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DYSART DRAIN IMPROVEMENT PROJECT

CONCEPT DESIGN STUDY

Description of Alternatives
and
Cost Estimates

Prepared for:
Flood Control District of
Maricopa County

April 30, 1993

Prepared by:
THE WLB GROUP, INC.
333 East Osborn Road, Suite 380
Phoenix, Arizona 85012
(602) 279-1016

FLOOD CONTROL DISTRICT RECEIVED		
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DRAFT



1.0 ALTERNATIVE NO. 1

This alternative is based on allowing the existing split flow at Reems Road and Northern Avenue to remain. Under current conditions, the Dysart Drain has insufficient capacity at Reems Road which is at the upstream end of the channel. The result is a split flow with approximately 800 cfs flowing easterly in Dysart Drain and 1500 cfs flowing southerly over Northern Avenue and along the west side of Luke AFB.

The effects on Luke AFB caused by the split flow appear to be minimal. Except for the area at the extreme south end of the runway; the flow is contained in the existing earthen channel along the west side of the base.

1.1 DESCRIPTION OF IMPROVEMENTS AND R/W REQUIREMENTS (Refer to Plan Sheets)

Sta. 10+40 to 113+15 (Agua Fria River Upstream to West Side of the Base Housing Area)

Channel Improvements:

This portion of the channel requires complete reconstruction in order to remove the sag in the existing channel east of Litchfield Road. The work includes: removing the existing concrete channel lining and existing farm bridge east of Dysart Road; excavation to lower the channel invert; removal and replacement of the El Mirage Road and Dysart Road bridges; and new concrete channel lining.

Right of Way Requirements:

An additional 30 feet of right of way is required on the south side of the channel from the Agua Fria River to Dysart Road. The existing right of way in this reach is 130 feet. The required right of way is 160 feet.

In addition to the above requirement, 60 feet of additional right of way is required between Dysart Road and the Base (Sta. 72+29 to Sta. 77+05). In this area, the existing right of way is 100 feet and the required right of way is 160 feet.

These right of way requirements were determined for the widest channel section which occurs at the location with the deepest cut (28 foot cut at Sta. 54+00). The right of way is also based on having a maintenance road on each side of the channel. Therefore, the right of way



requirement could be reduced by 1) eliminating one maintenance road or 2) narrowing the right of way in areas of shallower cuts. A critical area is where Morton Salt is located, as some of their drying beds may have to be reconfigured to accommodate the proposed channel. This is also where some of the deepest cuts occur.

Sta. 113+15 to 146+00 (West Side of Base Housing to the Railroad)

Channel Improvements:

The existing concrete lined channel in this reach is to remain and the channel lining is extended to the top of bank. In addition, the south bank is raised east of Litchfield Road to prevent breakout of flows onto the Base housing area. The Base bridge west of Litchfield Road also remains.

Right of Way Requirements:

No right of way is required for this reach. The channel is located on Base property.

Sta. 146+00 to 157+78 (Railroad Box Culverts)

Channel Improvements:

The improvements for this section of the channel involve the construction of three new 10' x 7' x 640' box culverts that will abut the south edge of the existing box culverts at the north end of the runway. The improvements also include the channel transitions on both ends of the new box culverts and removing and replacing the railroad.

There is an option (Option 1) in the cost estimate to reduce the length of the box culverts. The existing box culverts are much longer than what is necessary for the railroad crossing. If Luke AFB can accept an open channel at the end of the runway, there are substantial cost savings in reducing the length of the box culvert. The length required for the railroad is approximately 150 feet which results in a length reduction of 490 feet.

Right of Way Requirements:

No right of way is required in this reach. The channel is located on Base property.



Sta. 157+78 to 215+00 (Railroad Box Culverts to the Northern Avenue Culvert Crossing)

Channel Improvements:

The existing earthen channel in this section is to be enlarged. Other improvements include: a long spillway (approximately 1700 feet) to collect flows that concentrate along the AT&SF Railroad; relocation of the Base road that parallels the channel; raising the south bank of the channel upstream of the box culverts to increase the capacity of the culverts; and constructing 2 - 10' x 6' box culverts at the north driveway entrance onto the Base.

An option (Option 2) is included in the cost estimate to concrete-line the channel in this section.

Right of Way Requirements:

No right of way is required in this reach. The channel is located on Base property.

Sta. 215+00 to 219+40 (Northern Avenue Culvert Crossing)

Channel Improvements:

The existing Northern Avenue "Dip Section" and culvert crossing are reconstructed in order to provide for the 100-year flood with no more than 0.5 foot of floodwater over the roadway. The existing earthen channel, west of this location, is not improved.

Right of Way Requirements:

No right of way is required at this location. The improvements are within the existing Northern Avenue R/W.

1.2 ADVANTAGES AND DISADVANTAGES

Advantages:

1. Cost

This is the lowest cost alternative.



2. Maintenance

Since most of the channel will be concrete-lined, this alternative has one of the lowest maintenance requirements. Only the portion on the north side of the Base will be earthen lined. The rest of the channel improvements are concrete lined.

3. Litchfield Road Bridge

In this alternative the Litchfield Road bridge remains. This is an advantage, not only because of the cost of the bridge, but also because of the problem of maintaining adequate traffic flow on Litchfield Road during construction.

Disadvantages:

1. Split Flow at Reems Road

As stated previously, this alternative does not collect all of the runoff at Reems Road and the existing condition split flow will continue to occur.

1.3 COST ESTIMATE (Refer to the Itemized Estimates)

SUMMARY OF COST ESTIMATES FOR ALTERNATIVE 1			
DESCRIPTION	ALTERNATIVE 1	W/OPTION 1	W/OPTION 2
Cost Reduction (-) / Increase (+)		- \$545,200 (ON-BASE)	+ \$728,900 (ON-BASE)
Total On-Base Cost	\$5,871,000	\$5,325,800	\$6,599,900
Total Off-Base Cost	\$1,480,800	\$1,480,800	\$1,480,800
TOTAL COST	\$7,351,800	\$6,806,600	\$8,080,700

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 1
COST ESTIMATE

(OFF-BASE PORTION)

Page 1 of 4

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove El Mirage Road Bridge	1 Ea.	\$35,000	\$35,000
Demolish and Remove Dysart Road Bridge	1 Ea.	\$25,000	\$25,000
Demolish and Remove Farm Bridge	1 Ea.	\$15,000	\$15,000
Replace El Mirage Road Bridge (105' x 84')	8820 S.F.	\$45/S.F.	\$396,900
Replace Dysart Road Bridge (110' x 84')	9240 S.F.	\$45/S.F.	\$415,800
3 - 10' x 4' x 120' Box Culverts	120 L.F.	\$790/L.F.	\$94,800
Grouted Riprap Inlet Protection (Northern Ave. Culverts)	330 S.Y.	\$22/S.Y.	\$7,300
Rebuild and Replace Asphalt Pavement (Northern Ave. Dip Section)	1100 S.Y.	\$15/S.Y.	\$16,500
SUBTOTAL			\$1,006,300
+ 20% Contingencies			\$201,300
TOTAL CONSTRUCTION COST			\$1,207,600
+ 20% Engineering and Construction Management			\$241,500
Right of Way 60' x 430' = 25,800 S.F. 30' x 6190' = <u>185,700</u> S.F. 211,500 S.F.	211,500 S.F.	\$.15/S.F.	\$31,700
TOTAL OFF-BASE COST			\$1,480,800

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 1
COST ESTIMATE

(ON-BASE PORTION)

Page 2 of 4

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove 6" Concrete Lining w/Rebar (East of Litchfield Road)	500,000 S.F.	\$.75/S.F.	\$375,000
New 6" Concrete Lining w/Rebar (Includes Extended Lining on Existing Channel)	83,000 S.Y.	\$22/S.Y.	\$1,826,000
Channel Excavation (East of Litchfield Road)	289,000 C.Y.	\$3/C.Y.	\$867,000
Demolish and Remove 6" Concrete Lining w/Rebar (North of Runway)	21,500 S.F.	\$.75/S.F.	\$16,100
Replace Transition/Retaining Walls Downstream and Upstream of 2 - 10' x 5.5' B.C.'s	2,000 S.F.	\$30/S.F.	\$60,000
Grouted Riprap Bank Protection Upstream of 2 - 10' x 5.5' B.C.'s (North Side of Channel Only)	4,700 S.Y.	\$22/S.Y.	\$103,400
Channel Excavation (10' x 5.5' Box Culverts to the West)	22,300 C.Y.	\$2/C.Y.	\$44,600
3 - 10' x 7' x 640' Box Culverts (Adjacent to Existing 10' x 5.5' B.C.'s)	640 L.F.	\$900/L.F.	\$576,000
2 - 10' x 6' x 40' Box Culverts	40 L.F.	\$600/L.F.	\$24,000
Remove and Replace RR Track	600 L.F.	\$50/L.F.	\$30,000
Remove and Replace Access Road on North Side of Luke A.F.B. (3,600 L.F. x 24 F.T. = 9,600 S.Y.)	9,600 S.Y.	\$15/S.Y.	\$144,000
Grouted Riprap Outlet Protection for 3 - 10' x 4' x 120' Box Culverts 60' x 75' = 500 S.Y.	500 S.Y.	\$22/S.Y.	\$11,000
SUBTOTAL			\$4,077,100
+ 20% Contingencies			\$815,400
TOTAL CONSTRUCTION COST			\$4,892,500
+ 20% Engineering and Construction Management			\$978,500
TOTAL ON-BASE COST			\$5,871,000

DYSART DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE NO. 1
 COST ESTIMATE

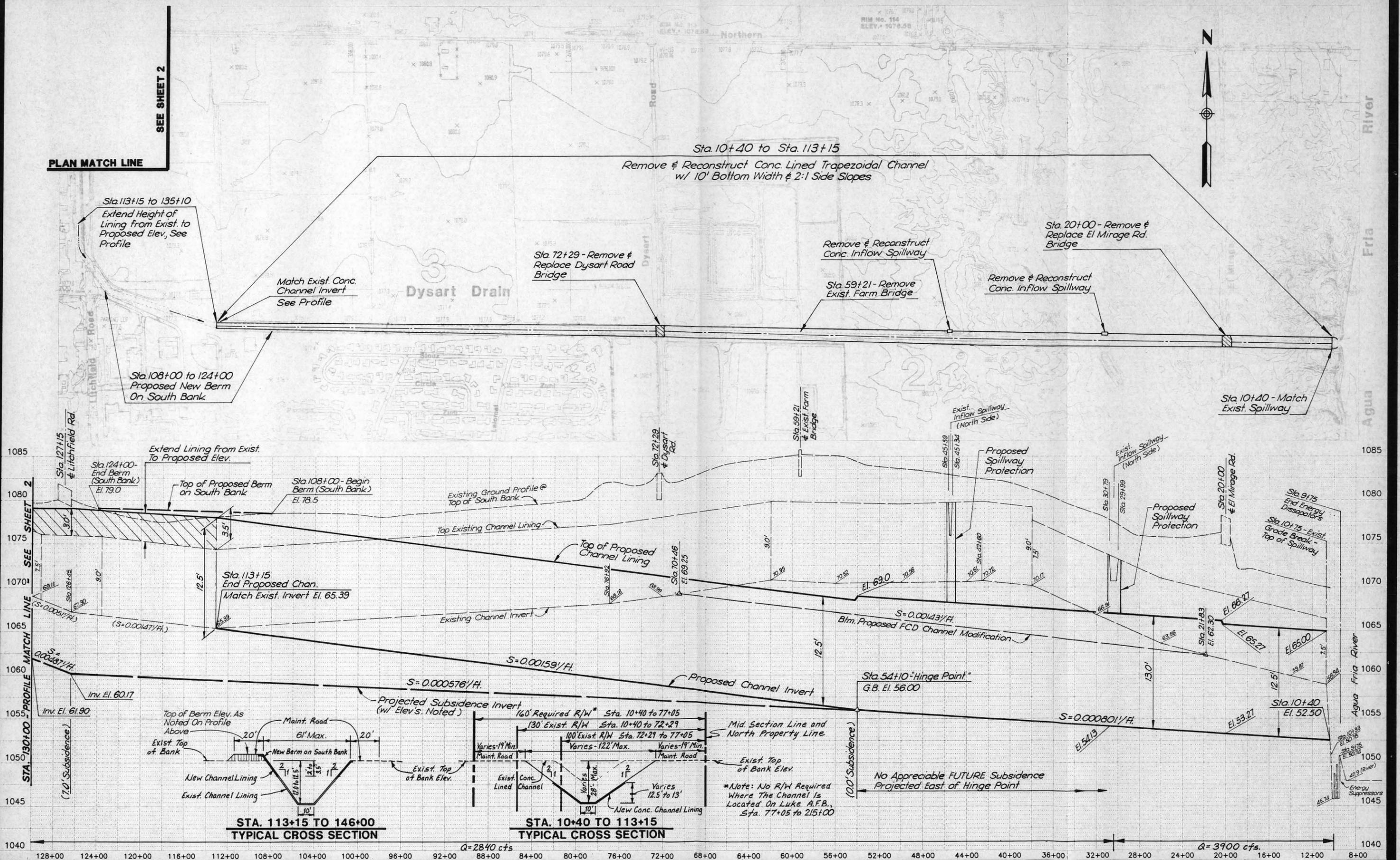
<u>OPTION 1</u>			
Reduce Length of Box Culverts At North End of Runway to 150 Feet			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Reduce Length of 3 - 10' x 7' Box Culvert	- 490 L.F.	\$900/L.F.	- \$441,000
Remove 2 - 10' x 5.5' Box Culverts (490' Length)	+ 28,700 S.F.	\$1/S.F.	+ \$28,700
Channel Excavation	+ 2,000 C.Y.	\$2/C.Y.	+ \$4,000
Grouted Riprap Bank Protection Upstream of Box Culverts (North Side Only)	+ 1,350 S.Y.	\$22/S.Y.	+ \$29,700
CONSTRUCTION COST ADJUSTMENT			- \$378,600
+ 20% Contingencies			- \$75,700
TOTAL CONSTRUCTION COST ADJUSTMENT			- \$454,300
+ 20% Engineering and Construction Management			- \$90,900
TOTAL COST ADJUSTMENT			- \$545,200

DYSART DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE NO. 1
 COST ESTIMATE

<u>OPTION 2</u>			
Provide Concrete Channel Lining Along North Edge of Luke AFB Between Northern Avenue Dip Section and Entrance to Box Culverts at the End of the Runway			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Concrete Channel Lining	+ 34,255 S.Y.	\$22/S.Y.	+ \$753,600
Grouted Riprap Bank Protection Upstream of 2 - 10'x5.5' B.C.'s (North Side of Channel Only)	- 4,700 S.Y.	\$22/S.Y.	- \$103,400
Remove and Replace Access Road on North Side of Luke AFB	- 9,600 S.Y.	\$15/S.Y.	- \$144,000
CONSTRUCTION COST ADJUSTMENT			+ \$506,200
+ 20% Contingencies			+ \$101,200
TOTAL CONSTRUCTION COST ADJUSTMENT			+ \$607,400
+ 20% Engineering and Construction Management			+ \$121,500
TOTAL COST ADJUSTMENT			+ \$728,900

PLAN MATCH LINE

SEE SHEET 2



STA. 113+15 TO 146+00
TYPICAL CROSS SECTION

STA. 10+40 TO 113+15
TYPICAL CROSS SECTION



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 1

No.	Date	Item

Scale 1"=400' H. 1"=5' V.
Job No. 289036-4
Date 4-20-93
Drawn By BKF
Checked By MTG

2.0 ALTERNATIVE NO. 2

This alternative is based on constructing a new channel along the Dysart Drain alignment from Reems Road to the Agua Fria River. In contrast to the channel proposed in Alternative No. 1, this channel will collect all of the runoff and eliminate the split flow at Reems Road and Northern Avenue.

