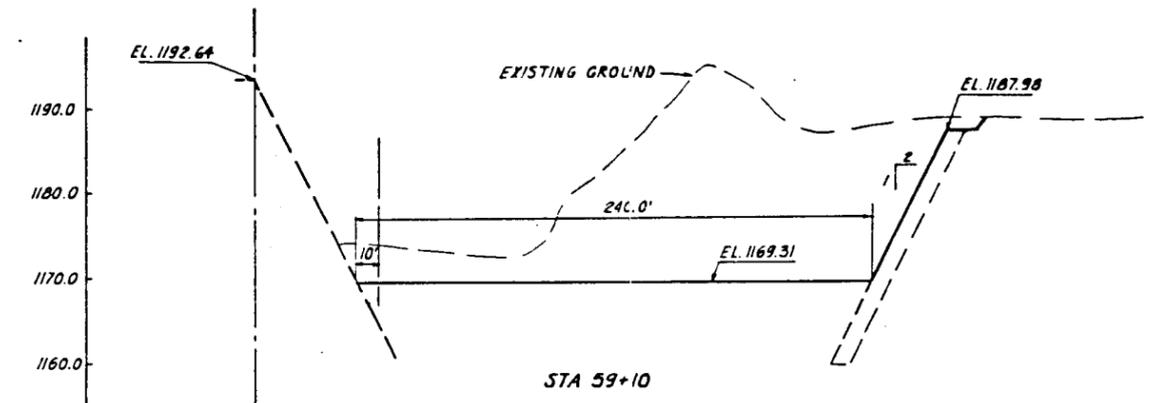
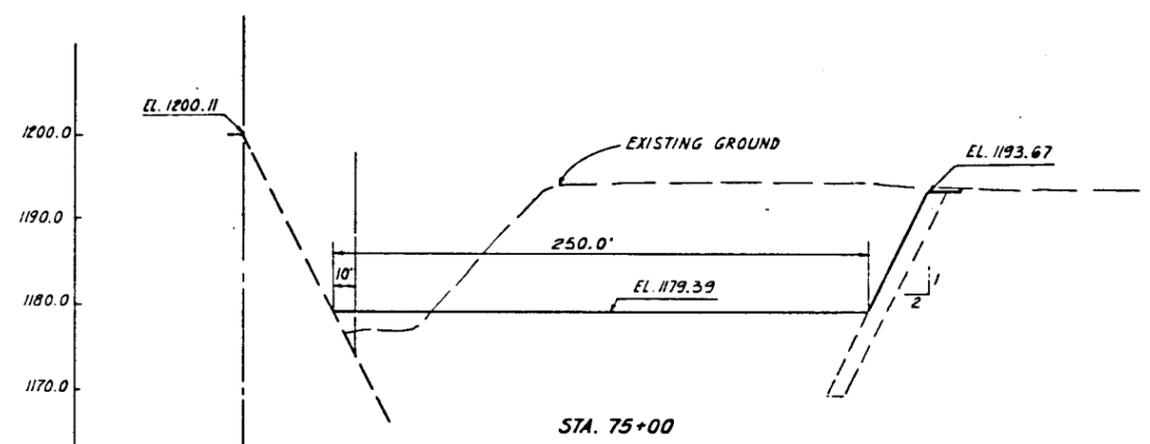
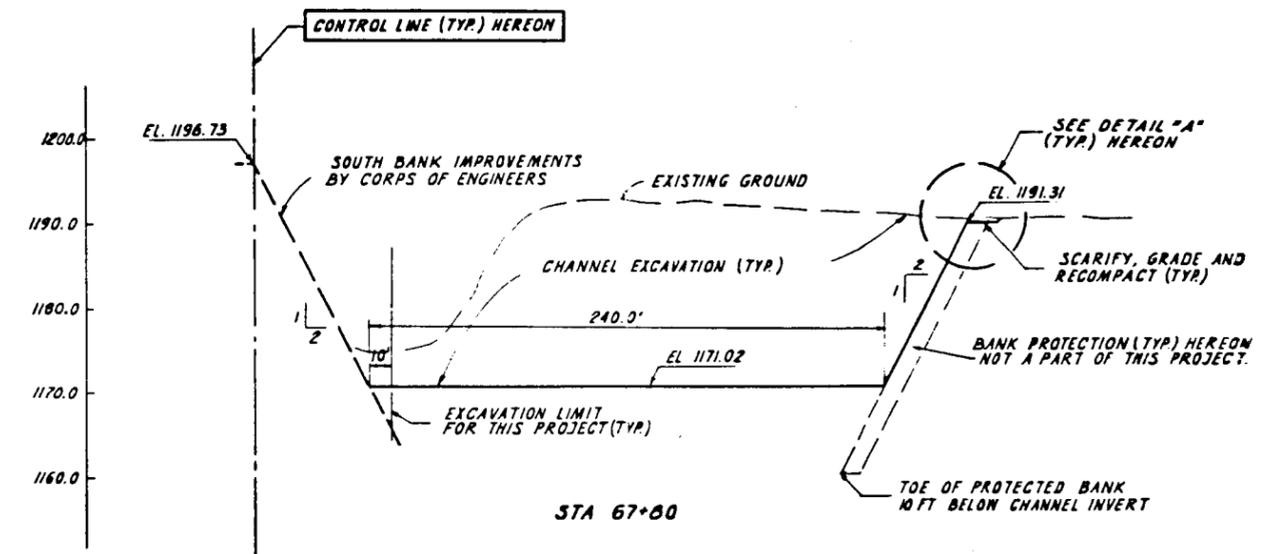
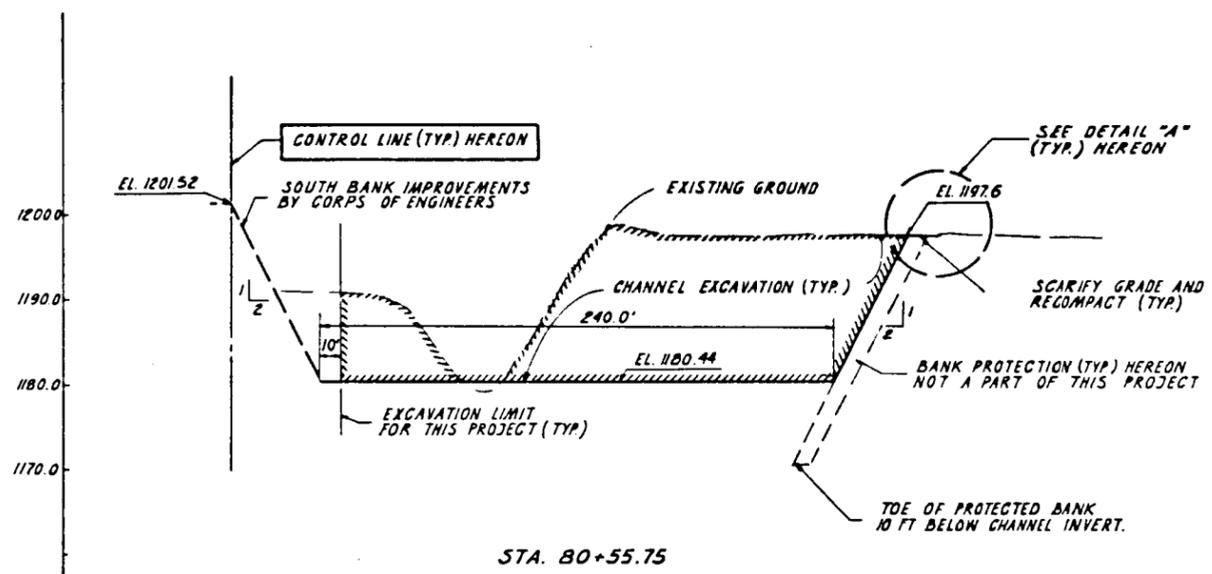
EXCAVATION PLAN

