

MICROFILMED

290.03.04

Prelim. Drainage Report - Paseo del Norte
from Wyoming to the I-25 Frontage Rd
Wilson & Company
Wilson & Company, 1991

**PRELIMINARY
DRAINAGE REPORT**

PASEO DEL NORTE

**FROM WYOMING BOULEVARD TO THE
I-25 FRONTAGE ROAD**

CITY PROJECT NO. 4083

DRAFT

Prepared by:

WILSON & COMPANY
6611 Gulton Ct.
Albuquerque, NM 87109

1 April 1991

**WILSON
& COMPANY**

PRELIMINARY
DRAINAGE REPORT

MICROFILMED

PASEO DEL NORTE

FROM WYOMING BOULEVARD TO THE
I-25 FRONTAGE ROAD

CITY PROJECT NO. 4083

DRAFT

Prepared for:

City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87125

Prepared by:

WILSON & COMPANY
6611 Gulton Ct.
Albuquerque, NM 87109

1 April 1991

WILSON & COMPANY

6611 Gulton Court, N.E.
Albuquerque, New Mexico 87109
P.O. Box 3548 87190
505-345-5345

Albuquerque
Colorado Springs
Kansas City
Phoenix
Salina, Kansas
Wichita

Letter of Transmittal

Date: 4/2/91
To: AMAFCA
Attn: CLIFF ANDERSON, P.E.
Project Name: PABED DEL NORTE
Project No.: 90-545

RECEIVED
APR 2 1991

AMAFCA

We are sending you:

- ☐ Attached
☐ Under separate cover via _____

The following items:

- ☐ Originals
☐ Prints

- ☐ Plans
☐ Samples
☐ Specifications

- ☐ Copy of letter
☐ Change order

☒ Preliminary Damage Report

Copies	Date	Description
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.

These are transmitted as checked below:

- | | | |
|---|---|---|
| ☐ For approval | ☐ Approved as submitted | ☐ Resubmit _____ copies for review |
| ☐ For your use | ☐ Approved as noted | ☐ Submit _____ copies for distribution |
| ☐ As required | ☐ Returned for corrections | ☐ Return _____ corrected prints |
| ☐ For review and comment | | |
| ☐ _____ | | |

Remarks: Cliff, call me if you have any questions.

Action requested:

Copies to:

Signed: John H. Jones III

If enclosures are not as noted, kindly notify us at once.

John H. Jones III

**PASEO DEL NORTE
PRELIMINARY
DRAINAGE REPORT**

TABLE OF CONTENTS

INTRODUCTION	1
HYDROLOGY	1
HYDRAULICS	1
OPTION 1	1-2
OPTION 2	2
OPTION 3	2
OPTION 4	3
OPTION 5	3
RECOMMENDATIONS	4
TABLE 1:	RESOURCE TECHNOLOGY, INC. PRELIMINARY FLOWS
TABLE 2:	SUMMARY OF PRELIMINARY CONSTRUCTION COST ESTIMATE
APPENDIX 1:	PRELIMINARY CONSTRUCTION
APPENDIX 2:	PRELIMINARY HYDRAULIC CALCULATIONS

INTRODUCTION

This report summarizes the preliminary drainage analysis for the Paseo del Norte project, located within Bernalillo County New Mexico. The project consists of roadway, storm drain, and channel improvements on Paseo del Norte from Wyoming Boulevard to the I-25 East Frontage Road. This report was prepared for the City of Albuquerque under Project Number 4083.

HYDROLOGY

The peak flows for this project were developed in a study of the North and South Domingo Baca Arroyos being completed for AMAFCA by Resource Technology, Inc. A summary of the preliminary flows used for the development of this drainage report is given in Table 1. The peak flowrates were developed utilizing the computer hydrologic model HYMO which was originally developed by the U.S. Department of Agriculture. The original computer model HYMO was updated by AMAFCA in order to better correlate with the hydrologic conditions in Albuquerque. The latest version of HYMO (AHMYO391) was updated to reflect the rainfall distribution requested by the Federal Emergency Management Agency (FEMA). The new rainfall distribution has slightly increased the developed peak runoff by approximately 5-10%. The flowrates shown in Table 1 reflect the peak flowrates generated by the new rainfall distribution, but are subject to change.

HYDRAULICS

As identified in Table 1, the peak flow expected to reach the intersection of Wyoming and Paseo del Norte generated in upstream basins is approximately 803 cfs. Five options were developed for discharging the upstream runoff developed in both the North and South Domingo Baca Drainage Basins to the South Domingo Baca Arroyo. Options 1-4 were developed for discharging only the Paseo del Norte corridor flows to the South Domingo Baca Arroyo while Option 5 incorporates the flows from the North Domingo Baca Drainage basins. The South Domingo Baca Arroyo runs east/west parallel to Paseo del Norte approximately 1,100' south of the proposed alignment. Design plans for concrete-lining the South Domingo Baca from Wyoming west to the existing box culverts at the I-25 Frontage Road are proceeding concurrently with the design of this project. A description of the five options are given below.

OPTION 1:

This option incorporates diverting all of the 803 cfs to the South Domingo Baca Arroyo at Wyoming Boulevard. The diversion would require the construction of 2 - 5' x 10' Concrete Box Culverts. Design plans for concrete-lining the South Domingo Baca Arroyo from Wyoming to Louisiana have already been completed. The remaining roadway flows would be collected and discharged to the South Domingo Baca at both Louisiana and the I-25 Frontage Road. The construction of this option includes the extension of facilities to the north at all the roadway crossings (Wyoming, Louisiana, and San Pedro) in order to collect runoff at the low areas near Hollywood

Boulevard. Plates 1-3 show the plan view of the proposed improvements with the profile shown of Plate 4. Also, a Preliminary Construction Cost Estimate for this option is given in Appendix 1.

OPTION 2:

Option 2 allows the storm runoff (803 cfs) generated east of Wyoming Boulevard to be directed under Wyoming via the construction of a 5' x 10' Concrete Box Culvert. The flows will then be carried by the construction of a concrete-lined channel (See Cross-Section given on Plates 1-3) to the intersection of Louisiana Boulevard. In order to save the existing YWCA building and parking lot, the trapezoidal channel will be transitioned into a 5' x 10' Concrete Box Culvert just east of the YWCA property and back into the proposed trapezoidal channel on the west side of the property. The runoff generated in the roadway and adjacent properties from Wyoming to Louisiana will be collected in a separate storm system and will intersect the upstream flows at a manhole in the intersection of Louisiana and Paseo del Norte. The flows will then be carried to the South Domingo Baca via the construction of a 5' x 12' Concrete Box Culvert. The remaining flows generated between Louisiana and the I-25 Frontage Road will be directed with a separate storm sewer system to the South Domingo Baca at the I-25 Frontage Road. The storm drain lines identified above would be extended to the north at all the road crossings (Wyoming, Louisiana, and San Pedro) to collect runoff from the low areas around Hollywood Boulevard. Plates 1-3 show the proposed alignment for the improvements, and Plates 5 and 6 show the preliminary profile for the storm sewer from Louisiana to the arroyo. A Preliminary Construction Estimate is given in Appendix 1.