2.1 DESCRIPTION OF IMPROVEMENTS AND R/W REQUIREMENTS (Refer to Plan Sheets)

Sta. 10+33 to 127+85 (Agua Fria River Upstream to Litchfield Road)

Channel Improvements:

This portion of the channel requires complete reconstruction in order to widen the existing channel bottom width and to remove the sag in the existing channel just east of Litchfield Road. The work includes: removing the existing concrete channel lining and existing farm bridge east of Dysart Road; excavation to lower and widen the channel invert; removal and replacement of El Mirage Road, Dysart Road and Litchfield Road Bridges; new concrete channel lining; and the south bank is raised on the east side of Litchfield Road to prevent breakout of flows onto the Base housing area.

Right of Way Requirements:

An additional 40 feet of right of way is required on the south side of the channel from the Agua Fria River to Dysart Road. The existing right of way in this reach is 130 feet and the required right of way is 170 feet.

In addition, 70 feet of additional right of way is required on the south side of the channel between Dysart Road and the Base (Sta. 72+29 to Sta. 77+05). In this area, the existing right of way is 100 feet and the required right of way is 170 feet.

These right of way requirements were determined for the widest channel section which occurs at the location with the deepest cut (28 foot cut at Sta. 54+00). The right of way is also based on requiring a maintenance road on each side of the channel. Therefore, the right of way requirement could be reduced by 1) eliminating one maintenance road or 2) narrowing the right of way in areas of shallower cuts. A critical area is where Morton Salt is located, as some of their drying beds may have to be reconfigured to accommodate the proposed channel. This is also where some of the deepest cut occurs.



Sta. 127+85 to 149+89 (Litchfield Road to the Railroad Box Culverts)

Channel Improvements:

This portion of the channel also requires complete reconstruction to increase the channel bottom width and depth. The work includes: removing the existing concrete lining; excavation to lower and widen the existing channel; removal and replacement of existing Luke AFB bridge; raising the south/west bank from Litchfield Road to Sta. 133+00 to prevent breakout flows; construction of two drop structures; removal and replacement of existing railroad spur track; and new concrete channel lining.

Right of Way Requirements:

No right of way is required for this reach. The channel is located on Base property.

Sta. 149+89 to 158+28 (Railroad Box Culverts and Transitions)

Channel Improvements:

The improvements for this section of the channel involve the construction of four new 10' x 10' x 640' box culverts and removing the existing 2 - 10' x 5.5' x 640' box culverts. The improvements also include the channel transitions on both ends of the box culverts, excavation of proposed channel configuration, and removal and replacement of the railroad over the box culverts.

There is an option (Option 1) in the cost estimate to reduce the length of the box culverts. The existing box culverts are much longer than what is necessary for the railroad crossing. If Luke AFB can accept an open channel at the end of the runway, there are substantial cost savings in reducing the length of the box culverts. The length required for the railroad is approximately 150 feet which results in a length reduction of 490 feet.

Right of Way Requirements:

No right of way is required in this reach. The improvements are located on Base property.



Sta. 158+28 to 214+40 (Upstream of Railroad Box Culverts to Culvert Outlet Under Northern Avenue)

Channel Improvements:

The improvements in this channel reach include the following: excavation to deepen and widen existing channel; new channel lining; construction of berm along south bank from Sta. 154+00 to Sta. 182+00 to prevent breakout flows; construction of a 1 foot drop structure; and removal of the existing 10' x 6' box culvert at the Northern Avenue driveway entrance to the base and replacing it with a bridge.

Right of Way Requirements:

No right of way is required for this reach. The channel improvements are located on the Base.

Sta. 214+40 to 248+50 (Box Culverts at Northern Avenue Dip Section to the Inflow Spillway at Reems Road)

Channel Improvements:

The existing Northern Avenue "Dip Section" and culvert crossing shall be reconstructed in order to provide for the 100-year flood with no more than 0.5 foot of floodwater over the roadway. Four new 10' x 7' x 120' box culverts will be built and the existing 7 - 48" CMP's will be removed.

The channel will be excavated for additional depth and width and will be concrete lined from the Northern Avenue culvert entrance to Reems Road. There are two existing culverts at driveway entrances into the farm fields that will be removed. It was assumed that these will not need to be replaced.

A grouted riprap spillway is required along Reems Road for stormwater inflows.

Right of Way Requirements:

Currently, there is 75 feet of right of way on the north side of Northern Avenue and on the east side of Reems Road. The existing channel lies inside this right of way.

To provide for the new channel, 25 feet of additional right of way will be required along the north side of Northern Avenue for a total of 100 feet, and 85 feet of additional right of way will be required along the east side of Reems Road for a total of 165 feet.

2.2 ADVANTAGES AND DISADVANTAGES

Advantages:

1. Collects all Runoff

All runoff will be collected in this channel from Reems Road to the Agua Fria River. Therefore, unlike Alternative No. 1, the split flow at Reems Road is eliminated which prevents the current flooding condition on the west side of the Base.

2. Maintenance

The entire channel is concrete lined, therefore, very little maintenance will be required.

Disadvantages:

1. Cost

This alternative and Alternative No. 4 are the costliest. The costs are high because the entire channel is concrete lined and all of the structures have to be replaced.

2. Litchfield Road Bridge

Litchfield Road Bridge will have to be replaced which would disrupt traffic. This alternative also requires replacement of the bridge on Luke AFB.

3. Utility Impacts

Since this alternative requires the largest and deepest channel section it is likely that it will have the greatest impact on existing utilities.

4. Most Disruption Through Base

The channel is totally reconstructed through the Base, therefore this alternative will cause the greatest disruption of normal AFB activities.



2.3 COST ESTIMATE (Refer to the Itemized Estimates)

SUMMARY OF COST ESTIMATES FOR ALTERNATIVE 2		
DESCRIPTION	ALTERNATIVE 2	W/O OPTION 1
Cost Reduction (-) / Increase (+)		- \$991,200 (ON-BASE)
Total On-Base Cost	\$9,614,800	\$8,623,600
Total Off-Base Cost	\$3,223,500	\$3,223,500
TOTAL COST	\$12,838,300	\$11,847,100

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 2
COST ESTIMATE

(OFF-BASE PORTION)

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove El Mirage Road Bridge	1 Ea.	\$35,000	\$35,000
Demolish and Remove Farm Bridge	1 Ea.	\$15,000	\$15,000
Demolish and Remove Dysart Road Bridge	1 Ea.	\$25,000	\$25,000
Demolish and Remove Litchfield Road Bridge	1 Ea.	\$35,000	\$35,000
Replace El Mirage Road Bridge (117' x 84')	9,828 S.F.	\$45/S.F.	\$442,300
Replace Dysart Road Bridge (124' x 84')	10,416 S.F.	\$45/S.F.	\$468,700
Replace Litchfield Road Bridge (71' x 120')	9,230 S.F.	\$45/S.F.	\$415,400
Construct 4 - 10' x 7' x 120' B.C. at Dip Section (Sta. 214+40 to Sta. 215+60)	120 L.F.	\$1,200/L.F.	\$144,000
Rebuild and Raise Dip Section on Northern Avenue, Remove and Replace Pavement	1,560 S.Y.	\$15/S.Y.	\$23,400
Channel Excavation (North of Northern Avenue)	29,360 C.Y.	\$3/C.Y.	\$88,100
New 6" Concrete Channel Lining (North of Northern Avenue)	17,983 S.Y.	\$22/S.Y.	\$395,600
Grouted Riprap Erosion Protection	4,995 S.Y.	\$22/S.Y.	\$109,900
SUBTOTAL			\$2,197,400
+ 20% Contingencies			\$439,500
TOTAL CONSTRUCTION COST			\$2,636,900
+ 20% Engineering and Construction Management			\$527,400
Right of Way East of Dysart 6190' x 40' = 247,600 S.F. West of Dysart 430' x 70' = 30,100 S.F. North of Northern = 116,600 S.F.	394,300 S.F.	\$.15/S.F.	\$59,200
TOTAL OFF-BASE COST			\$3,223,500

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 2
COST ESTIMATE

(ON-BASE PORTION)

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove 6" Concrete Lining w/Rebar	681,403 S.F.	\$.75/S.F.	\$511,000
Demolish and Remove Luke A.F.B. Bridge	1 Ea.	\$15,000	\$15,000
Demolish and Remove 2 - 10' x 5.5' x 640' B.C.	37,440 S.F.	\$1/S.F.	\$37,400
Channel Excavation	452,602 C.Y.	\$3/C.Y.	\$1,357,800
Replace Luke A.F.B. Bridge (102' x 26')	2,652 S.F.	\$45/S.F.	\$119,300
Demolish and Remove 10' x 6' x 40' Box Culvert	1,280 S.F.	\$1/S.F.	\$1,300
New Bridge at Driveway Entrance off Northern Avenue (60' x 40')	2,400 S.F.	\$45/S.F.	\$108,000
Remove and Replace RR Track	1,200 L.F.	\$50/L.F.	\$60,000
Construct 4 - 10' x 10' x 640' B.C.	640 L.F.	\$1,600/L.F.	\$1,024,000
New 6" Concrete Lining w/Rebar	155,139 S.Y.	\$22/S.Y.	\$3,413,100
2' Drop Structure at Sta. 134+00	1 Ea.	\$15,000/Ea.	\$15,000
3' Drop Structure at Sta. 139+42	1 Ea.	\$10,000/Ea.	\$10,000
1' Drop Structure at Sta. 187+00	1 Ea.	\$5,000/Ea.	\$5,000
SUBTOTAL			\$6,676,900
+ 20% Contingencies			\$1,335,400
TOTAL CONSTRUCTION COST			\$8,012,300
+20% Engineering and Construction Management			\$1,602,500
TOTAL ON-BASE COST			\$9,614,800

DYSART DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE NO. 2
 COST ESTIMATE

<u>OPTION 1</u>			
Reduce Length of Box Culverts At North End of Runway to 150 Feet			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Reduce Length of 4 - 10' x 10' Box Culverts	- 490 L.F.	\$1600/L.F.	- \$784,000
Channel Excavation	+ 2,500 S.F.	\$2/C.Y.	+ \$5,000
Channel Lining	+ 4,125 C.Y.	\$22/S.Y.	+ \$90,800
CONSTRUCTION COST ADJUSTMENT			- \$688,300
+ 20% Contingencies			- \$137,700
TOTAL CONSTRUCTION COST ADJUSTMENT			- \$826,300
+ 20% Engineering and Construction Management			- \$165,200
TOTAL COST ADJUSTMENT			- \$991,200

SEE SHEET 2

PLAN MATCH LINE

Sta. 10+33 to Sta. 134+85

Remove & Reconstruct Conc. Lined Trapezoidal Channel w/ 20' Bottom Width & 2:1 Side Slopes

Sta. 127+15 - Remove & Replace Litchfield Rd. Bridge

Sta. 72+29 - Remove & Replace Dysart Road Bridge

Remove & Reconstruct Conc. Inflow Spillway

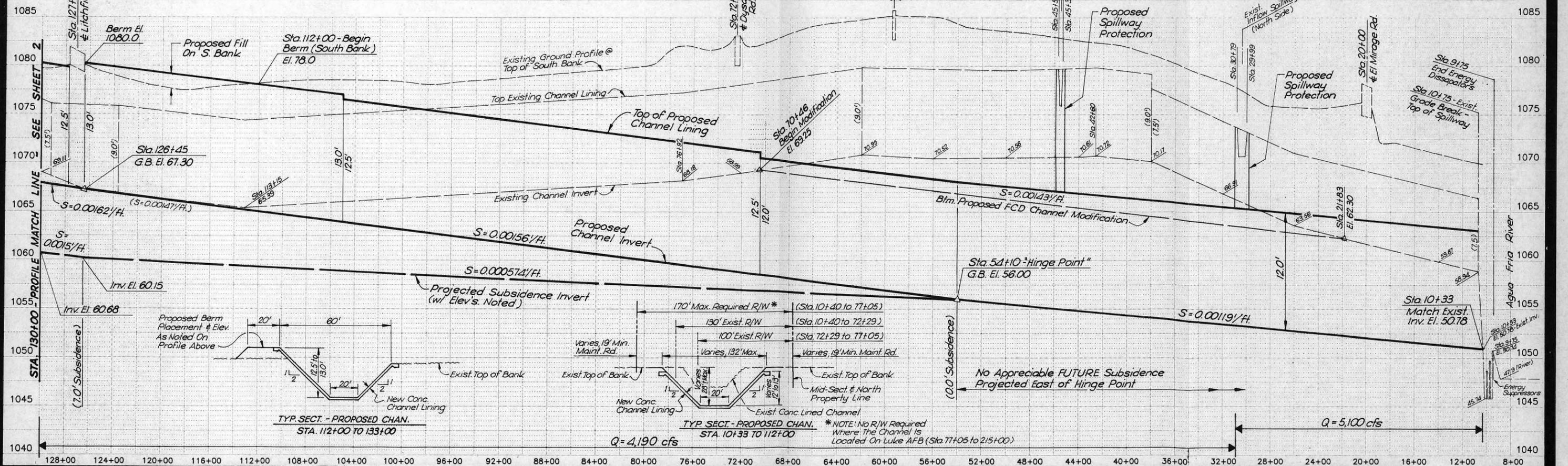
Sta. 20+00 - Remove & Replace El Mirage Rd. Bridge