283-100

SCALE: HORIZ. 1"=200' VERT. 1"=5'

JOB NO. 24723 DATE 3-87 SHEET 4 OF 8

ellis-murphy, inc.



PRELIMINARY PLAN
NOT FOR CONSTRUCTION

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DESIGN	3-87	JVA
DRAWING	3-87	JVK



SKUNK CREEK
CHANNEL IMPROVEMENTS



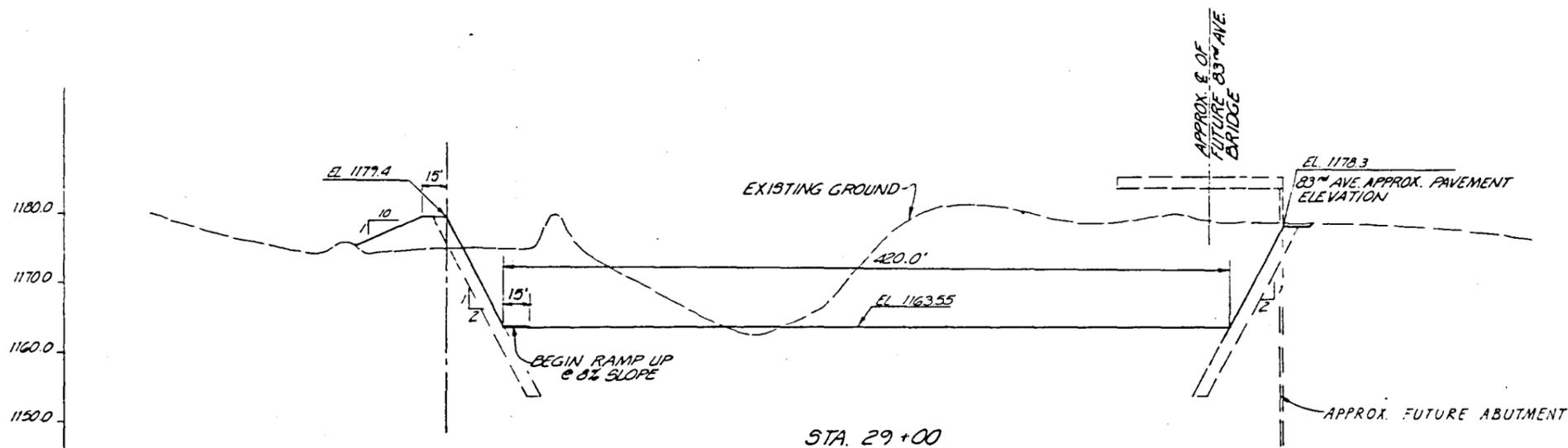
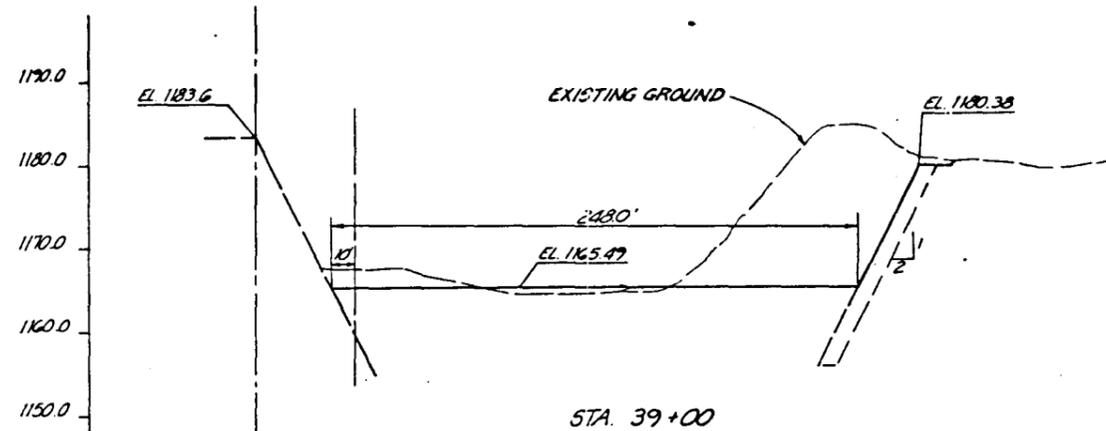
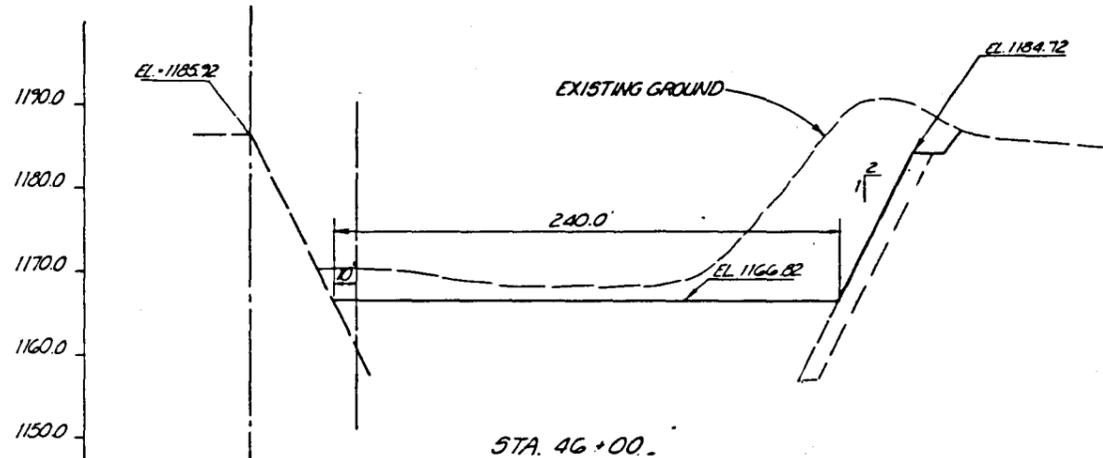
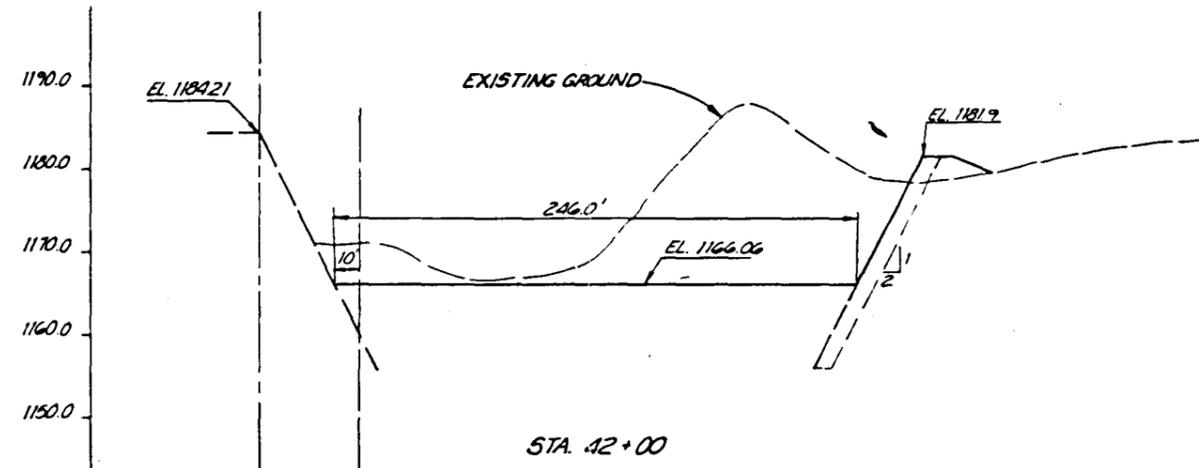
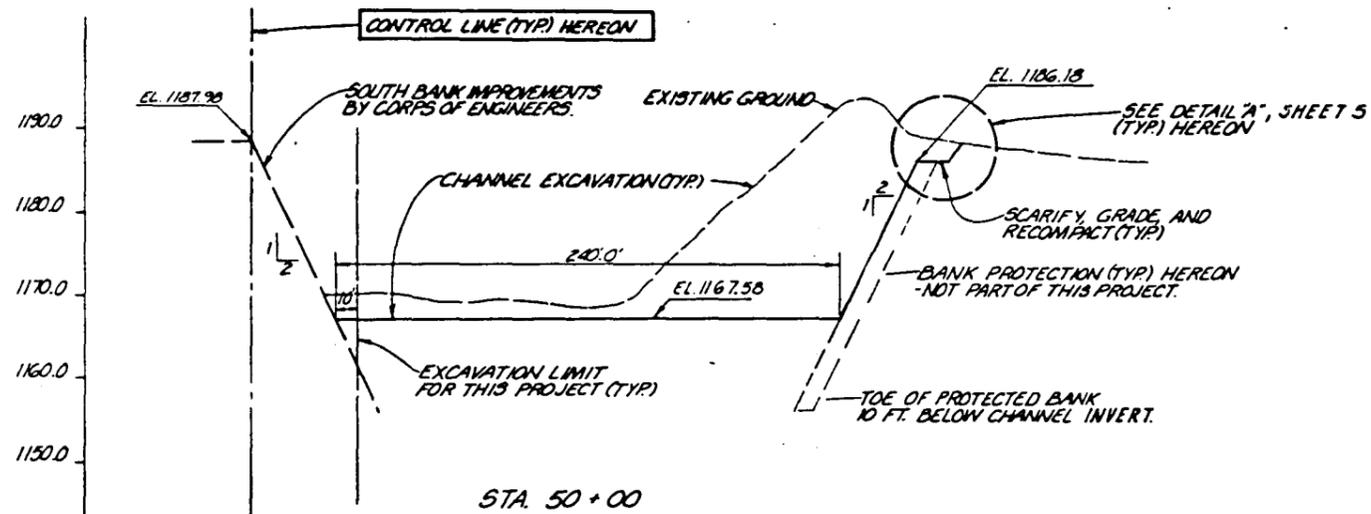
CROSS SECTIONS