OPTION 3:

This alternative incorporates the construction of a diversion structure to be built just east of the Wyoming intersection which will carry 450 cfs down Wyoming via a 5' x 8' Concrete Box Culvert to the South Domingo Baca Arroyo. The remaining 310 cfs will be directed under Wyoming via a 60" Reinforced Concrete Pipe. The 60" R.C.P. will run on the north side of Paseo del Norte to Louisiana Boulevard. The storm runoff generated between Wyoming and Louisiana Boulevard would then be combined with the flows in the proposed 60" pipe at a manhole in the intersection of Louisiana and Paseo del Norte. The flows would then be conveyed to the South Domingo Baca Arroyo on the west side of Louisiana via the construction of a 5' x 8' Concrete Box Culvert. The remaining roadway flows generated between Louisiana and the I-25 Frontage Road would be collected and discharged to the South Domingo Baca Arroyo at the existing box culverts by means of the construction of a separate storm sewer system. The construction of this option includes the extension of facilities to the north at all the roadway crossings (Wyoming, Louisiana, and San Pedro) in order to collect runoff at the low areas near Hollywood Boulevard. The proposed improvements are shown on Plates 1, 2, 3, 5 and 6 (Profile) with the corresponding Preliminary Construction Cost Estimate given in Appendix 1.

OPTION 4:

Option 4 will allow the flows generated east of Wyoming Boulevard to be carried under Wyoming and into the proposed concrete-lined trapezoidal channel. The channel would be transitioned at the YWCA property to a 5' x 10' C.B.C. and back to the channel on the west side of the property. The flows would be conveyed under Louisiana Boulevard via the construction of a 5' x 10' C.B.C. and back into the trapezoidal channel. The proposed channel would be constructed to the intersection of San Pedro and Paseo del Norte. The flows generated in the roadway between Wyoming and San Pedro would be added to the flows in the channel in a manhole located at the intersection of San Pedro and Paseo del Norte. The flows would then be directed to the South Domingo Baca Arroyo through 2 - 5' x 10' C.B.C. on the west side of San Pedro. The remaining storm runoff from San Pedro to the I-25 Frontage Road would be discharged to the existing structure at the Frontage Road via the construction of a separate storm sewer system. The storm drain lines identified above would be extended to the north at all the road crossings (Wyoming, Louisiana, and San Pedro) to collect runoff from the low areas around Hollywood Boulevard. Plates 1, 2, and 3 identify the proposed improvements. A Preliminary Construction Cost Estimate is given in Appendix 1.

OPTION 5:

Option 5 was investigated to determine a preliminary structure cost estimate and preliminary structure sizes if all the flows from the North Domingo Baca Arroyo were diverted to the proposed concrete - lined trapezoidal channel along the north side of Paseo del Norte. Diversion of the North Domingo Baca runoff would occur at Holbrook, Ventura, Barstow, Wyoming, and San Pedro Boulevard. The proposed concrete-lined channel would be transitioned to concrete box culvert structures at road crossings (Wyoming, Louisiana, and San Pedro) and at the YWCA property located between Wyoming and Louisiana Boulevard. A 8' x 14' concrete box culvert would be needed at the Wyoming, YWCA, and Louisiana Boulevard crossings, and an 8' x 16' concrete box culvert would be required at the San Pedro crossing. The proposed trapezoidal channel would have a 10' bottom with 2:1 (horizontal | vertical) side slopes from Wyoming to just east of San Pedro Boulevard. The channel would then be transitioned to a 16' bottom width before the 8' x 16' concrete box culvert at San Pedro. The bottom width would then be transitioned to a 20' width after the concrete box culvert as the channel turns south towards the South Domingo Baca Arroyo. The channel alignment and crossing structure at San Pedro could be moved east so that the proposed concrete channel would be located on the east side of San Pedro Boulevard as it approaches the South Domingo Baca Arroyo. This would reduce the amount of right-of-way that would need to be purchased on the east side of San Pedro. The roadway flows generated from the construction of the proposed Paseo del Norte improvements would then be directly discharged to the proposed channel. The size of the structures and channel cross-sections are based on the flows obtained from Resource Technology, Inc. A complete hydraulic analysis should be performed to verify the structure sizes and channel cross-sections identified in this report. A Preliminary Construction Cost Estimate is given in Appendix 1.

RECOMMENDATIONS

It is recommended that the proposed improvements identified as Option 5 be constructed to collect and discharge storm runoff to the South Domingo Baca Arroyo. As shown in Table 2, the preliminary construction cost for the drainage improvements for Option 5 is approximately 2.7 million dollars. Although the preliminary construction cost for Option 5 is higher than the other options, Wilson & Company feels that the benefits of providing a method of draining both drainage basins (North Domingo Baca and Paseo del Norte) outweighs the additional expenditure. The construction of the proposed channel along with the extension of the storm sewer systems north at both Wyoming and San Pedro will remove the flood plain associated with the North Domingo Baca Arroyo. This will allow for future development of a large portion of North Albuquerque Acres. The channel will also provide a means of draining for future developments in the area. Additional investigation and analysis should be completed during the design phase to verify the actual location of constraints and confirm or reject the assumptions outlined in this preliminary analysis.

RESOURCE TECHNOLOGY, INC.

TABLE 1

INTERSECTION OR LOCATION	OPTION B	OPTION E	OPTION G	OPTION H4	OPTION H5	OPTION H6
FLOW IN CFS						
SOUTH BACA DAM AT LOWELL	202	202	202	202	202	202
NORTH BACA DAM AT HAMILTON	197	197	197	197	197	197
HOLBROOK	334	334	334	809	809	809
VENTURA	460	460	460	1694	1695	951
BARSTOW	637 *	637	637	2330	2330	1122
WYOMING	182	803 *	803	3335	3335	3290
LOUISIANA	304	132 *	901	3488	3488	3455
SAN PEDRO	447	144	1035	3655	4202	4130
JUNCTION WITH SO. DOMINGO BACA CHANNEL	446	137	1045	3625	4098	4100

OPTION B: DIVERSION OF 637 CFS TO SDB CHANNEL AT BARSTOW
 OPTION E: DIVERSION OF 803 CFS TO SDB CHANNEL AT WYOMING
 AND 132 CFS TO SDB CHANNEL AT LOUISIANA
 NO DIVERSIONS TO SDB CHANNEL
 OPTION G: NOB DIVERSIONS TO PDN CHANNEL AT HOLBROOK (475 CFS),
 OPTION H4: VENTURA (743 CFS), BARSTOW (481 CFS) AND WYOMING (897 CFS).
 OPTION H5: NOB DIVERSIONS TO PDN CHANNEL SAME AS H4 PLUS SAN PEDRO (453 CFS).
 OPTION H6: NOB DIVERSIONS TO PDN CHANNEL AT HOLBROOK (475 CFS),
 WYOMING (2028 CFS) AND SAN PEDRO (453 CFS).