Sta. 59+21 - Remove Exist. Farm Bridge

Remove & Reconstruct Conc. Inflow Spillway

Sta. 112+00 to 133+00 Proposed Berm On South Bank

Sta. 10+33 - Match Exist. Spillway



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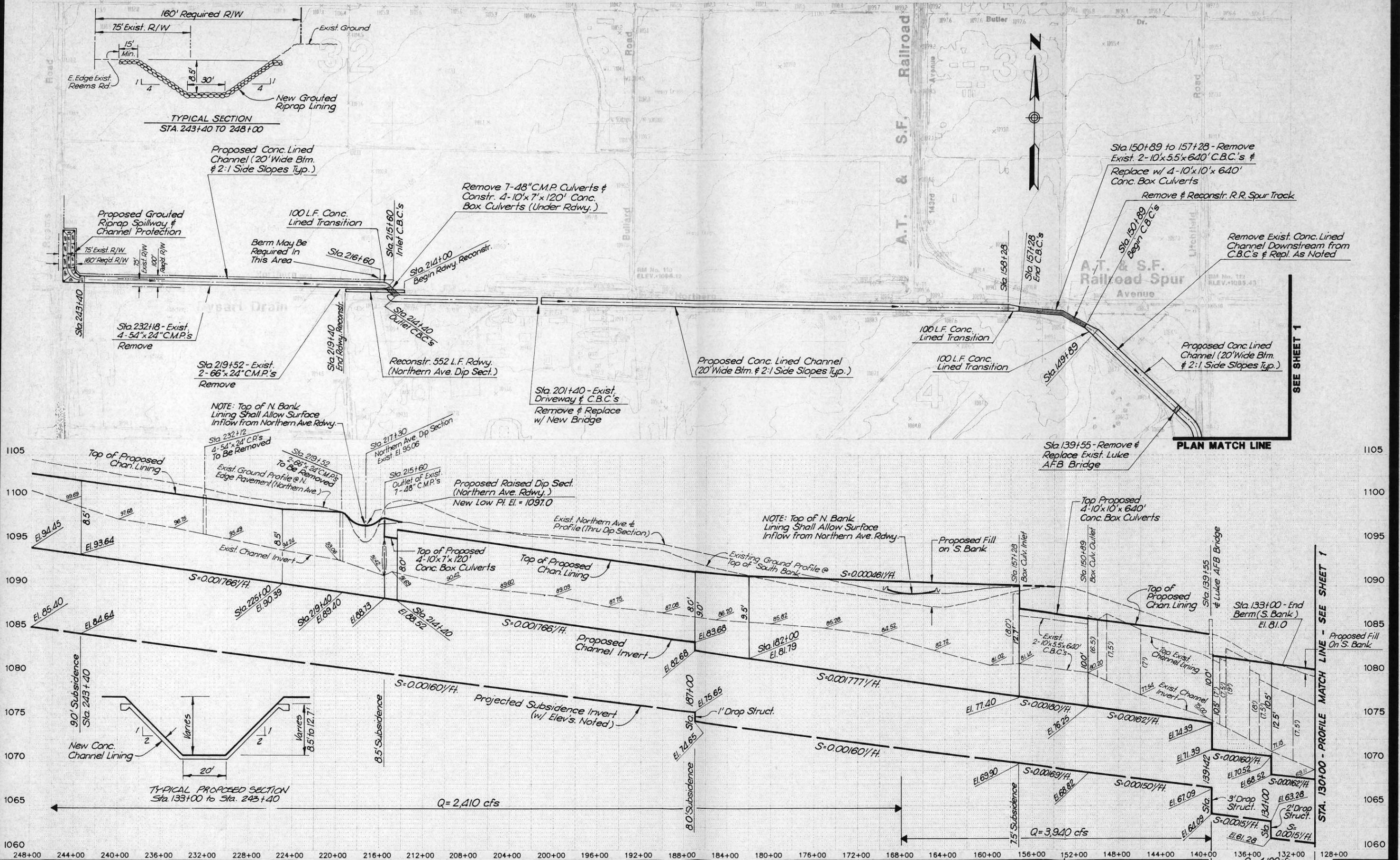
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 2

No.	Date	Item

Scale 1"=400' H. 1"=5' V.
 Job No. 289036-4
 Date 4-20-93
 Drawn By BKF
 Checked By MTG

Sheet 1
 of 2





3.0 ALTERNATIVE NO. 3

This alternative consists of collecting the runoff at Reems Road and Northern Avenue and conveying it south, under Northern Avenue, and around the west side of the Base to Bullard Wash. The remainder of the flows are collected in Dysart Drain and conveyed east to the Agua Fria River. The effect of constructing the channel on the west side of the Base is a significantly reduced flow in the Dysart Drain. This minimizes the channel improvements necessary for the Dysart Drain.

3.1 DESCRIPTION OF IMPROVEMENTS AND R/W REQUIREMENTS (Refer to Plan Sheets)

3.1.1 DYSART DRAIN

Sta. 10+40 to 113+15 (Agua Fria River Upstream to West Side of Base Housing Area)

Channel Improvements:

This portion of the channel again requires complete reconstruction in order to remove the sag in the existing channel just east of Litchfield Road. The channel will still have to be excavated considerably east of Dysart Road to accommodate the anticipated future subsidence even though the flows are reduced compared to Alternative 1 and Alternative 2.

The work includes: removal of the existing concrete channel lining and farm bridge east of Dysart Road; removal and replacement of El Mirage Road and Dysart Road bridges; excavation to lower the channel invert; and new concrete channel lining.

Right of Way Requirements:

An additional 20 feet of right of way is required on the south side of the channel from the Agua Fria River to Dysart Road. The existing right of way in this reach is 130 feet. The required right of way is 150 feet.

In addition to the above requirement, 50 feet of additional right of way, south of the channel, is required from Dysart Road west to the Base (Sta. 72+29 to Sta. 77+05). In this area, the existing right of way is 100 feet and the required right of way is 150 feet.



These right of way requirements were determined for the widest channel section which occurs at the location with the deepest cut (26 foot cut at Sta. 54+00). The right of way is also based on having a maintenance road on each side of the channel. Therefore, the right of way requirement could be reduced by 1) eliminating one maintenance road or 2) narrowing the right of way in areas of shallower cuts. A critical area is where Morton Salt is located, as some of their drying beds may have to be reconfigured to accommodate the proposed channel. This is also where some of the deepest cuts occur.

Sta. 113+15 to 135+00 (West Side of Base Housing to West of Litchfield Road)

Channel Improvements:

The existing concrete lined channel in this reach is to remain and the channel lining is extended to the top of bank. In addition, the south bank is raised east of Litchfield Road to prevent breakout of flows onto the Base housing area. The Base bridge west of Litchfield Road and Litchfield Road bridge both remain.

Right of Way Requirements:

No right of way is required for this reach. The channel is located on Base property.

Sta. 135+00 to 146+00 (West of Litchfield Road to Railroad Box Culverts)

Channel Improvements:

No channel improvements are required in this reach.

Right of Way Requirements:

No right of way is required for this reach.



Sta. 146+00 to 157+78 (Railroad Box Culverts and Upstream and Downstream Transitions)

Channel Improvements:

The improvements for this section of the channel involve the construction of one new 10' x 7' x 640' box culvert that will abut the south edge of the existing box culverts under the railroad at the north end of the runway. The improvements also include new channel transitions on both ends of the new box culvert and removing and replacing the railroad.

There is an option (Option 1) in the cost estimate to reduce the length of the box culverts. The existing box culverts are much longer than what is necessary for the railroad crossing. If Luke AFB can accept an open channel at the end of the runway, there are substantial cost savings in reducing the length of the box culvert. The length required for the railroad is approximately 150 feet which results in a length reduction of 490 feet.

Right of Way Requirements:

No right of way is required in this reach. The improvements are located on Base property.

Sta. 157+78 to 215+60 (Railroad Box Culverts to the Northern Avenue Culvert Crossing)

Channel Improvements:

The existing earthen channel in this section is to be enlarged from Sta. 157+78 to Sta. 185+00 and regraded from Sta. 185+00 to Sta. 215+60. Other improvements include: a long spillway (approximately 1700 feet) to collect flows that concentrate along the AT&SF Railroad; relocation of the Base road that parallels the channel; and raising the south bank of the channel upstream of the railroad box culverts to increase the capacity of the culverts. The existing 10' x 6' box culvert at the Northern Avenue driveway entrance will remain. The culverts at the Northern Avenue dip section will also remain.

An option (Option 2) is included in the cost estimate to concrete-line the channel in this section.

Right of Way Requirements:

No right of way is required in this reach. The channel is located on Base property.



3.1.2 CHANNEL ALONG THE WEST SIDE OF LUKE AFB

Sta. 16+85 to 56+00 (Outlet of South Channel to the End of the Proposed Dikes)

Channel Improvements:

The improvements for this portion of the channel include widening the existing channel bottom width to 150 feet and providing dikes on the south and north side of the channel where shown on the plans. Rock riprap protection at the outlet into Bullard Wash would be required to disperse the flows and reduce the velocity. Also, rock riprap protection would be required on the inside and outside edges of the channel bends.

Right of Way Requirements:

Currently, the existing channel at the south outlet is located in a drainage easement. New right of way or additional drainage easement would be required with an approximate width of 400 feet. The existing easement width is 100 feet. The cost estimate is based on acquiring new right of way.

Sta. 56+00 to 233+60 (End of Dikes on South End to Northern Avenue)

Channel Improvements:

The improvements in this reach consist of an earthen channel with a 150 foot bottom width. Rock riprap is included for the channel bends at the inside and outside edges of the channel. Two drop structures will also be required in this reach along with grouted riprap outlet protection downstream of the box culverts under Northern Avenue.

Right of Way Requirements:

An additional 250 feet of right of way will be required along the west side of Luke AFB from Northern Avenue south, approximately 4500 feet. The new right of way is located west of the existing Luke AFB property line. No right of way is required for the remainder of the channel to the south where it is located on Base property.



Sta. 233+60 to 262+00 (Northern Avenue Box Culverts to Reems Road)

Channel Improvements:

Channel improvements in this reach consist of 4 - 10' x 7' x 150' box culverts under Northern Avenue, channel excavation for a 70 foot bottom width earthen channel, and grouted riprap inflow spillway/channel protection at Reems Road.

Right of Way Requirements:

Currently, there is 75 feet of right of way on the north side of Northern Avenue and on the east side of Reems Road. The existing channel lies inside this right of way.

Additional right of way of 130 feet will be required along the north side of Northern Avenue for a total of 205 feet, and 140 feet of additional right of way will be required along the east side of Reems Road for a total of 215 feet.

3.2 ADVANTAGES AND DISADVANTAGES

Advantages:

1. Collects all Runoff

All flows are collected in channels so that the Base is not impacted by any off-site stormwater flows.

2. Reduced Flow In Dysart Drain

This alternative reduces the amount of flow that reaches the Dysart Drain channel, therefore, it minimizes the reconstruction of Dysart Drain.

3. Cost

This is the second lowest cost of all five alternatives, but very close to the cost of the detention scheme in Alternative 5.

Disadvantages:

1. Channel Outlet

Flow in the west channel is difficult to outlet at the south end of the Base because the channel slope is very flat. In addition, Bullard Wash is not well defined and has no channel banks. Therefore, the west side channel is constructed with dikes on each side where it outlets into Bullard Wash.

2. Additional Right of Way

Additional right of way is required around the west and south side of Luke AFB.

3. Increased Maintenance

The west channel will require a significant amount of maintenance since it is not lined.

4. Channelized Flows South Including Low Flows

This alternative, as well as the other 4 alternatives, reduces the 100-year peak discharge in Bullard Wash with the improvement of Dysart Drain. However, the addition of the west side channel will result in higher flows during the more frequent storms.

Currently, the stormwater runoff from small floods is all collected in the Dysart Drain and conveyed to the Agua Fria River. In the case of Alternative 3, these low flows will be conveyed to Bullard Wash. The result will be more frequent flooding along Bullard Wash which includes several roadway crossings to the south. In addition, crop damage along Bullard Wash may increase as a result of the more frequent flooding.



3.3 COST ESTIMATE (Refer to the Itemized Estimates)

SUMMARY OF COST ESTIMATES FOR ALTERNATIVE 3				
DESCRIPTION	ALT NO. 3	W/OPTION 1	W/OPTION 2	W/OPTION 3
Cost Reduction (-) / Increase (+)		-\$171,200 (ON-BASE)	+\$527,600 (ON-BASE)	+\$4,176,400 (ON-BASE) +\$359,700 (OFF-BASE)
Total On-Base Cost	\$6,380,800	\$6,209,600	\$6,908,400	\$10,557,200
Total Off-Base Cost	\$3,698,900	\$3,698,900	\$3,698,900	\$4,058,600
TOTAL COST	\$10,079,700	\$9,908,500	\$10,607,300	\$14,615,800

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 3
COST ESTIMATE

(OFF-BASE PORTION)

DYSART DRAIN EAST OF LITCHFIELD ROAD			
DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove El Mirage Road Bridge	1 Ea.	\$35,000	\$35,000
Demolish and Remove Dysart Road Bridge	1 Ea.	\$25,000	\$25,000
Demolish and Remove Farm Bridge	1 Ea.	\$15,000	\$15,000
Replace El Mirage Road Bridge (92' x 84')	7728 S.F.	\$45/S.F.	\$347,800
Replace Dysart Road Bridge (98' x 84')	8232 S.F.	\$45/S.F.	\$370,400
CONSTRUCTION COST SUBTOTAL (Dysart Drain)			\$793,200
Right of Way 50' x 430' = 21,500 S.F. 20' x 6190 = <u>123,800</u> S.F. 145,300 S.F.	145,300 S.F.	\$.15/S.F.	\$21,800
CHANNEL ALONG WEST SIDE OF BASE (OFF-BASE PROPERTY) AND NORTH OF NORTHERN AVENUE TO REEMS ROAD			
Grouted Riprap Spillway and Channel Protection at Reems Road	8745 S.Y.	\$22/S.Y.	\$192,400
Inlet and Outlet Protection of 4 - 10' x 7' x 150' B.C.'s	3160 S.Y.	\$22/S.Y.	\$69,500
4 - 10' x 7' x 150' B.C.'s	150 L.F.	\$1200/L.F.	\$180,000
Channel Excavation	297085 C.Y.	\$3/C.Y.	\$891,300
3' Drop Structure (Grouted Riprap 2018 S.Y. @ \$22/S.Y.) (Concrete Retaining Wall 1548 S.F. @ \$30/S.F.)	1 Ea.	\$90,800	\$90,800
2' Drop Structure (Grouted Riprap 1995 S.Y. @ \$22/S.Y.) (Concrete Retaining Wall 1215 S.F. @ \$30/S.F.)	1 Ea.	\$80,300	\$80,300