SCALE	JOB NO.	DATE	SHEET
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ellis:murphy, inc.

CROSS SECTIONS ARE DRAWN LOOKING DOWNSTR.

DETAIL "A"
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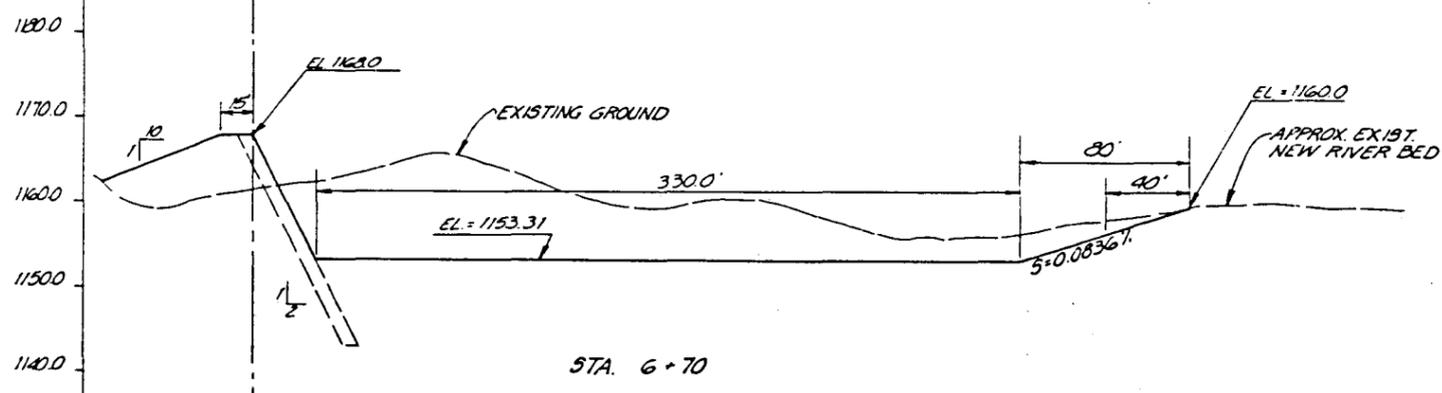
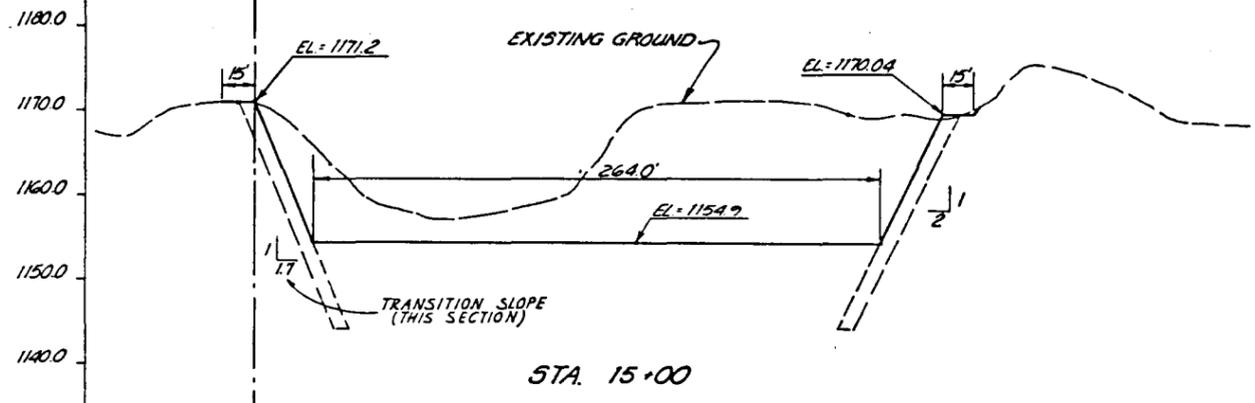
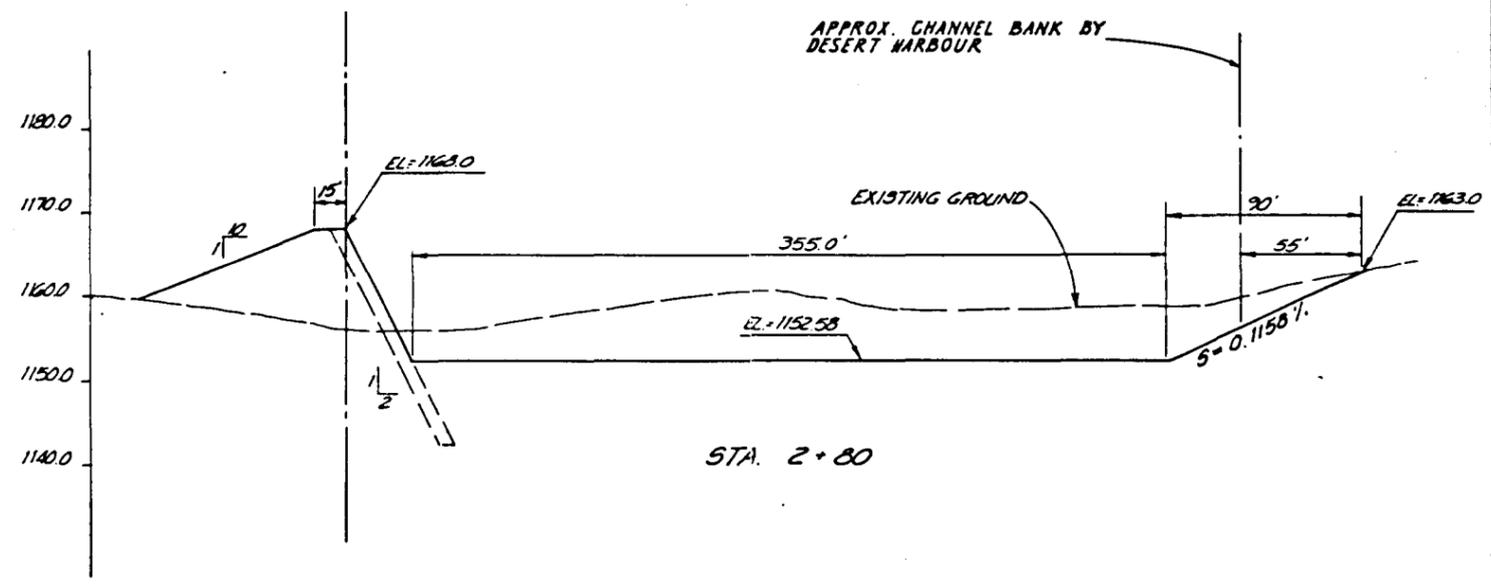
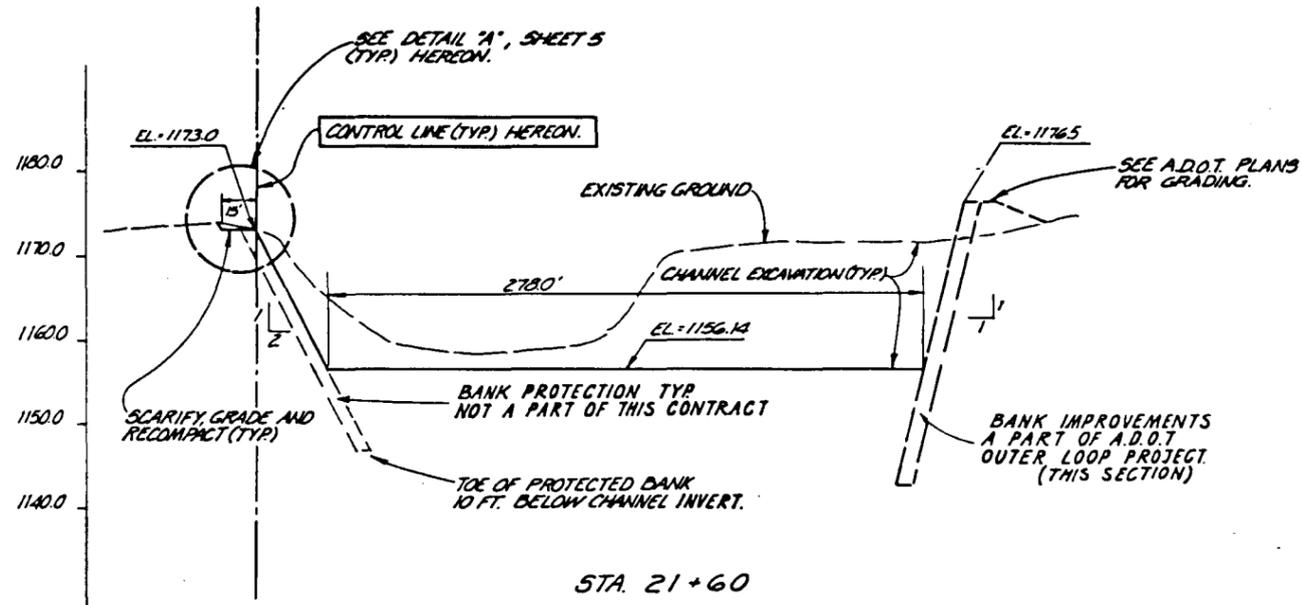
CROSS SECTIONS ARE DRAWN LOOKING DOWNSTR

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

TASK	DATE	SIGNATURE
CHECKED	3-87	JAL
DESIGN	3-87	ZMK
DRAFTING	3-87	Robert P. Howell

J2S3-100
SKUNK CREEK
CHANNEL IMPROVEMENTS

CROSS SECTIONS			
SCALE HOR. 1"=40' VER. 1"=10'	JOB NO. 24723	DATE 3-87	SHEET 6 OF 8
ellis-murphy, inc.			