* Flow diverted to SDB channel

HYMNO 391

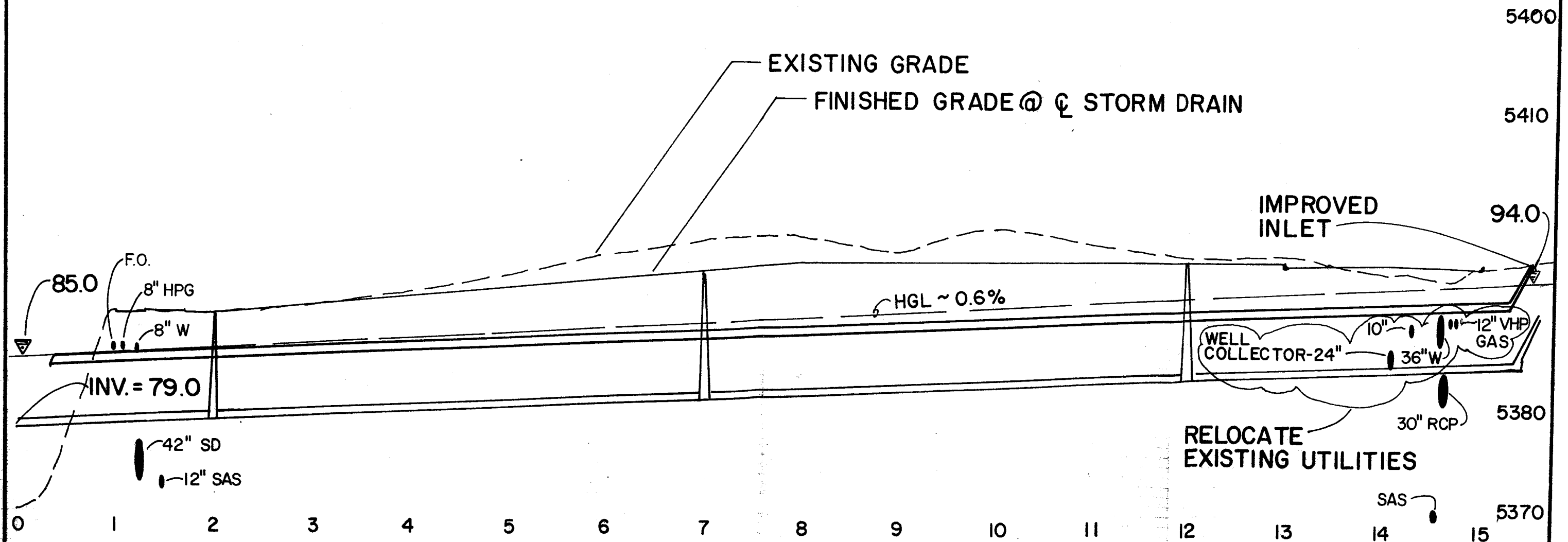
2/22/91

261200M.014

TABLE 2

SUMMARY OF PRELIMINARY COST ESTIMATES

Option No. 1	
Diversion of Upstream Flows to the South Domingo Baca Arroyo at Wyoming Boulevard	\$1,406,922.00
Option No. 2	
Upstream Flows Under Wyoming and Diverted to the South Domingo Baca Arroyo at Louisiana Boulevard	\$1,614,448.00
Option No. 3	
Diversion of Approximately Half of the Upstream Flows to the South Domingo Baca Arroyo at Wyoming Boulevard with the Remaining Flows Diverted at Louisiana Boulevard	\$1,359,853.00
Option No. 4	
Upstream Flows Conveyed on the North Portion of Paseo del Norte in a Concrete-Lined Channel to San Pedro where the Flows will be Diverted to the South Domingo Baca Arroyo	\$2,235,145.00
Option No. 5	
All the Flows from the North Domingo Baca will be Diverted in a Concrete-Lined Channel Under San Pedro to the South Domingo Baca Arroyo	\$2,697,420.00