CONSTRUCTION COST SUBTOTAL (North and South of Northern Avenue)			\$1,504,300
Right of Way North Northern - 385,270 S.F. W. Side of Base- 250' x 4450' = 1,112,500 S.F. S. Side of Base- 400' x 2400' = 960,000 S.F.	2,457,770 S.F.	\$.15/S.F.	\$368,700
TOTAL CONSTRUCTION COST (W/O Contingencies)			\$2,297,500
+ 20% Contingencies			\$459,500
TOTAL CONSTRUCTION COST			\$2,757,000
+ 20% Engineering and Construction Management			\$551,400
TOTAL RIGHT OF WAY COST			\$390,500
TOTAL OFF-BASE COST			\$3,698,900

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 3
COST ESTIMATE

(ON-BASE PORTION)

DYSART DRAIN			
DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove 6" Concrete Lining w/Rebar (East of Litchfield Road)	500,050 S.F.	\$.75/S.F.	\$375,000
New 6" Concrete Lining w/Rebar (Includes Extending Lining from STA. 113+15 to STA 135+00)	78,166 S.Y.	\$22/S.Y.	\$1,719,700
Channel Excavation (East of Litchfield Road)	255,000 C.Y.	\$3.00/C.Y.	\$765,000
Demolish and Remove 6" Concrete Lining w/Rebar (North of Runway)	21,519 S.F.	\$.75/S.F.	\$16,100
Replace Transition/Retaining Walls Downstream and Upstream of 2 - 10' x 5.5' and 1 - 10' x 7' B.C.	2000 S.F.	\$30/S.F.	\$60,000
Channel Excavation (B.C.'s West to Ex. 7 - 48" CMP's at Northern Avenue Dip Section)	12,450 C.Y.	\$2.00/C.Y.	\$24,900
1 - 10' x 7' x 640' Box Culvert	640 L.F.	\$370/L.F.	\$236,800
Grouted Riprap Bank Protection Upstream of 2 - 10' x 5.5' B.C.'s (North Side of Channel Only)	4,700 S.Y.	\$22/S.Y.	\$103,400
Remove and Reconstruct Base Roadway on North Side of Luke AFB 3360 L.F. x 24 Ft. = 8960 S.Y.	8960 S.Y.	\$15/S.Y.	\$134,400
Remove and Replace RR Track	600 L.F.	\$50/L.F.	\$30,000
CONSTRUCTION COST SUBTOTAL (Dysart Drain)			\$3,465,300
CHANNEL ALONG WEST SIDE OF BASE (ON-BASE PROPERTY)			
Channel Excavation on West and South Side of Base	383,995 C.Y.	\$1/C.Y. (Place Fill On-Site)	\$384,000
Riprap Bank Protection	11,635 C.Y.	\$50/C.Y.	\$581,800

CONSTRUCTION COST SUBTOTAL	\$965,800
TOTAL CONSTRUCTION COST (W/O Contingencies)	\$4,431,100
+ 20% Contingencies	\$886,200
TOTAL CONSTRUCTION COST	\$5,317,300
+ 20% Engineering and Construction Management	\$1,063,500
TOTAL ON-BASE COST	\$6,380,800

DYSART DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE NO. 3
 COST ESTIMATE

<u>OPTION 1</u>			
Reduce Length of Box Culverts At North End of Runway to 150 Feet			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Reduce Length of 1 - 10' x 7' Box Culvert	- 490 L.F.	\$370/L.F.	- \$181,300
Remove 2 - 10' x 5.5' Box Culverts (490' Length)	+ 28,700 S.F.	\$1/S.F.	+ \$28,700
Channel Excavation	+ 2,000 C.Y.	\$2/C.Y.	+ \$4,000
Grouted Riprap Bank Protection Upstream of Box Culverts (North Side Only)	+ 1,350 S.Y.	\$22/S.Y.	+ \$29,700
CONSTRUCTION COST ADJUSTMENT			- \$118,900
+ 20% Contingencies			- \$23,800
TOTAL CONSTRUCTION COST ADJUSTMENT			- \$142,700
+ 20% Engineering and Construction Management			- \$28,500
TOTAL COST ADJUSTMENT			- \$171,200

DYSART DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE NO. 3
 COST ESTIMATE

<u>OPTION 2</u>			
Provide Concrete Channel Lining Along North Edge of Luke AFB Between Northern Avenue Dip Section and Entrance to Box Culverts at the End of the Runway			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Concrete Channel Lining	+ 27,900 S.Y.	\$22/S.Y.	+ \$613,800
Grouted Riprap Bank Protection Upstream of 2 - 10'x5.5' B.C.'s (North Side of Channel Only)	- 4,700 S.Y.	\$22/S.Y.	- \$103,400
Remove and Replace Access Road on North Side of Luke AFB	- 9,600 S.Y.	\$15/S.Y.	- \$144,000
CONSTRUCTION COST ADJUSTMENT			+ \$366,400
+ 20% Contingencies			+ \$73,300
TOTAL CONSTRUCTION COST ADJUSTMENT			+ \$439,700
+ 20% Engineering and Construction Management			+ \$87,900
TOTAL COST ADJUSTMENT			+ \$527,600

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 3
COST ESTIMATE

<u>OPTION 3</u>			
Provide Concrete Channel Lining Along West Side of Luke AFB			
OFF-BASE COST ADJUSTMENT			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Concrete Channel Lining	+ 29,450 S.Y.	\$22/S.Y.	+ \$647,900
Grouted Riprap Outlet Protection Downstream of 4 - 10' x 7' B.C.'s	- 1,600 S.Y.	\$22/S.Y.	- \$35,200
Drop Structures (2 Drops)	Job	\$171,100/Job	- \$171,100
Channel Excavation	- 40,500 C.Y.	\$3/C.Y.	- \$121,500
CONSTRUCTION COST ADJUSTMENT			+ \$320,100
+ 20% Contingencies			+ \$64,000
TOTAL CONSTRUCTION COST ADJUSTMENT			+ \$384,100
Right of Way 150' Width Reduction (150' x 4500')	-675,000 S.F.	\$.15/S.F.	- \$101,200
+ 20% Engineering and Construction Management			+ \$76,800
TOTAL OFF-BASE COST ADJUSTMENT			+ \$359,700
ON-BASE COST ADJUSTMENT			
Concrete Channel Lining	+161,700 S.Y.	\$22/S.Y.	+ \$3,557,400
Channel Excavation	-192,000 C.Y.	\$1/C.Y.	- \$192,000
Bank Protection	- 9,300 C.Y.	\$50/C.Y.	- \$465,000
CONSTRUCTION COST ADJUSTMENT			+ \$2,900,400
+ 20% Contingencies			+ \$580,000
TOTAL CONSTRUCTION COST ADJUSTMENT			+ \$3,480,400
+ 20% Engineering and Construction Management			+ \$696,000
TOTAL ON-BASE COST ADJUSTMENT			+ \$4,176,400

PLAN MATCH LINE

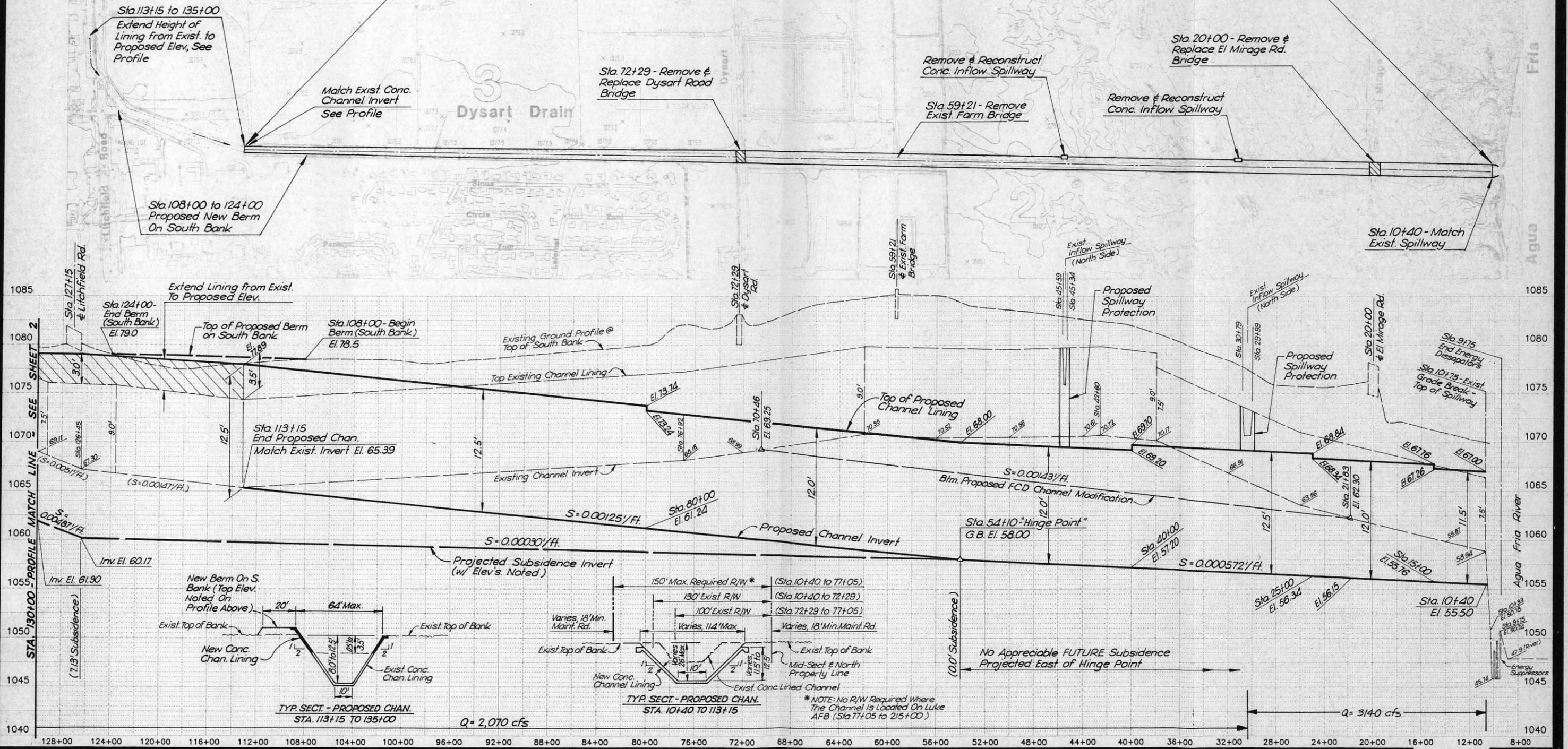
SEE SHEET 2

Sta. 10+40 to Sta. 113+15

Remove & Reconstruct Conc. Lined Trapezoidal Channel w/ 10' Bottom Width & 2:1 Side Slopes



Fria River
Agua Fria River



Sta. 113+15 to 135+00
Extend Height of Lining from Exist. to Proposed Elev. See Profile

Match Exist. Conc. Channel Invert See Profile

Sta. 72+29 - Remove & Replace Dysart Road Bridge

Remove & Reconstruct Conc. Inflow Spillway

Sta. 20+00 - Remove & Replace El Mirage Rd. Bridge

Remove & Reconstruct Conc. Inflow Spillway

Sta. 59+21 - Remove Exist. Farm Bridge

Sta. 108+00 to 124+00
Proposed New Berm On South Bank

Extend Lining from Exist. To Proposed Elev.

Sta. 108+00 - Begin Berm (South Bank) El. 78.5

Existing Ground Profile @ Top of South Bank

Top Existing Channel Lining

Top of Proposed Channel Lining

Proposed Spillway Protection

Proposed Spillway Protection

Sta. 9+75 End Energy Dissipators

Sta. 10+75 - Exist. Grade Break - Top of Spillway

Sta. 124+00 - End Berm (South Bank) El. 79.0

Top of Proposed Berm on South Bank

Sta. 113+15 End Proposed Chan. Match Exist. Invert El. 65.39

Existing Channel Invert

Proposed Channel Invert

Blm. Proposed FCD Channel Modification

Sta. 51+10 "Hinge Point" G.B. El. 58.00

Sta. 40+00 El. 57.20

Sta. 25+00 El. 56.34

Sta. 10+40 El. 55.50

New Berm On S. Bank (Top Elev. Noted On Profile Above)

Exist. Top of Bank

New Conc. Chan. Lining

Exist. Conc. Chan. Lining

TYP. SECT. - PROPOSED CHAN. STA. 113+15 TO 135+00

Projected Subsidence Invert (w/ Elev's. Noted)

Exist. Top of Bank

New Conc. Channel Lining

Exist. Conc. Lined Channel

TYP. SECT. - PROPOSED CHAN. STA. 10+40 TO 113+15

150' Max. Required R/W*

130' Exist. R/W

100' Exist. R/W

Varies, 114' Max.

Varies, 18' Min. Maint. Rd.