CROSS SECTIONS ARE DRAWN LOOKING DOWNSTREAM.

PRELIMINARY PLAN
NOT FOR CONSTRUCTION

TASK	DATE	SIGNATURE
CHECKED	3-87	JAL
DESIGN	3-87	ZMK
Drafting	3-87	Robert P. Howell



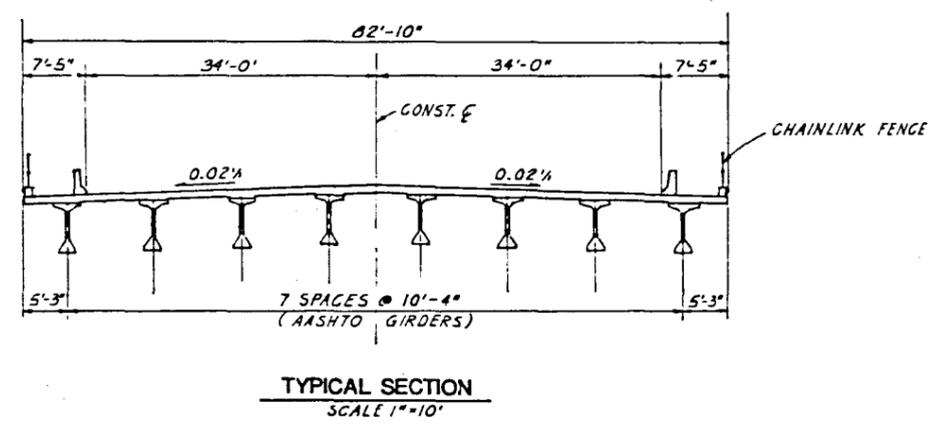