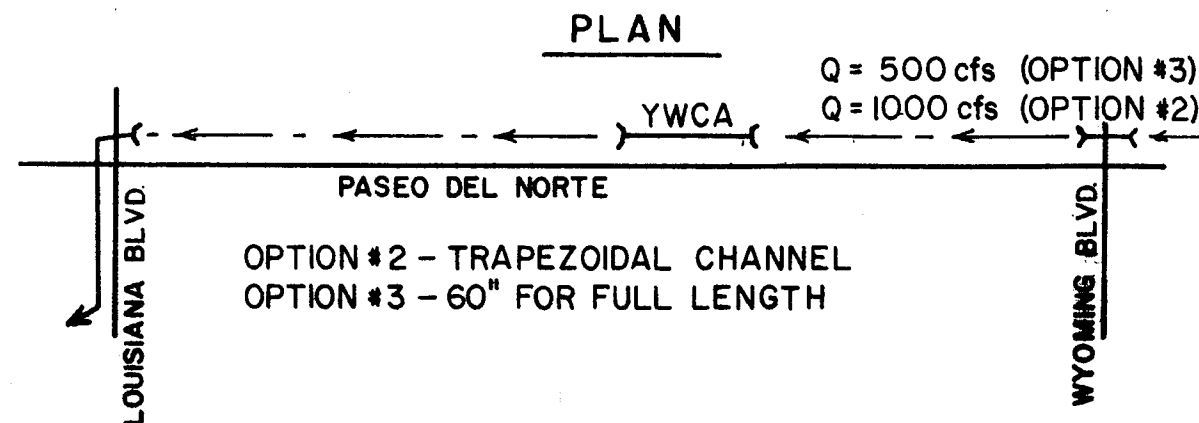
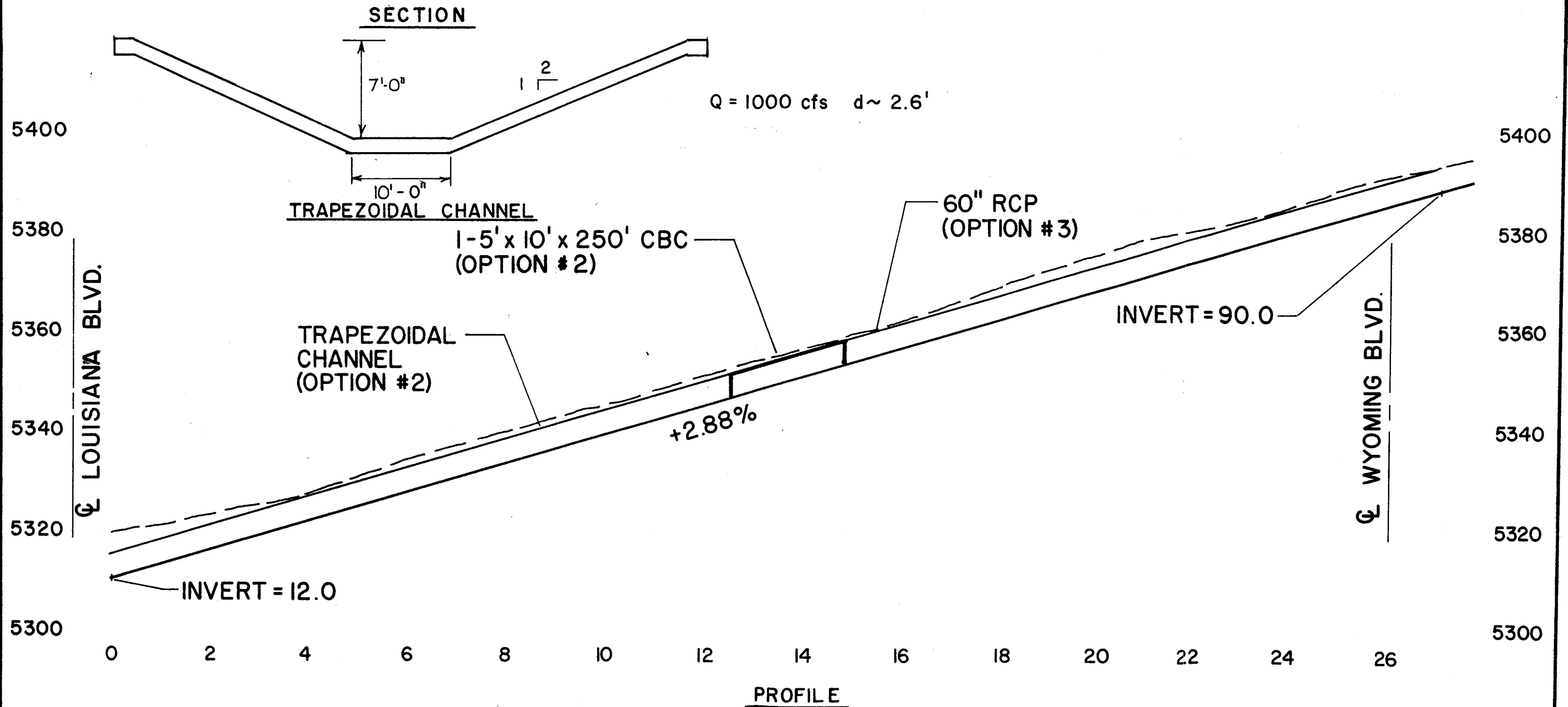
OPTION #1 - Q = 1000 cfs need 2 - 5' x 8' CBC
 OPTION #3 - Q = 500 cfs need 1 - 5' x 8' CBC or 84" RCP

OPTION #1 & OPTION #3
 PLATE # 4

**WILSON
& COMPANY**

PASEO DEL NORTE		
WYOMING BLVD.		
STORM DRAIN PROFILE		
DSGN. SJM	DR. KIS	CK.
FILE 90-545	DATE 1/91	SHEET

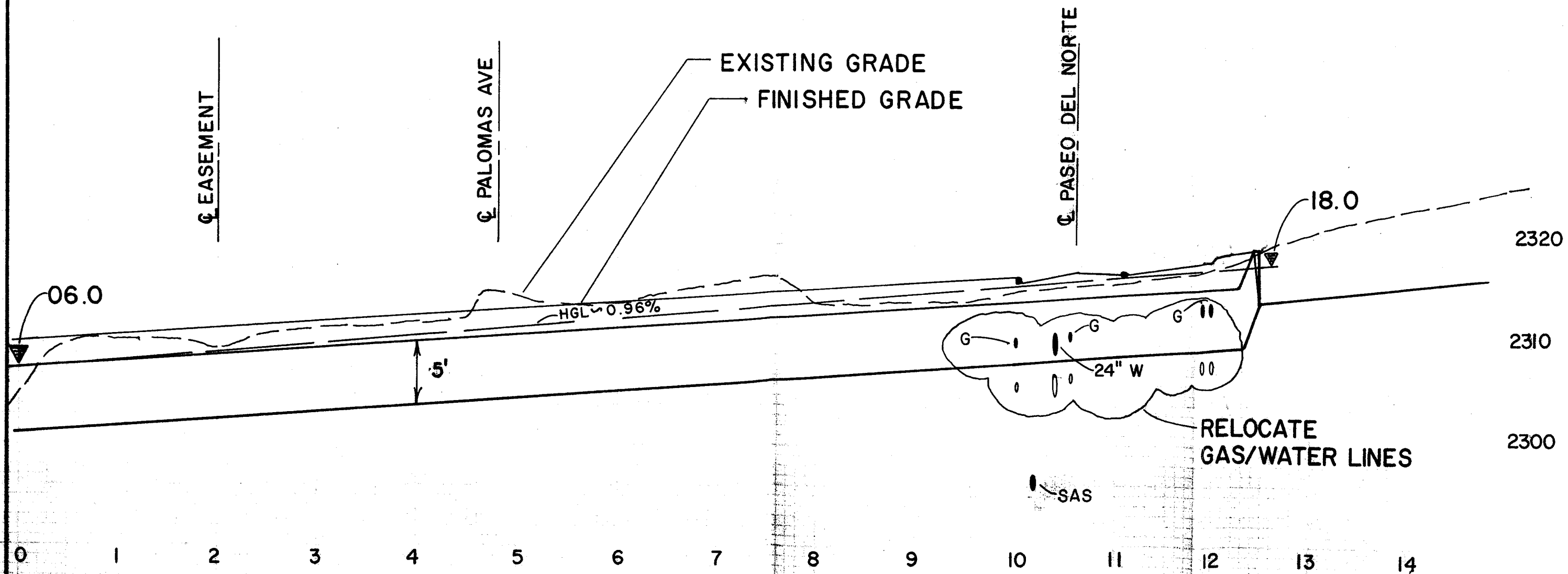
6000



OPTION #2 & OPTION #3
 PLATE # 5

WILSON & COMPANY	PASEO DEL NORTE		
	North Drainage Channel Between Louisiana & Wyoming		
	PLAN · PROFILE · SECTION		
	DSGN. SJM	DR. KIS	CK.
FILE 90-545	DATE 1/91	SHEET	

6001



OPTION # 2 - Q = 1000 cfs need 5' x 12' CBC
 OPTION # 3 - Q = 600 cfs need 5' x 8' CBC

OPTION # 2 & OPTION # 3
 PLATE # 6

WILSON
 COMPANY

PASEO DEL NORTE
 Louisiana Blvd.