Mid. Sect. & North Property Line

Exist. Top of Bank

* NOTE: No R/W Required Where The Channel is Located On Luke AFB (Sta. 77+05 to 215+00)

(0.0' Subsidence)

No Appreciable FUTURE Subsidence Projected East of Hinge Point

Q = 3140 cfs



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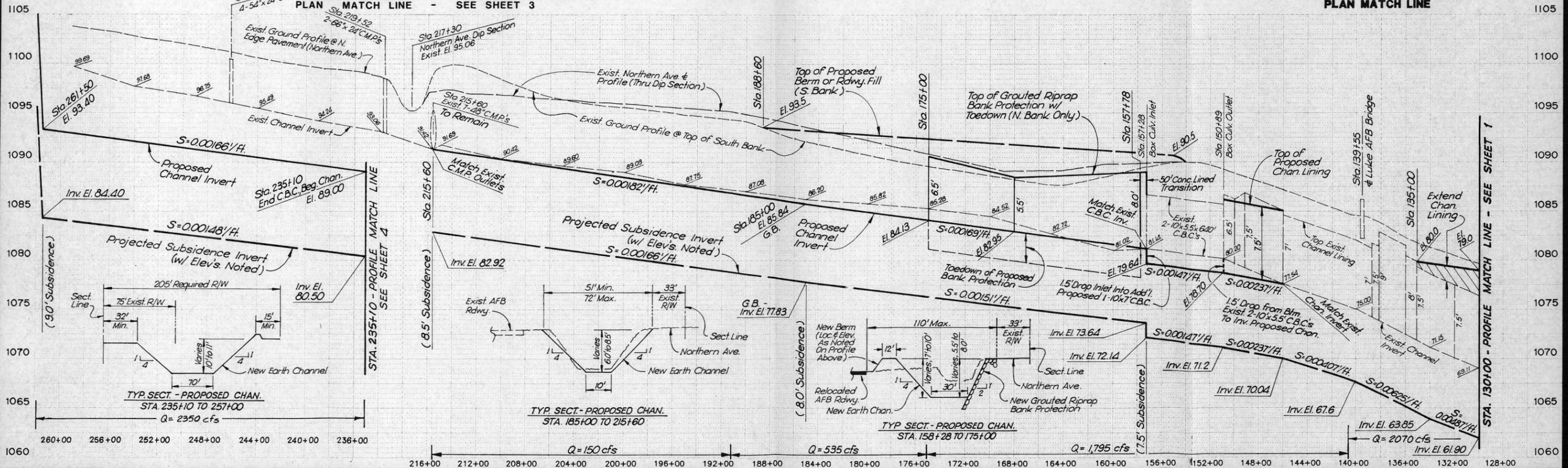
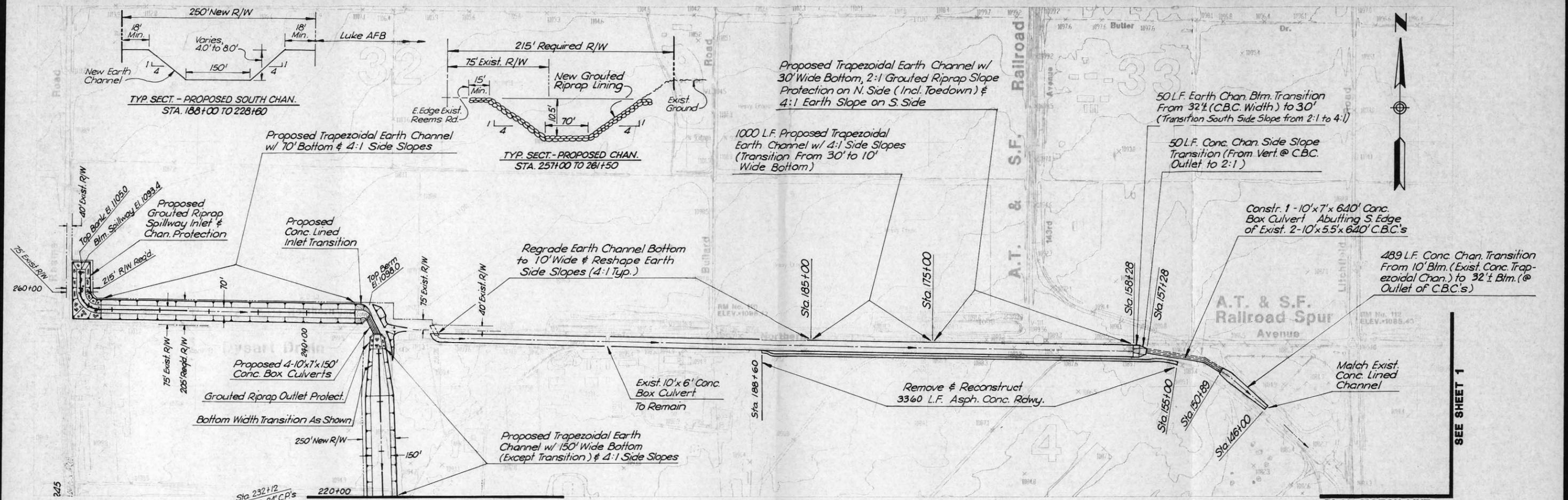
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 3

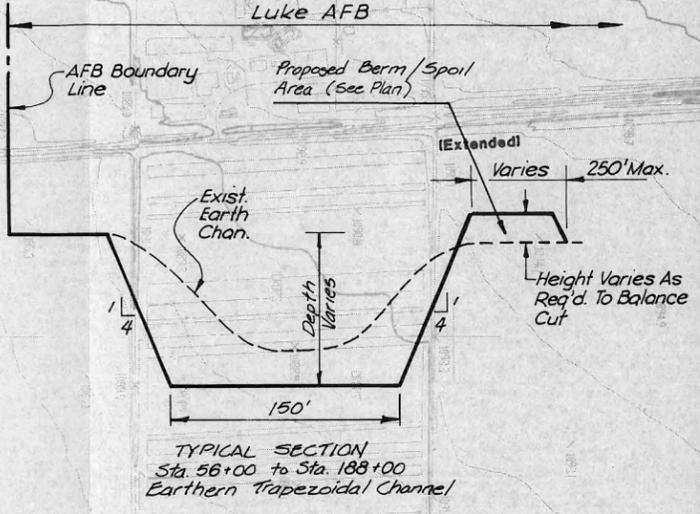
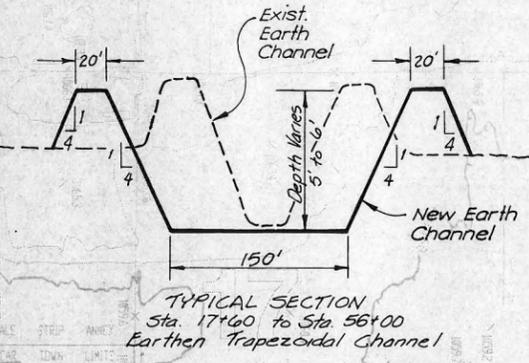
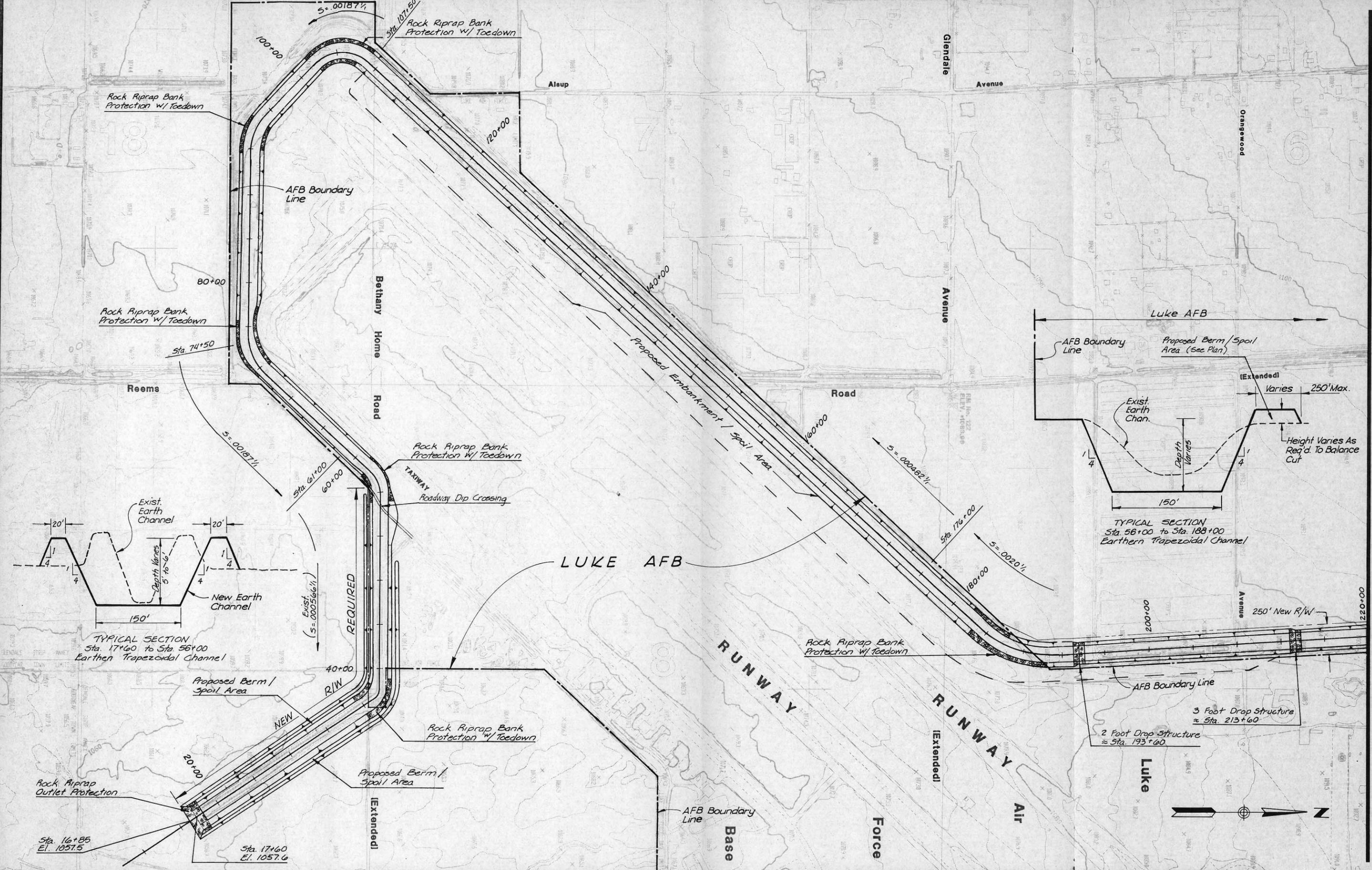
No.	Date	Item

Scale 1"=400' H. 1"=5' V.
Job No. 289036-4
Date 4-20-93
Drawn By BKF
Checked By MTG

Sheet 1
Of 4



No.	Date	Item



PLAN MATCH LINE - SEE SHEET 2



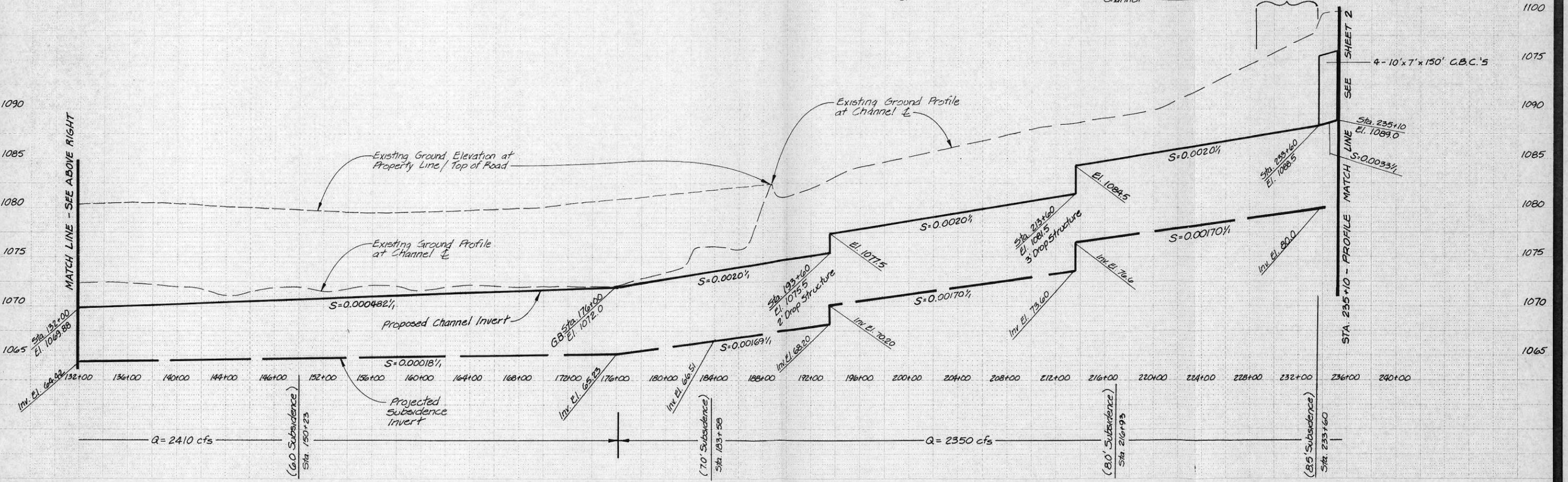
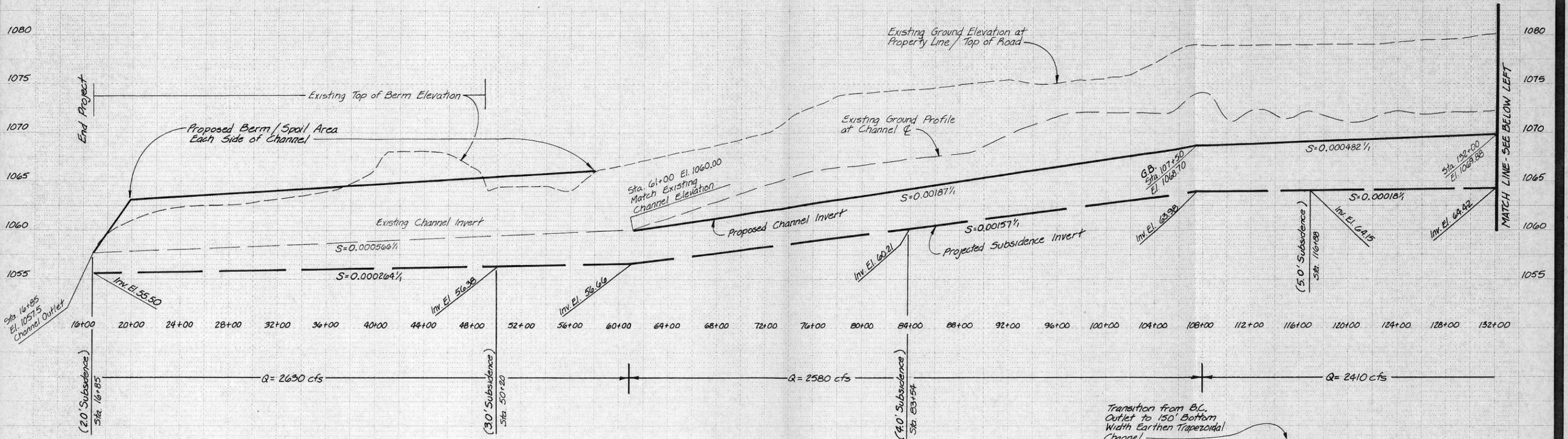
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 3
Channel Around West Side Of Luke A.F.B.

No.	Date	Item

Scale 1"=400' H. 1"=5' V.
 Job No. 289036-4
 Date 4-20-93
 Drawn By BKF
 Checked By MTG



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 3

Channel Profile Around West Side Of Luke A.F.B.

No.	Date	Item

Scale 1" = 400' H. 1" = 5' V.
 Job No. 289036-4
 Date 4-20-93
 Drawn By BKF
 Checked By MTG

4.0 ALTERNATIVE NO. 4

This alternative includes a large detention basin (290 ac.) which collects and detains all of the runoff from the 100-year flood that currently reaches the Dysart Drain between Reems Road and the AT&SF Railroad. The outflow from the basin is conveyed to the Agua Fria River in the Dysart Drain.