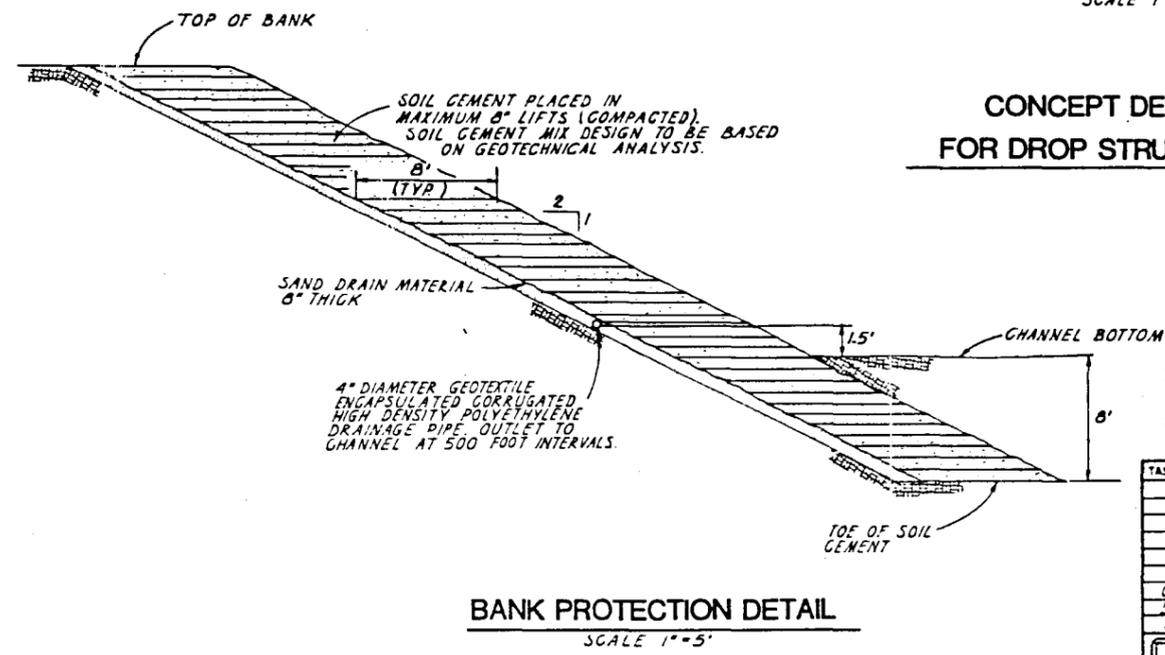
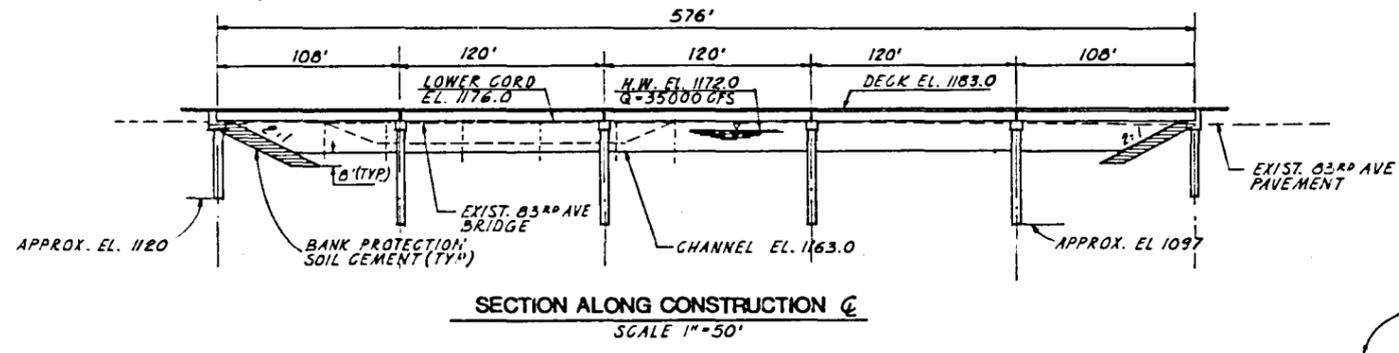
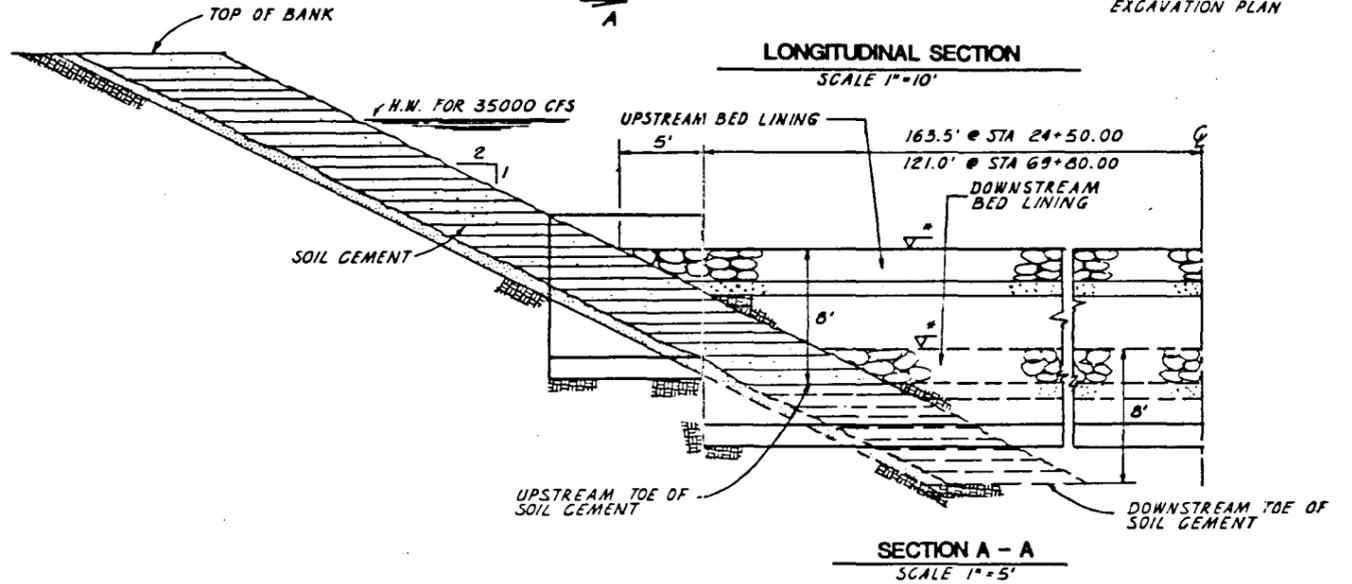
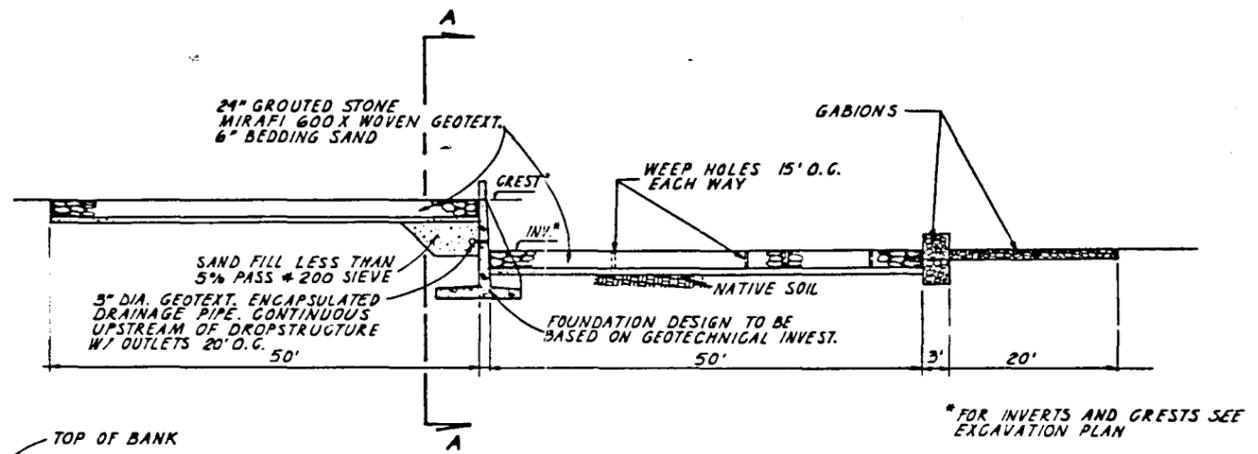
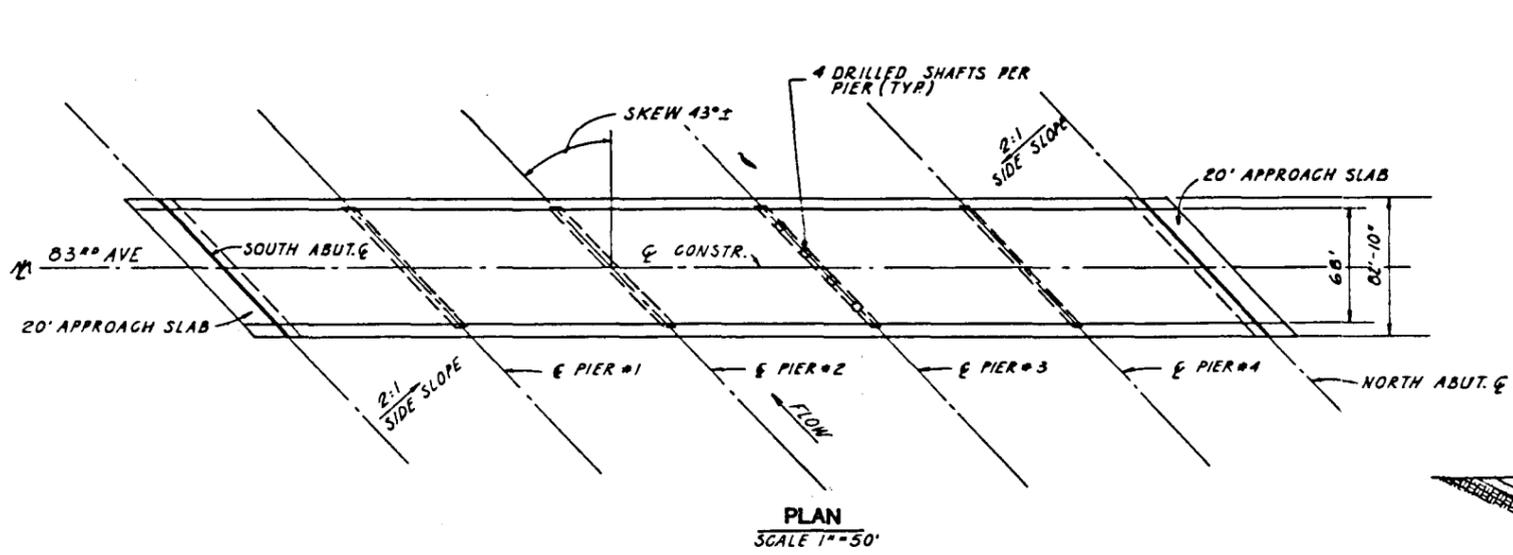
SKUNK CREEK
CHANNEL IMPROVEMENTS