STORM DRAIN PROFILE

DATE	BY	DR	CK
90-545	1/91		

6002

APPENDIX 1
PRELIMINARY CONSTRUCTION
ESTIMATES

PASEO DEL NORTE PROJECT
 PRELIMINARY DRAINAGE ESTIMATE
 OPTION #1 - DIVERSION OF UPSTREAM FLOWS TO THE SOUTH
 DOMINGO BACA ARROYO AT WYOMING BOULEVARD

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
501325	24" R.C.P. CL III	LF	2990	\$32.00	\$95,680.00
501331	30" R.C.P. CL III	LF	3420	\$37.00	\$126,540.00
501337	36" R.C.P. CL III	LF	1410	\$50.00	\$70,500.00
501343	42" R.C.P. CL III	LF	1000	\$53.00	\$53,000.00
501349	48" R.C.P. CL III	LF	810	\$60.00	\$48,600.00
	54" R.C.P. CL III	LF	2140	\$70.00	\$149,800.00
	5'X10' CBC	LF	2440	\$260.00	\$634,400.00
	CONCRETE HEADWALL	EA	1	\$3,500.00	\$3,500.00
	CHANNEL INLET	EA	2	\$2,500.00	\$5,000.00
623126	CDI TYPE I - OVER 4' TYPE B CURB	EA	32	\$2,500.00	\$80,000.00
662102	MANHOLE TYPE II	EA	4	\$3,000.00	\$12,000.00
			SUBTOTAL		\$1,279,020.00
			10% CONTINGENCIES		\$127,902.00
			TOTAL		\$1,406,922.00

PASEO DEL NORTE PROJECT
 PRELIMINARY DRAINAGE ESTIMATE
 OPTION #2 - UPSTREAM FLOWS UNDER WYOMING AND DIVERTED TO THE SOUTH
 DOMINGO BACA ARROYO AT LOUSIANA BOULEVARD

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
501325	24" R.C.P. CL III	LF	2170	\$32.00	\$69,440.00
501331	30" R.C.P. CL III	LF	1020	\$37.00	\$37,740.00
501337	36" R.C.P. CL III	LF	1250	\$50.00	\$62,500.00
501343	42" R.C.P. CL III	LF	1000	\$53.00	\$53,000.00
501349	48" R.C.P. CL III	LF	810	\$60.00	\$48,600.00
	54" R.C.P. CL III	LF	1010	\$70.00	\$70,700.00
	5'X10' CBC	LF	490	\$260.00	\$127,400.00
	5'X12' CBC	LF	1320	\$340.00	\$448,800.00
	CONCRETE HEADWALL	EA	6	\$3,500.00	\$21,000.00
	CHANNEL INLET	EA	2	\$2,500.00	\$5,000.00
623126	CDI TYPE I - OVER 4' TYPE B CURB	EA	32	\$2,500.00	\$80,000.00
662102	MANHOLE TYPE II	EA	9	\$3,000.00	\$27,000.00
203001	UNCLASS. EXCAVATION	CY	8600	\$2.50	\$21,500.00
509058	STR. CONC. CL A-9"	SY	7900	\$50.00	\$395,000.00
			SUBTOTAL		\$1,467,680.00
			10% CONTINGENCIES		\$146,768.00
			TOTAL		\$1,614,448.00

PASEO DEL NORTE PROJECT
 PRELIMINARY DRAINAGE ESTIMATE
 OPTION #3 - DIVERSION OF APPROXIMATELY HALF OF THE UPSTREAM FLOWS TO
 THE SOUTH DOMINGO BACA ARROYO AT WYOMING BOULEVARD WITH THE
 REMAINING UPSTREAM FLOWS DIVERTED AT LOUISIANA BOULEVARD

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
501325	24" R.C.P. CL III	LF	2470	\$32.00	\$79,040.00
501331	30" R.C.P. CL III	LF	1020	\$37.00	\$37,740.00
501337	36" R.C.P. CL III	LF	1250	\$50.00	\$62,500.00
501343	42" R.C.P. CL III	LF	1000	\$53.00	\$53,000.00
501349	48" R.C.P. CL III	LF	810	\$60.00	\$48,600.00
	54" R.C.P. CL III	LF	1010	\$70.00	\$70,700.00
	60" R.C.P. CL III	LF	2690	\$85.00	\$228,650.00
	5'X8' CBC	LF	2730	\$200.00	\$546,000.00
	CONCRETE HEADWALL	EA	6	\$3,500.00	\$21,000.00
623126	CDI TYPE I - OVER 4' TYPE B CURB	EA	32	\$2,500.00	\$80,000.00
662102	MANHOLE TYPE II	EA	3	\$3,000.00	\$9,000.00
			SUBTOTAL		\$1,236,230.00
			10% CONTINGENCIES		\$123,623.00
			TOTAL		\$1,359,853.00

PASEO DEL NORTE PROJECT
 PRELIMINARY DRAINAGE ESTIMATE
 OPTION #4 - UPSTREAM FLOWS CONVEYED ON THE NORTH PORTION
 OF PASEO DEL NORTE IN A CONCRETE-LINED CHANNEL TO
 SAN PEDRO WHERE THE FLOWS WILL BE DIVERTED TO THE SDB

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
203001	UNCLASS. EXCAVATION	CY	18700	\$2.50	\$46,750.00
501325	24" R.C.P. CL III	LF	2400	\$32.00	\$76,800.00
501337	36" R.C.P. CL III	LF	1010	\$50.00	\$50,500.00
	5'X10' CBC	LF	3230	\$260.00	\$839,800.00
	5'X12' CBC	LF	115	\$340.00	\$39,100.00
	CONCRETE HEADWALL	EA	8	\$3,500.00	\$28,000.00
509058	STR. CONC. CL A -9"	SY	17300	\$50.00	\$865,000.00
623126	CDI TYPE I - OVER 4' TYPE B CURB	EA	32	\$2,500.00	\$80,000.00
662102	MANHOLE TYPE II	EA	2	\$3,000.00	\$6,000.00
				SUBTOTAL	\$2,031,950.00
				10% CONTINGENCIES	\$203,195.00
				TOTAL	\$2,235,145.00