The basin was designed to reduce the peak discharge in the Dysart Drain down to the capacity of the existing culverts under the railroad. Therefore, much of the existing Dysart Drain Channel will not require any improvement including the entire reach from the railroad downstream to the sag point in the channel east of Litchfield Road. However, due to the subsidence problem, the channel will require reconstruction from the sag point out to the Agua Fria River.

4.1 DESCRIPTION OF IMPROVEMENTS AND R/W REQUIREMENTS (Refer to Plan Sheets)

Sta. 10+40 to 113+15 (Agua Fria River Upstream to West Side of the Base Housing Area)

Channel Improvements:

This portion of the channel requires complete reconstruction in order to remove the sag in the existing channel east of Litchfield Road. The work includes: removing the existing concrete channel lining and existing farm bridge east of Dysart Road; excavation to lower the channel invert; removal and replacement of the El Mirage Road and Dysart Road bridges; and new concrete channel lining.

Right of Way Requirements:

An additional 20 feet of right of way is required on the south side of the channel from the Agua Fria River to Dysart Road. The existing right of way in this reach is 130 feet. The required right of way is 150 feet.

In addition to the above requirement, 50 feet of additional right of way is required between Dysart Road and the Base (Sta. 72+29 to Sta. 77+05). In this area, the existing right of way is 100 feet and the required right of way is 150 feet.

These right of way requirements were determined for the widest channel section which occurs at the location with the deepest cut (26 foot cut at Sta. 54+00). The right of way is also based on having a maintenance road on each side of the channel. Therefore, the right of way requirement could be reduced by 1) eliminating one maintenance road or 2) narrowing the right of way in areas of shallower cuts. A critical area is where Morton Salt is located, as some of their drying beds may have to be reconfigured to accommodate the proposed channel. This is also where some of the deepest cuts occur.

Sta. 113+15 to 157+28 (West Side of Base Housing to the Railroad)

Channel Improvements:

The existing concrete lined channel in this reach is to remain. The channel lining is extended to the top of bank from Sta. 113+15 to Sta. 134+00. The bridge at Litchfield Road, the Base bridge west of Litchfield and the long culverts under the railroad all remain as is.

Right of Way Requirements:

No right of way is required for this reach.

Sta. 157+28 to 166+50 (Railroad Box Culverts to the Detention Basin Outlet)

Channel Improvements:

The existing earthen channel in this section is to be concrete lined from the detention basin outlet downstream to the inlet of the box culverts under the railroad. The channel construction includes raising the existing top of the south bank in order to increase the capacity of the box culverts.

Right of Way Requirements:

No right of way is required in this reach. The improvements are located on Base property.



Sta. 166+50 to Detention Basin (Detention Basin and Outlet Structure)

Basin Construction:

A new 290-acre detention basin is to be constructed on the north side of Northern Avenue from Reems Road east to the AT&SF Railroad (about 1.5 miles in length). To compensate for the slope of the land, the basin is terraced. The result is two basins, one on the west side and one on the east side, that are interconnected with an 8' x 5' box culvert. The outlet for both basins is a double 8' x 5' box culvert under Northern Avenue that discharges to the Dysart Drain. These basins and outlet box culverts are designed to reduce the 100-year peak outflow to Dysart Drain so that the existing channel elements from the existing 2- 10' x 5.5' x 640' box culvert to the sag east of Litchfield Road can contain the outflow without any modifications.

The basins are designed to incorporate spoil areas so that the cut from the basin can be balanced on-site.

Other basin elements include the use of small berms along the north side of the basin to direct flows to grouted riprap inflow spillways. Bank protection will also be required at the major inflow points along Reems Road and along the AT&SF Railroad.

Emergency overflow spillways, which are located at existing ground elevation on the southwest, south, and northeast side of the basin, have been sized to allow the Probable Maximum Flood to pass without breaching the proposed berms around the south and east side of the basin. Another spillway is located at the "terrace" of the interconnected basins to allow overflow into the eastern basin in case of large inflows to the west basin.

Right of Way Requirements:

The detention basin requires the acquisition of 290 acres of agricultural land north of Northern Avenue.

4.2 ADVANTAGES AND DISADVANTAGES

Advantages:

1. Minimizes Channel Construction

The detention basin significantly reduces the peak discharge in Dysart Drain. Consequently, much of the existing channel improvements remain as is; including: the Railroad box culverts, the Base bridge and Litchfield Road bridge.

2. Collects all Runoff

This alternative collects all the runoff from Reems Road to the Agua Fria River. Therefore, the current split flow that occurs at Reems Road and Northern Avenue will be eliminated.

3. Protection from Future Land Subsidence

Although each alternative presented in this study has been designed to accommodate future land subsidence; the detention basin provides added protection. If more subsidence occurs than what is anticipated, the channel alternatives (Alternative Nos. 1, 2, and 3) could lose significant capacity. This could greatly reduce the level of flood protection provided by the channel, whereas, the detention basin would continue to function even if more than the expected amount of subsidence occurs. Under these circumstances, the outflow from the basin may cause flooding but the frequency and severity of the flooding would be substantially less than with the channel alternatives.

Disadvantages:

1. Most Costly

This alternative and Alternative No. 2, where all the flow is conveyed to the Agua Fria River, are the two most costly solutions.

2. Maintenance

The detention basin presents a large maintenance requirement.

3. Right of Way Acquisition

This alternative requires a 290 acre acquisition for the detention basin.



4.3 COST ESTIMATE (Refer to the Itemized Estimates)

SUMMARY OF COST ESTIMATES FOR ALTERNATIVE 4	
DESCRIPTION	ALTERNATIVE 4
Total On-Base Cost	\$4,023,800
Total Off-Base Cost	\$8,590,300
TOTAL COST	\$12,614,100

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 4
COST ESTIMATE

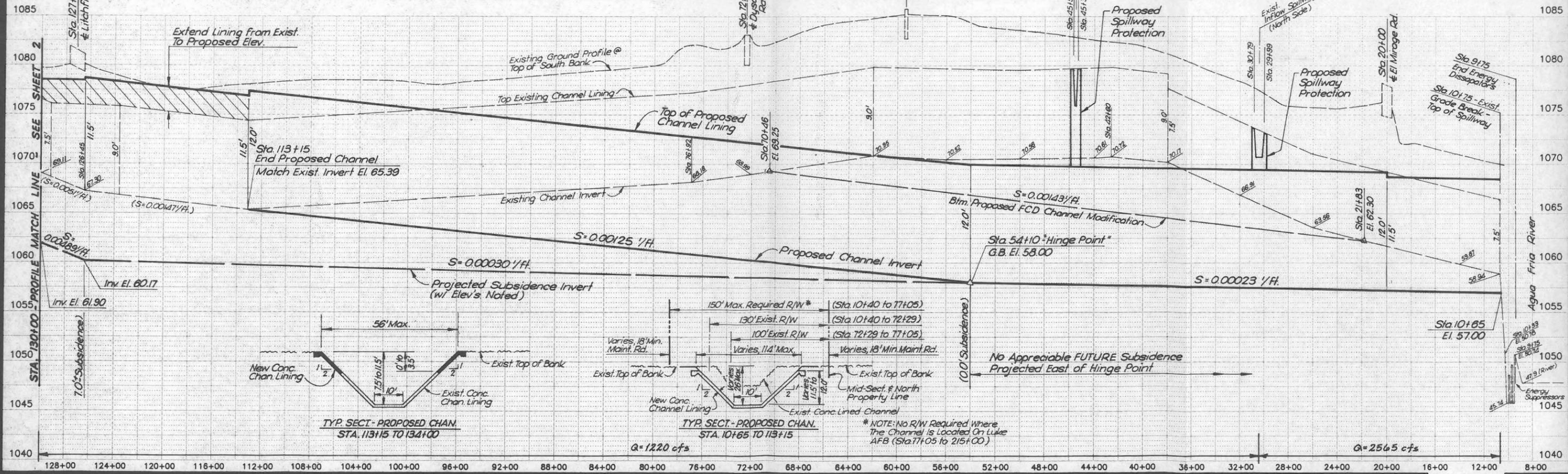
(OFF-BASE PORTION)

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove El Mirage Road Bridge	1 Ea.	\$35,000	\$35,000
Demolish and Remove Farm Bridge	1 Ea.	\$15,000	\$15,000
Demolish and Remove Dysart Road Bridge	1 Ea.	\$25,000	\$25,000
Replace El Mirage Road Bridge (85' x 84')	7,140 S.F.	\$45/S.F.	\$321,300
Replace Dysart Road Bridge (100' x 84')	8,400 S.F.	\$45/S.F.	\$378,000
Detention Basin Cut Volumes	3,263,935 C.Y.	\$1/C.Y.	\$3,263,900
Construct 2 - 8' x 5' x 270' C.B.C.'s at Southeast Corner of Detention Basin #2	270 L.F.	\$435/L.F.	\$117,500
Construct 1 - 8' x 5' x 100' C.B.C. that Connects Detention Basins #1 and #2	100 L.F.	\$250/L.F.	\$25,000
Grouted Riprap Bank Protection at Detention Basins' Spillways and Culverts	34,670 S.Y.	\$22/S.Y.	\$762,700
SUBTOTAL			\$4,943,400
+ 20% Contingencies			\$988,700
TOTAL CONSTRUCTION COST			\$5,932,100
+ 20% Engineering and Construction Management			\$1,186,400
Right of Way (Channel) 50' x 430' = 21,500 S.F. 20' x 6190' = <u>123,800</u> S.F. 145,300 S.F.	145,300 S.F.	\$.15/S.F.	\$21,800
Right of Way (Detention Basin)	290 Ac.	\$5,000/Ac.	\$1,450,000
TOTAL OFF-BASE COST			\$8,590,300

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 4
COST ESTIMATE

(ON-BASE PORTION)

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove 6" Concrete Lining w/Rebar	496,226 S.F.	\$.75/S.F.	\$372,200
Channel Excavation	216,071 C.Y.	\$3/C.Y.	\$648,200
New 6" Concrete Lining w/Rebar	80,633 S.Y.	\$22/S.Y.	\$1,773,900
		SUBTOTAL	\$2,794,300
		+ 20% Contingencies	\$558,900
		TOTAL CONSTRUCTION COST	\$3,353,200
		+ 20% Engineering and Construction Management	\$670,600
		TOTAL ON-BASE COST	\$4,023,800



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 4

No.	Date	Item

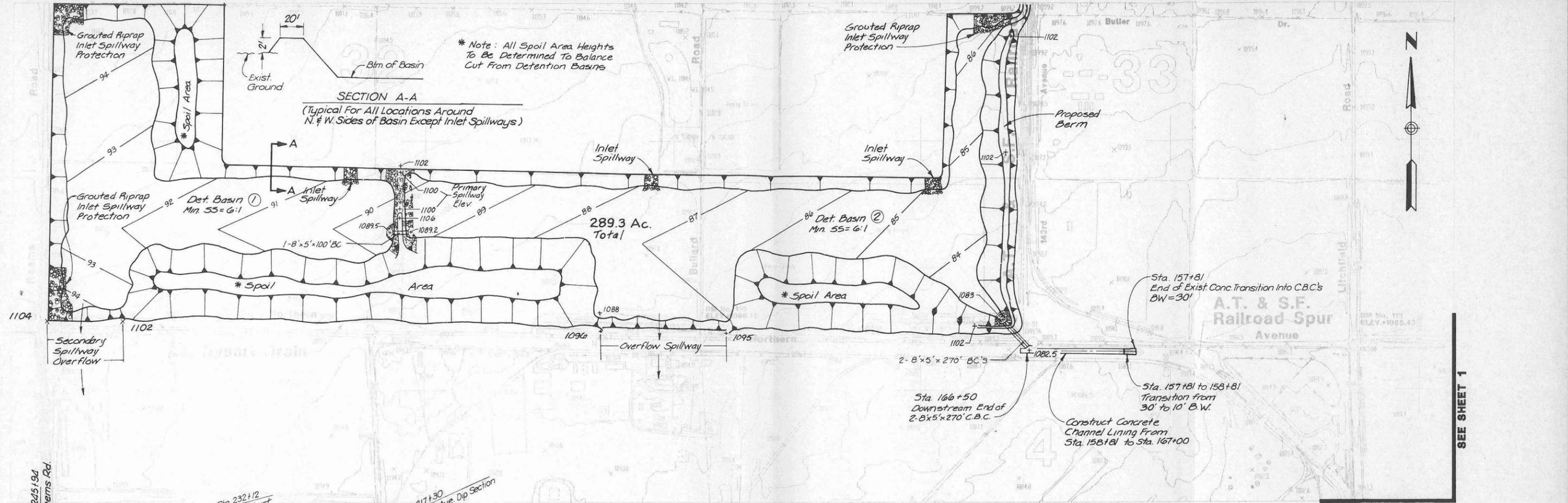
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Job No. 289036-4

Date 4-20-93

Drawn By BKF

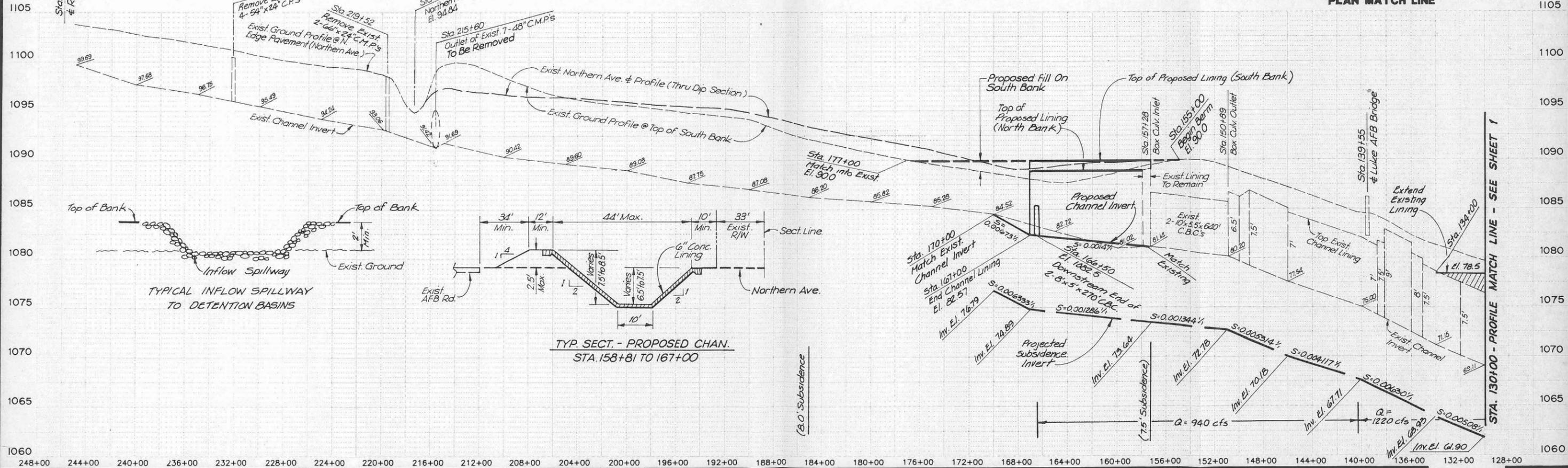
Checked By MTG



SECTION A-A
(Typical For All Locations Around N. & W. Sides of Basin Except Inlet Spillways)

* Note: All Spoil Area Heights To Be Determined To Balance Cut From Detention Basins

PLAN MATCH LINE



TYPICAL INFLOW SPILLWAY TO DETENTION BASINS

TYP. SECT. - PROPOSED CHAN. STA. 158+81 TO 167+00

STA. 130+00 - PROFILE MATCH LINE - SEE SHEET 1

No.	Date	Item



5.0 ALTERNATIVE NO. 5

This alternative includes two separate detention basins. A 125-acre basin is located at Reems Road and Northern Avenue and a 116-acre basin is located at Northern Avenue and the Atchison, Topeka and Santa Fe Railroad.