CROSS SECTIONS

SCALE	JOB NO	DATE	SHEET
1" = 20'	24723	3-87	7 of 8

ellis-murphy, inc.



**CONCEPT DESIGN FOR
REPLACEMENT BRIDGE AT 83RD AVE.**

**CONCEPT DESIGN
FOR DROP STRUCTURE**

**PRELIMINARY PLAN
NOT FOR CONSTRUCTION**

TASK	DATE	SIGNATURE
CHECKED	4-87	JAL
DESIGN	4-87	ZMK
DRAFTING	4-87	ZMK



**SKUNK CREEK
CHANNEL IMPROVEMENTS**



**83 RD AVE. BRIDGE
AND DROP STRUCTURES
CONCEPT DESIGN**

SCALE	JOB NO.	DATE	SHEET
	24723	APRIL 07	8 OF 8

ellis-murphy, inc.

Exhibit No. 9

CONSTRUCTION QUANTITY ESTIMATE

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Units</u>
1	Earthwork (Excavation)	793,752	cu.yd.
2	Earthwork (Fill)	22,487	cu.yd.
3	Soil Cement Bank Protection	136,150	cu.yd.
4	Drop Structures - Grouted Rip-Rap	4,022	cu.yd.
5	Drop Structures - Gabions	732	cu.yd.
6	Drop Structures - Concrete	600	cu.yd.
7	Geotextile	6,000	sq.yd.

Exhibit No. 10

PRELIMINARY COST ESTIMATE

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total</u>
1	Earthwork		* * By ADOT * *	
2	Soil Cement	131,150	\$32/cu.yd.	\$4,356,800
3	Grouted Rip-Rap	4,022	\$30/cu.yd.	120,660
4	Gabions	732	\$70/cu.yd.	51,240
5	Concrete	660	\$300/cu.yd.	198,000
6	Geotextile	6,000	\$2.50/sq.yd.	15,000
7	83rd Ave. Bridge	47,712	\$40/sq.ft.	<u>1,908,480</u>
			TOTAL	\$6,650,180

5.0 REFERENCES

Arizona Department of Transportation, July 1986, Plans for Outer Loop Bridges over Skunk Creek.

Arizona Department of Water Resources, 1985, Design Manual for Engineering Analysis of Fluvial Systems, by Simons, Li & Associates, Inc.

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Flood Control District of Maricopa County, 1987, verbal communication between FDC staff and Ellis-Murphy.

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_____, November 1984, Skunk Creek Bank Stabilization, Plans and Profiles (15 sheets).

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