PASEO DEL NORTE PROJECT
 PRELIMINARY DRAINAGE ESTIMATE
 OPTION #5 - ALL THE FLOWS FROM THE NORTH DOMINGO BACA
 WILL BE DIVERTED IN A CONCRETE-LINED CHANNEL UNDER
 SAN PEDRO TO THE SOUTH DOMINGO BACA ARROYO

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
203001	UNCLASS. EXCAVATION	CY	55000	\$2.50	\$137,500.00
	8' X 14' CBC	LF	650	\$410.00	\$266,500.00
	8' X 16' CBC	LF	525	\$500.00	\$262,500.00
501325	24" R.C.P. CL III	LF	700	\$32.00	\$22,400.00
501337	30" R.C.P. CL III	LF	400	\$37.00	\$14,800.00
501337	76" R.C.P. CL III	LF	250	\$50.00	\$12,500.00
509058	STR. CONC. CL A -9"	SY	33000	\$50.00	\$1,650,000.00
	CDI TYPE I - OVER 4' TYPE B CURB	EA	32	\$2,500.00	\$80,000.00
	MANHOLE TYPE II	EA	2	\$3,000.00	\$6,000.00
				SUBTOTAL	\$2,452,200.00
				10% CONTINGENCIES	\$245,220.00
				TOTAL	\$2,697,420.00

APPENDIX 2

PRELIMINARY HYDRAULIC CALCULATIONS

COMP. JMS

WILSON
& COMPANY

LOC.

FILE 90-546

CK.

PROJ. PASEO DEL NORTE SHEET 1

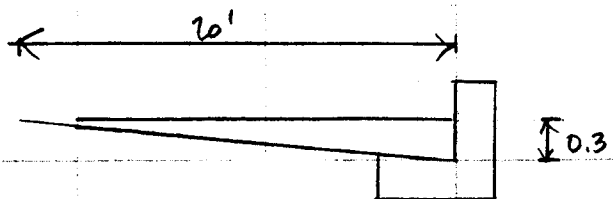
DATE

3/4/91

SUBJ.

INLET SPACING

OF

PASEO DEL NORTE CALCULATIONS:Criteria $n = 0.017$, height above flowline = 6" ($\sqrt{x d} \leq 6.6$)Calculate street Capacity:

$$Area = (1/2)(20)(0.3) = 3.0' \quad WP = 20 + 0.3 = 20.3$$

$$R_h = 3/20.3 = 0.1478$$

$$Q_{cap} = 1.49 / 0.017 (3) (0.1478)^{2/3} (0.028)^{1/2} = 12.3 \text{ cfs}$$

$$V_{cap} = Q/A = 12.3/3 = 4.1, \text{ depth} = 0.3 \quad \sqrt{x d} = 4.1(0.3) = 1.23 < 6.6 \checkmark$$

Calculate Inlet Spacing:

$$Q_{cap \text{ street}} = 12.3 \text{ cfs}$$

$$Q_{cap \text{ inlets (Type 'A', 'C', and 'D')}} \approx 3.2 \text{ cfs (Plate 22.3, DPM, Volume II)}$$

$$\text{Composite Roadway "C"} \Rightarrow \frac{(0.93)(82)(0.66) + (0.6)(82)(0.34)}{82} = 0.818, \text{ say } 0.82$$

(66% Paving/sidewalk, 34% Compacted Soil)

$$Q = C I A \quad (I = 5.05 \text{ in/hr, Section 22, DPM, January 1991, Zone 2})$$

$$A = Q/C I = 12.3 / (0.82)(5.05) = 2.97 \text{ ac}$$

$$A = LW \Rightarrow L = \frac{2.97(43560)}{82} = 1,577.9, \text{ say } 1575 \text{ ft}$$

Use 4 inlets (1 Type 'A' upstream, 3 Type 'C' downstream)

• Per D.P.M., only two inlets will be used in series

COMP. NMS
CK. _____
DATE 3/14/21

WILSON
& COMPANY

LOC. _____ FILE 90-645
PROJ. P2N SHEET 1
SUBJ. Hydraulic Calcs OF _____

Channel Transitions @ Cross Streets (Option #4)

1) Wyoming Boulevard

$$Q_{100} = 3210 \text{ cfs (from RT1 study of NDB : SDB Arroyos)}$$

→ Use trapezoidal channel @ street slope ($s = 2.9\%$) w/ $b = 10'$, $z = 2$

$$y_1 (Q_{100} = 3210) = 4.41', \quad V_1 = 98.6 \text{ fps}$$

$$E_1 = y_1 + \frac{V_1^2}{2g} = 4.41 + \frac{(98.6)^2}{2(32.2)} = 27.58'$$

→ Transition into box culvert under Wyoming Boulevard with the maximum water depth to be 7.0'. Headloss @ entrance assumed to be 10% of velocity head.

$$E_1 = E_2 + h_L, \quad h_L = 0.1 \frac{V_1^2}{2g} = 0.1 \frac{(98.6)^2}{2(32.2)} = 2.3'$$

$$E_2 = E_1 - h_L = 27.58 - 2.3 = 25.3'$$

$$E_2 = y_2 + \frac{V_2^2}{2g} = y_2 + \frac{Q^2}{2gy_2^2}, \quad y_2(\text{max}) = 7.0'$$

$$Q^2 = (2)(g)(y_2^2)(E_2 - y_2) = (2)(32.2)(7)^2(25.3 - 7) = 51,632$$

$$Q = 240, \quad b = Q/b = (3210)/240 = 13.4'$$

→ Use 1- 8 x 14' Concrete Box Culvert

2) Louisiana Boulevard

$$Q_{100} = 3410 \text{ cfs (from RT1 study)}$$

$$y_1 (Q_{100} = 3410) = 4.55' \quad (b = 10, z = 2, \text{ trapezoidal channel})$$

$$E_1 = y_1 + \frac{V_1^2}{2g} = 4.55 + \frac{(99.25)^2}{2(32.2)} = 28.77'$$

COMP.

Jms

**WILSON
& COMPANY**

LOC.

FILE 90-545

CK.

PROJ.

PPN

SHEET

2

DATE

5/14/91

SUBJ.