The 125-acre basin adjacent to Reems Road detains runoff from the 100-year flood and discharges at a reduced flow (approximately 550 cfs) into a proposed channel to Bullard Wash. The channel is located on Luke AFB property along the west and south sides of the Base.

The 116-acre basin adjacent to the AT&SF Railroad also detains runoff from the 100-year flood. The reduced outflow (approximately 950 cfs) is metered into Dysart Drain and conveyed east to the Agua Fria River.

The 116-acre basin was designed to reduce the peak discharge in the Dysart Drain down to the capacity of the existing culverts under the railroad. Therefore, much of the existing Dysart Drain Channel will not require any improvement including the entire reach from the railroad box culvert downstream to the sag point in the channel east of Litchfield Road. However, due to the subsidence problem, the channel will require reconstruction from the sag point out to the Agua Fria River.

5.1 DESCRIPTION OF IMPROVEMENTS AND R/W REQUIREMENTS (Refer to Plan Sheets)

5.1.1 DYSART DRAIN

Sta. 10+40 to 113+15 (Agua Fria River Upstream to West Side of Base Housing Area)

Channel Improvements:

As with the other alternatives, this portion of the channel requires complete reconstruction in order to remove the sag in the existing channel just east of Litchfield Road. The channel will still have to be excavated considerably east of Dysart Road to account for projected future subsidence even though the flows are considerably reduced compared to Alternatives 1, 2, and 3.

The work includes: removal of the existing concrete channel lining and farm bridge east of Dysart Road; removal and replacement of El Mirage Road and Dysart Road bridges; excavation to lower the channel invert; and new concrete channel lining.



Right of Way Requirements:

An additional 20 feet of right of way is required on the south side of the channel from the Agua Fria River to Dysart Road. The existing right of way in this reach is 130 feet. The required right of way is 150 feet.

In addition to the above requirement, 50 feet of additional right of way is required between Dysart Road and the Base (Sta. 72+29 to Sta. 77+05). In this area, the existing right of way is 100 feet and the required right of way is 150 feet.

These right of way requirements were determined for the widest channel section which occurs at the location with the deepest cut (26 foot cut at Sta. 54+00). The right of way is also based on having a maintenance road on each side of the channel. Therefore, the right of way requirement could be reduced by 1) eliminating one maintenance road or 2) narrowing the right of way in areas of shallower cuts. A critical area is where Morton Salt is located, as some of their drying beds may have to be reconfigured to accommodate the proposed channel. This is also where some of the deepest cuts occur.

Sta. 113+15 to 157+28 (West Side of Base Housing to the Railroad)

Channel Improvements:

The existing concrete lined channel in this reach is to remain and the channel lining is extended to the top of bank. The Base bridge west of Litchfield Road, the Litchfield Road bridge and the culvert under the railroad all remain as is.

Right of Way Requirements:

No right of way is required for this reach.

Sta. 157+28 to 166+50 (Railroad Box Culverts to the Detention Basin Outlet)

Channel Improvements:

Channel improvements in this reach consist of channel excavation to lower the channel invert, new concrete channel lining from Sta. 157+81 to Sta. 167+00, and elevating the south bank to prevent breakout flows to the south.



Right of Way Requirements:

No right of way is required for this reach. The improvements are located on the Base property.

116-Acre Detention Basin West of AT&SF Railroad

Basin Construction:

A new 116-acre detention basin is to be constructed on the north side of Northern Avenue, west of the AT&SF Railroad. The basin and outlet culverts are sized to reduce the peak outflow into Dysart Drain so that the existing 2 - 10' x 5.5' box culverts at the north end of the runway have adequate capacity to pass the 100-year flow.

The channel downstream to the sag east of Litchfield Road would also remain as the existing capacity is adequate to convey this flow.

Two - 8' x 5' x 270' box culverts under Northern Avenue would connect the detention basin to Dysart Drain.

The basin is designed to incorporate spoil areas so that the cut from the basin can be balanced on-site.

A small berm will be required along the north side of the basin to direct flows to two grouted riprap inflow spillways. A grouted riprap spillway will also need to be located where a majority of the flows enter the basin along the AT&SF railroad. Emergency overflow spillways, which are located at existing ground elevation on the southeast and northeast corner of the basin, have been sized to pass the Probable Maximum Flood without breaching the berms on the south and east side of the basin.

Right of Way Requirement:

The detention basin requires the acquisition of 116 acres of agricultural land north of Northern Avenue.



5.1.2 CHANNEL AROUND WEST AND SOUTH SIDE OF LUKE AIR FORCE BASE

Sta. 18+75 to 233+60 (Bullard Wash to Northern Avenue)

Channel Improvements:

The channel in this reach consists of utilizing the existing earthen channel from the outlet at Sta. 18+75 to Sta. 61+00. From Sta. 61+00 to Sta. 188+90 it will be deepened and widened to a 50 foot bottom width and the side slopes will vary to match the existing channel sides. From Sta. 190+40 to Sta. 233+60, a new earthen channel is constructed with a 10 foot bottom width and 4:1 side slopes. Rock riprap erosion protection will be required at the transition from 50 foot bottom width to the 10 foot bottom width. Discharges vary from 900 cfs at the south end of the Base to 550 cfs from the detention basin outlet at Northern Avenue.

Grouted riprap channel protection will be required at the outlet of the box culvert. An option is provided in the cost estimate (Option 1) to concrete-line the entire channel reach south of Northern Avenue. This would reduce the maintenance requirement.

Right of Way Requirement:

No right of way is required in this reach. The entire channel is located on the Base.

125-Acre Detention Basin East of Reems Road

Basin Construction:

A new 125-acre detention basin is to be constructed north of Northern Avenue and east of Reems Road. The basin and the 8' x 5' x 150' box culvert outlet are sized to reduce the 100-year peak outflow to 550 cfs from the existing 2350 cfs that enters the basin. This outflow is conveyed around the west side of Luke AFB in an earthen channel.

This basin is also designed to incorporate spoil areas so that the cut from the basin can be balanced on site.

Other elements of the basin include a grouted riprap inflow spillway north of Northern Avenue along Reems Road to allow the stormwater flows along Reems Road into the basin. A small berm will be required along the north side of the basin to direct flows to another spillway on the north end of the basin. Emergency overflow spillways, which are located at existing ground elevation at the southwest and northeast corners of the basin, have been sized to allow the Probable Maximum Flood to pass without breaching the proposed berms around the south and east side of the basin.

Right of Way Requirements:

The detention basin requires the acquisition of 125 acres of farmland located north of Northern Avenue and east of Reems Road.

5.2 ADVANTAGES AND DISADVANTAGES

Advantages:

1. Minimizes Channel Construction

The detention basins significantly reduce the peak discharge in both Dysart Drain and the channel around the west side of the Base. Much of the existing Dysart Drain channel improvements remain as is, including: the Railroad box culverts, the Base bridge and Litchfield Road bridge. The channel along the west and south side of the Base would be located entirely on Base property and would utilize much of the existing earthen channel.

2. Collects all Runoff

This alternative collects all the runoff from Reems Road to the Agua Fria River. The current split flow that occurs at Reems Road and Northern Avenue will be contained in the detention basin and the west side channel.



3. Protection from Future Land Subsidence

Although each alternative presented in this study has been designed to accommodate future land subsidence; the detention basin provides added protection. If more subsidence occurs than what is anticipated, the channel alternatives (Alternative Nos. 1, 2, and 3) could lose significant capacity. This could greatly reduce the level of flood protection provided by the channel, whereas, the detention basins would continue to function even if more than the expected amount of subsidence occurs. Under these circumstances, the outflow from the basins may cause flooding but the frequency and severity of the flooding would be substantially less than with the channel alternatives.

4. Cost

This basin alternative is less costly than Alternative 2 and Alternative 4 and is about the same cost as Alternative 3 where flows at Reems Road and Northern Avenue are conveyed south in a channel without detention.

Disadvantages:

1. Maintenance

The detention basins present a large maintenance requirement.

2. Right of Way Acquisition

This alternative requires the acquisition of 241 acres of farmland for the two detention basins.

3. Increased Stormwater Flows

This alternative, as well as the other 4 alternatives, reduces the 100-year peak discharge in Bullard Wash with the improvement of Dysart Drain. However, the addition of the west side channel will result in higher flows during the more frequent storms. Currently, the stormwater runoff from small floods is all collected in the Dysart Drain and conveyed to the Agua Fria River. In the case of alternative 5 and alternative 3, these low flows will be conveyed to Bullard Wash. The result will be more frequent flooding along Bullard Wash which affects several roadway crossings to the south. Moreover, in the case of this alternative, the duration of flooding will be increased as a result of metering the flows from the detention basin. The result could be longer roadway closures downstream and longer inundation periods for crops along Bullard Wash.

5.3 COST ESTIMATE (Refer to the Itemized Estimates)

SUMMARY OF COST ESTIMATES FOR ALTERNATIVE 5		
DESCRIPTION	ALTERNATIVE 5	W/OPTION 1
Cost Reduction (-) / Increase (+)		+ \$2,665,300 (On-Base)
Total On-Base Cost	\$4,325,300	\$6,990,600
Total Off-Base Cost	\$6,328,500	\$6,328,500
TOTAL COST	\$10,653,800	\$13,319,100

DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 5
COST ESTIMATE

(OFF-BASE PORTION)

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove El Mirage Road Bridge	1 Ea.	\$35,000	\$35,000
Demolish and Remove Farm Bridge	1 Ea.	\$15,000	\$15,000
Demolish and Remove Dysart Road Bridge	1 Ea.	\$25,000	\$25,000
Replace El Mirage Road Bridge (85' x 84')	7,140 S.F.	\$45/S.F.	\$321,300
Replace Dysart Road Bridge (100' x 84')	8,400 S.F.	\$45/S.F.	\$378,000
Detention Basin Cut Volumes	2,050,070 C.Y.	\$1/C.Y.	\$2,050,100
Construct 2 - 8' x 5' x 270' C.B.C. at Southeast Corner of Detention Basin #2	270 L.F.	\$435/L.F.	\$117,400
Construct 1 - 8' x 5' x 150' that Connects Detention Basin #1 to the South Channel	150 L.F.	\$250/L.F.	\$37,500
Grouted Riprap Bank Protection at Detention Basin Spillways and Culverts	25,693 S.Y.	\$22/S.Y.	\$565,300
SUBTOTAL			\$3,544,600
+ 20% Contingencies			\$708,900
TOTAL CONSTRUCTION COST			\$4,253,500
+ 20% Engineering and Construction Management			\$850,700
Right of Way (Channel) 50' x 430' = 21,500 S.F. 20' x 6190' = <u>123,800</u> S.F. 145,300 S.F.	145,300 S.F.	\$.15/S.F.	\$21,800
Right of Way (Detention Basin)	240.5 Ac.	\$5000/Ac.	\$1,202,500
TOTAL OFF-BASE COST			\$6,328,500

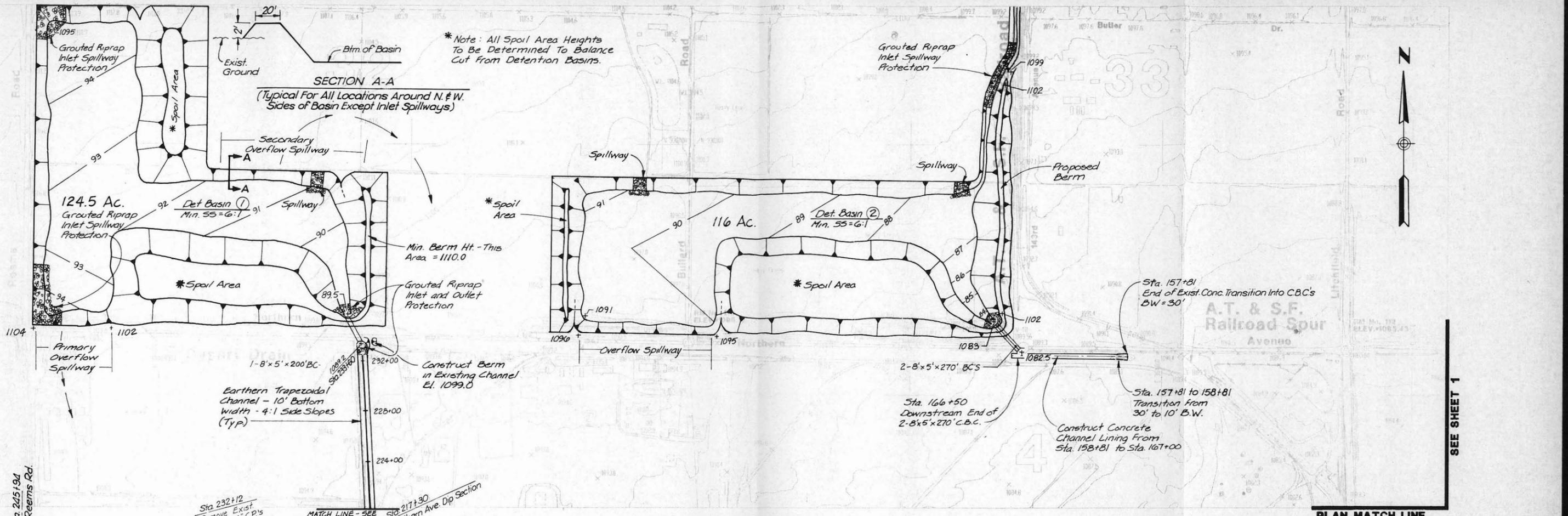
DYSART DRAIN IMPROVEMENT PROJECT
ALTERNATIVE NO. 5
COST ESTIMATE

(ON-BASE PORTION)