Hydraulic Gates

OF

(Cont)

- Transition into box culvert under Louisiana Boulevard with the same conditions as @ Wyoming

$$E_1 = E_2 + h_L \quad , \quad h_L = (0.1) \frac{(99.25)^2}{2(32.2)} = 2.39'$$

$$E_2 = 28.47 - 2.39 = 26.08' \quad , \quad y_2(\max) = 7.0'$$

$$q^2 = (2)(32.2)(7)^2(26.08 - 7) = 60,205 \quad , \quad q = 245.4$$

$$b = 3410 / 245.4 = 13.9'$$

► Use 1- 8' x 14' Concrete Box Culvert

3. San Pedro Boulevard

$$Q_{100} = 4060 \text{ cfs (from RTI study)}$$

$$y_{\text{normal}} = 4.96' \quad (b = 15', z = 2, \text{trapezoidal channel})$$

$$E_1 = y_1 + \frac{V_1^2}{2g} = 4.96 + \frac{(41.11)^2}{2(32.2)} = 31.20'$$

$$h_L = 0.1 \frac{(41.11)^2}{2(32.2)} = 2.62'$$

$$E_2 = E_1 - h_L = 31.2 - 2.62 = 28.58' \quad , \quad y_2(\max) = 7.0'$$

$$q^2 = (2)(32.2)(7)^2(28.58 - 7) = 63,096 \quad , \quad q = 261$$

$$b = 4060 / 261 = 15.6'$$

► Use 1- 8' x 16' Concrete Box Culvert

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 14, 1991
PASEO DEL NORTE
UPSTREAM OF THE SOUTH DOMINGO BACA
OPTION H5 (RTI 100-YEAR FLOWS)

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	3545.0
Channel Bottom Slope (feet per foot).....	0.0100
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)....	2.00
Channel Bottom Width (feet).....	10.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	6.01
Flow Velocity (feet per second).....	26.79
Froude Number (Flow is Super-Critical).....	2.395
Velocity Head (feet).....	11.15
Energy Head (feet).....	17.16
Cross-Sectional Area of Flow (square feet).....	132.31
Top Width of Flow (feet).....	34.04

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 14, 1991
PASEO DEL NORTE
UPSTREAM OF LOUISIANA BOULEVARD
OPTION H5 (RTI 100-YEAR FLOWS)

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	3410.0
Channel Bottom Slope (feet per foot).....	0.0290
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)...	2.00
Channel Bottom Width (feet).....	10.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	4.55
Flow Velocity (feet per second).....	39.25
Froude Number (Flow is Super-Critical).....	3.940
Velocity Head (feet).....	23.92
Energy Head (feet).....	28.47
Cross-Sectional Area of Flow (square feet).....	86.89
Top Width of Flow (feet).....	28.20

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 26, 1991
PASEO DEL NORTE
UPSTREAM OF SAN PEDRO BOULEVARD
OPTION H5 (RTI 100-YEAR FLOWS)

```
=====
PROGRAM INPUT DATA:
DESCRIPTION                                                    VALUE
-----
Flow Rate (cubic feet per second)..... 3590.0
Channel Bottom Slope (feet per foot)..... 0.0290
Manning's Roughness Coefficient (n-value)..... 0.0130
Channel Side Slope - Left Side (horizontal/vertical).... 2.00
Channel Side Slope - Right Side (horizontal/vertical)... 2.00
Channel Bottom Width (feet)..... 10.0
=====
```

```
=====
PROGRAM RESULTS:
DESCRIPTION                                                    VALUE
-----
Normal Depth (feet)..... 4.67
Flow Velocity (feet per second)..... 39.79
Froude Number (Flow is Super-Critical)..... 3.953
Velocity Head (feet)..... 24.59
Energy Head (feet)..... 29.25
Cross-Sectional Area of Flow (square feet)..... 90.22
Top Width of Flow (feet)..... 28.67
=====
```

```
=====
TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.
=====
```

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 26, 1991
PASEO DEL NORTE
UPSTREAM OF WYOMING BOULEVARD
OPTION H5 (RTI 100-YEAR FLOWS)

=====

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	3210.0
Channel Bottom Slope (feet per foot).....	0.0290
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)...	2.00
Channel Bottom Width (feet).....	10.0

=====

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	4.41
Flow Velocity (feet per second).....	38.62
Froude Number (Flow is Super-Critical).....	3.926
Velocity Head (feet).....	23.16
Energy Head (feet).....	27.58
Cross-Sectional Area of Flow (square feet).....	83.12
Top Width of Flow (feet).....	27.66

=====

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 26, 1991
PASEO DEL NORTE
SAN PEDRO BOULEVARD SOUTH OF INTERSECTION
OPTION H5 (RTI 100-YEAR FLOWS)

=====

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	4060.0
Channel Bottom Slope (feet per foot).....	0.0290
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)...	2.00
Channel Bottom Width (feet).....	20.0

=====

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Normal Depth (feet).....	3.79
Flow Velocity (feet per second).....	38.90
Froude Number (Flow is Super-Critical).....	3.978
Velocity Head (feet).....	23.50
Energy Head (feet).....	27.29
Cross-Sectional Area of Flow (square feet).....	104.36
Top Width of Flow (feet).....	35.14

=====

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

March 26, 1991
PASEO DEL NORTE
SAN PEDRO BOULEVARD SOUTH OF INTERSECTION
OPTION H5 (RTI 100-YEAR FLOWS)

=====

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	4060.0
Channel Bottom Slope (feet per foot).....	0.0100
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)...	2.00
Channel Bottom Width (feet).....	20.0

=====

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	5.05
Flow Velocity (feet per second).....	26.70
Froude Number (Flow is Super-Critical).....	2.419
Velocity Head (feet).....	11.07
Energy Head (feet).....	16.12
Cross-Sectional Area of Flow (square feet).....	152.06
Top Width of Flow (feet).....	40.21