DESCRIPTION	QUANTITY	UNIT COST	COST
Demolish and Remove 6" Concrete Lining w/Rebar	496,226 S.F.	\$.75/S.F.	\$372,200
Excavation Along Dysart Drain	216,071 C.Y.	\$3/C.Y.	\$648,200
New 6" Concrete Lining w/Rebar	80,633 S.Y.	\$22/S.Y.	\$1,773,900
Excavation Along Channel West and South of Luke AFB	141,592 C.Y.	\$1/C.Y.	\$141,600
Grouted Riprap Bank Protection in Channel West and South of Luke AFB	3080 S.Y.	\$22/S.Y.	\$67,800
SUBTOTAL			\$3,003,700
+ 20% Contingencies			\$600,700
TOTAL CONSTRUCTION COST			\$3,604,400
+ 20% Engineering and Construction Management			\$720,900
TOTAL ON-BASE COST			\$4,325,300

DYSART DRAIN IMPROVEMENT PROJECT
 ALTERNATIVE NO. 5
 COST ESTIMATE

<u>OPTION 1</u>			
Provide Concrete Channel Lining Along West Side of Luke AFB			
DESCRIPTION	QUANTITY	UNIT COST	COST ADJUSTMENT
Concrete Channel Lining	+ 92,350 S.Y.	\$22/S.Y.	+ \$2,031,700
Grouted Riprap Bank Protection	- 3,080 S.Y.	\$22/S.Y.	- \$67,800
Channel Excavation	-113,000 S.Y.	\$1/C.Y.	- \$113,000
CONSTRUCTION COST ADJUSTMENT			+ \$1,850,900
+ 20% Contingencies			+ \$370,200
TOTAL CONSTRUCTION COST ADJUSTMENT			+ \$2,221,100
+ 20% Engineering and Construction Management			+ \$444,200
TOTAL COST ADJUSTMENT			+ \$2,665,300

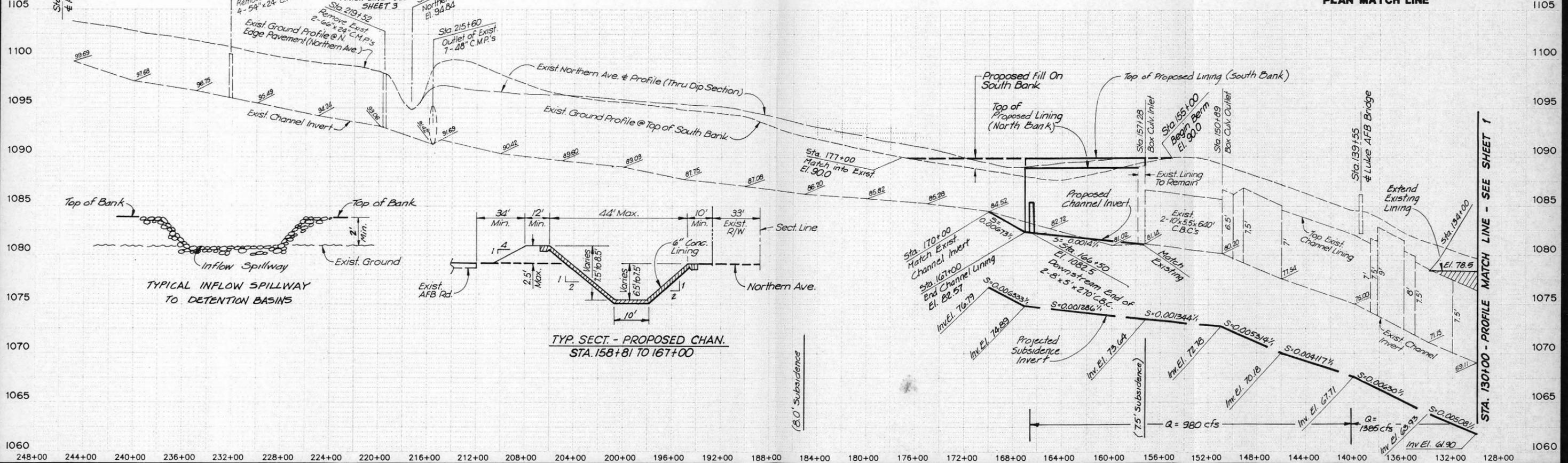


* Note: All Spoil Area Heights To Be Determined To Balance Cut from Detention Basins.

SECTION A-A
(Typical For All Locations Around N. & W. Sides of Basin Except Inlet Spillways)

PLAN MATCH LINE

SEE SHEET 1

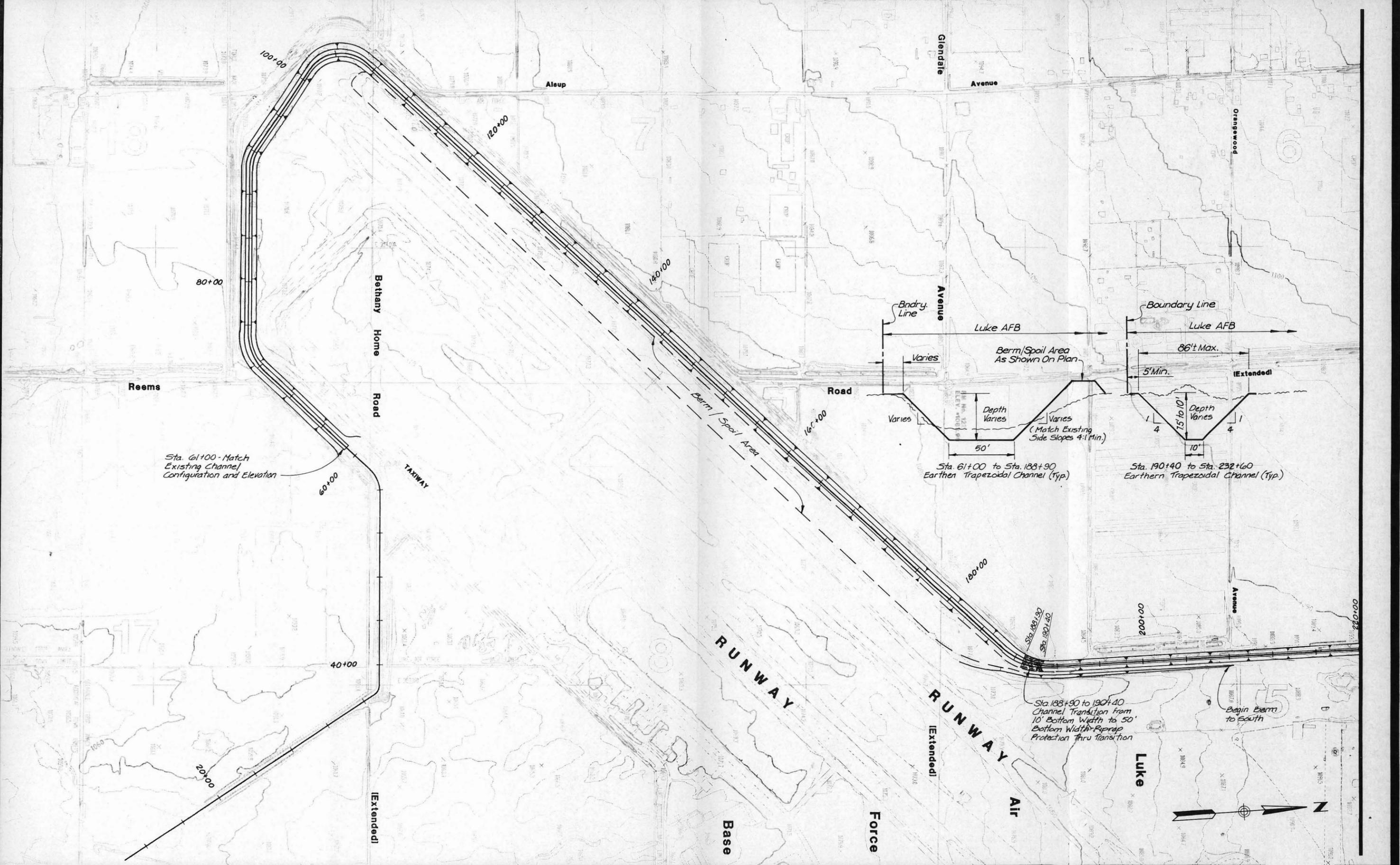


TYPICAL INFLOW SPILLWAY TO DETENTION BASINS

TYP. SECT. - PROPOSED CHAN. STA. 158+81 TO 167+00

STA. 130+00 - PROFILE MATCH LINE - SEE SHEET 1

No.	Date	Item



Sta. 61+00 - Match Existing Channel Configuration and Elevation

Sta. 61+00 to Sta. 188+90 Earthen Trapezoidal Channel (Typ)

Sta. 190+40 to Sta. 232+60 Earthen Trapezoidal Channel (Typ)

Sta. 188+90 to 190+40 Channel Transition from 10' Bottom Width to 50' Bottom Width Riprap Protection Thru Transition

Begin Berm to South



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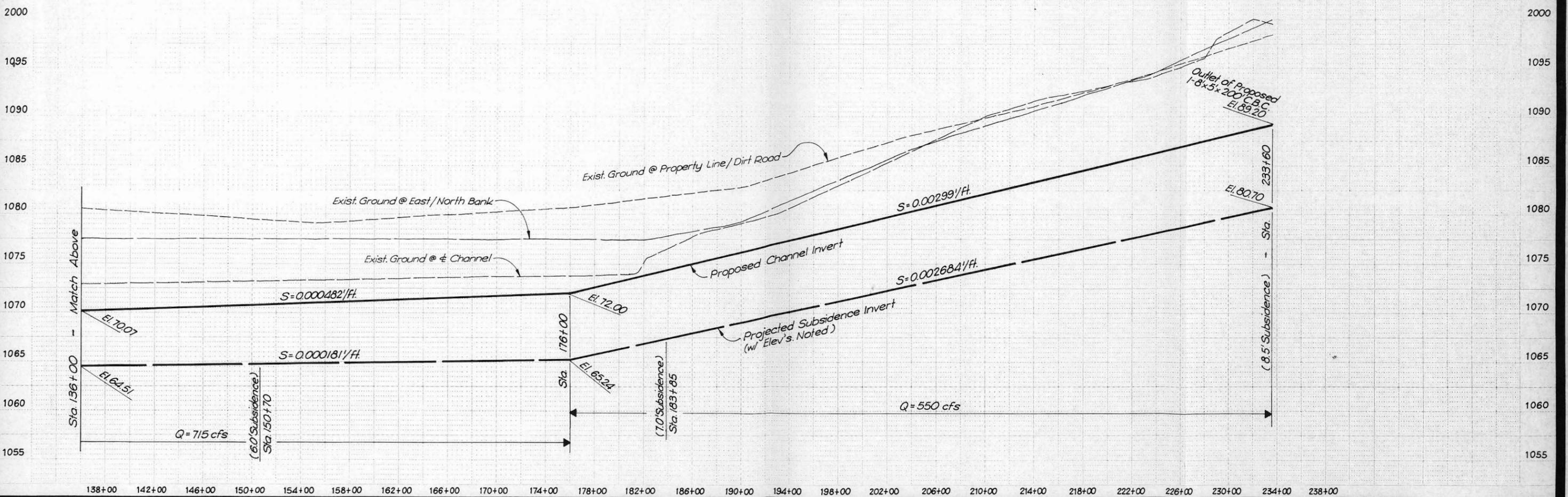
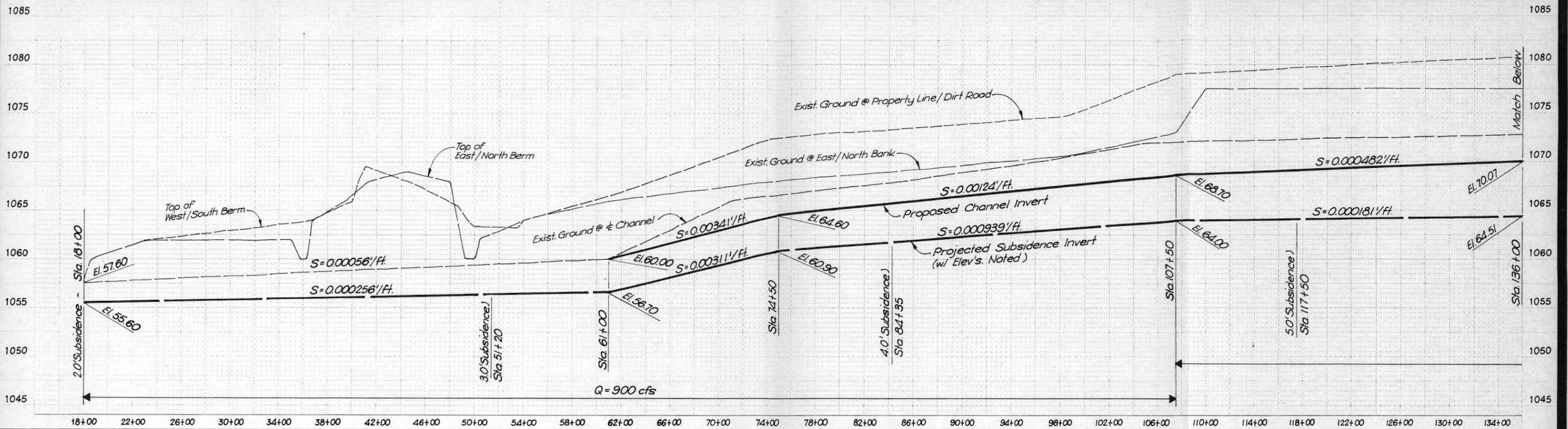
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Dysart Drain Improvement Project
Preliminary Design

ALTERNATIVE NO. 5

Channel Around West Side Of Luke A.F.B.

No.	Date	Item

Scale 1" = 400' H. 1" = 5' V.
Job No. 289036-4
Date 4-20-93
Drawn By BKF
Checked By MTG



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Dysart Drain Improvement Project
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ALTERNATIVE NO. 5

Channel Profile Around West Side Of Luke A.F.B.

No.	Date	Item

Scale 1" = 400' H. 1" = 5' V.
Job No. 289036-4
Date 4-20-93
Drawn By BKF
Checked By MTG

Sheet 4
Of 4