=====

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

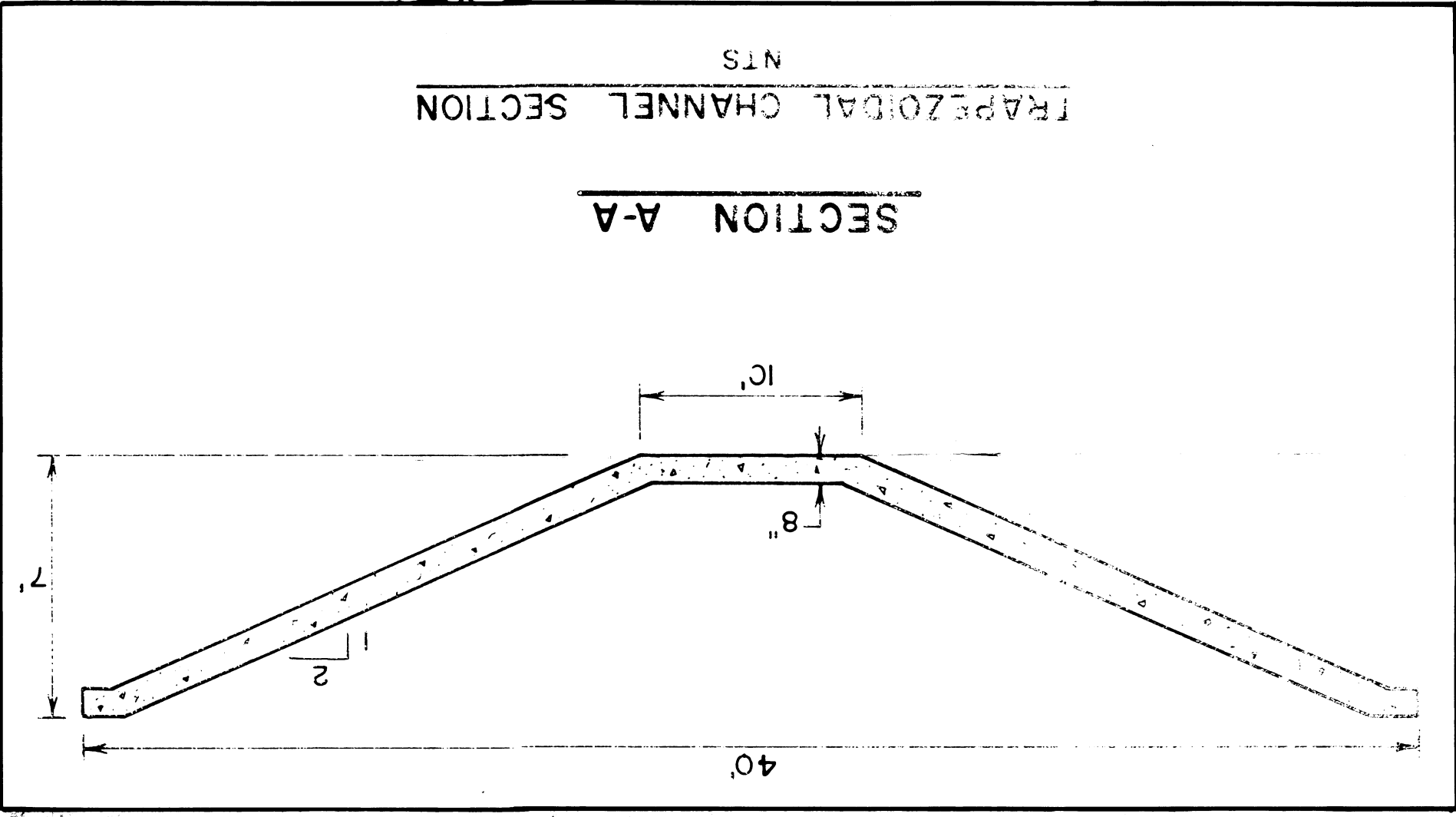
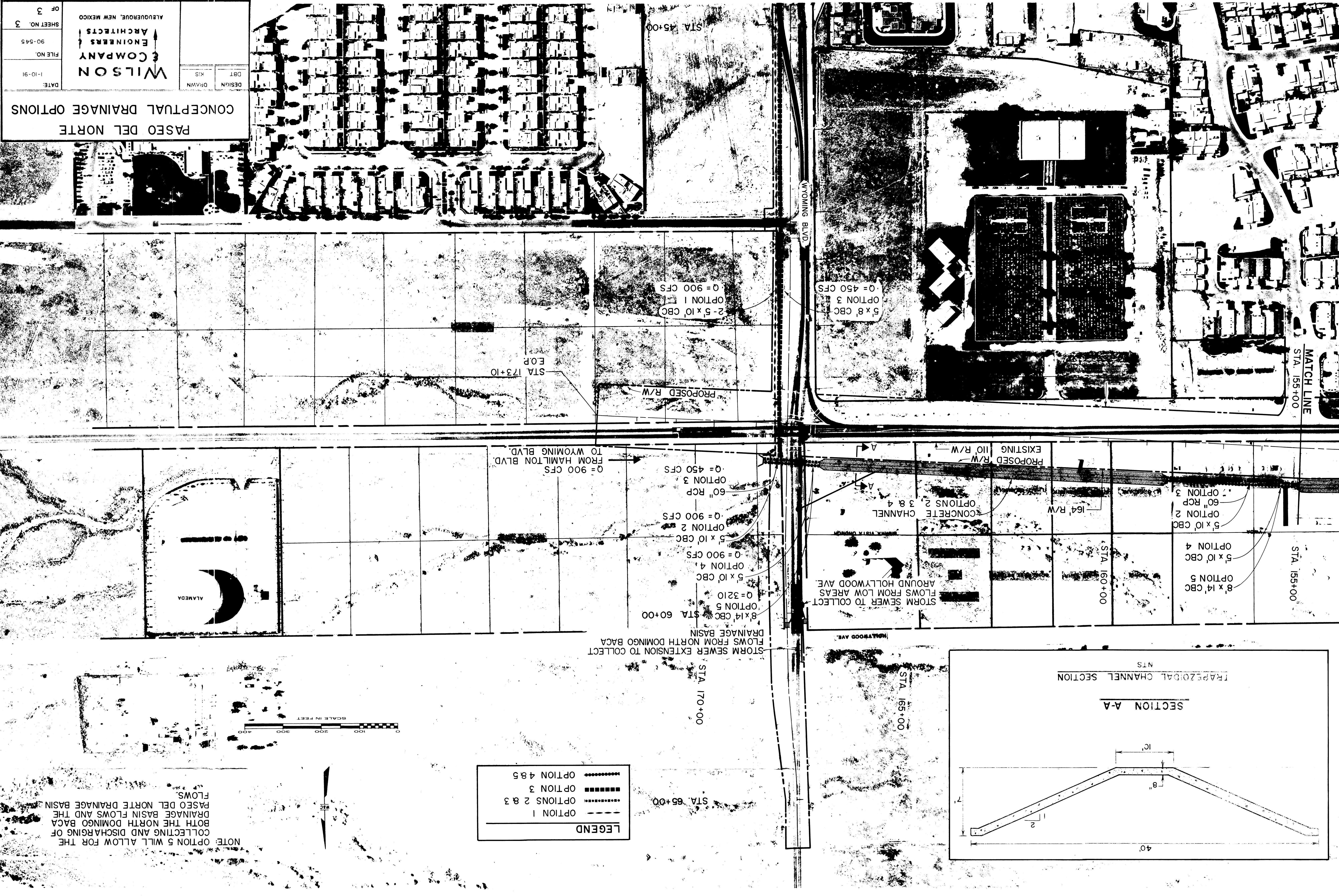
6005

DATE: 1-10-91
FILE NO. 90-545
SHEET NO. 3
OF 3

WILSON & COMPANY
ENGINEERS & ARCHITECTS
ALBUQUERQUE, NEW MEXICO

DESIGN DBT
DRAWN KIS

PASEO DEL NORTE
CONCEPTUAL DRAINAGE OPTIONS



LEGEND

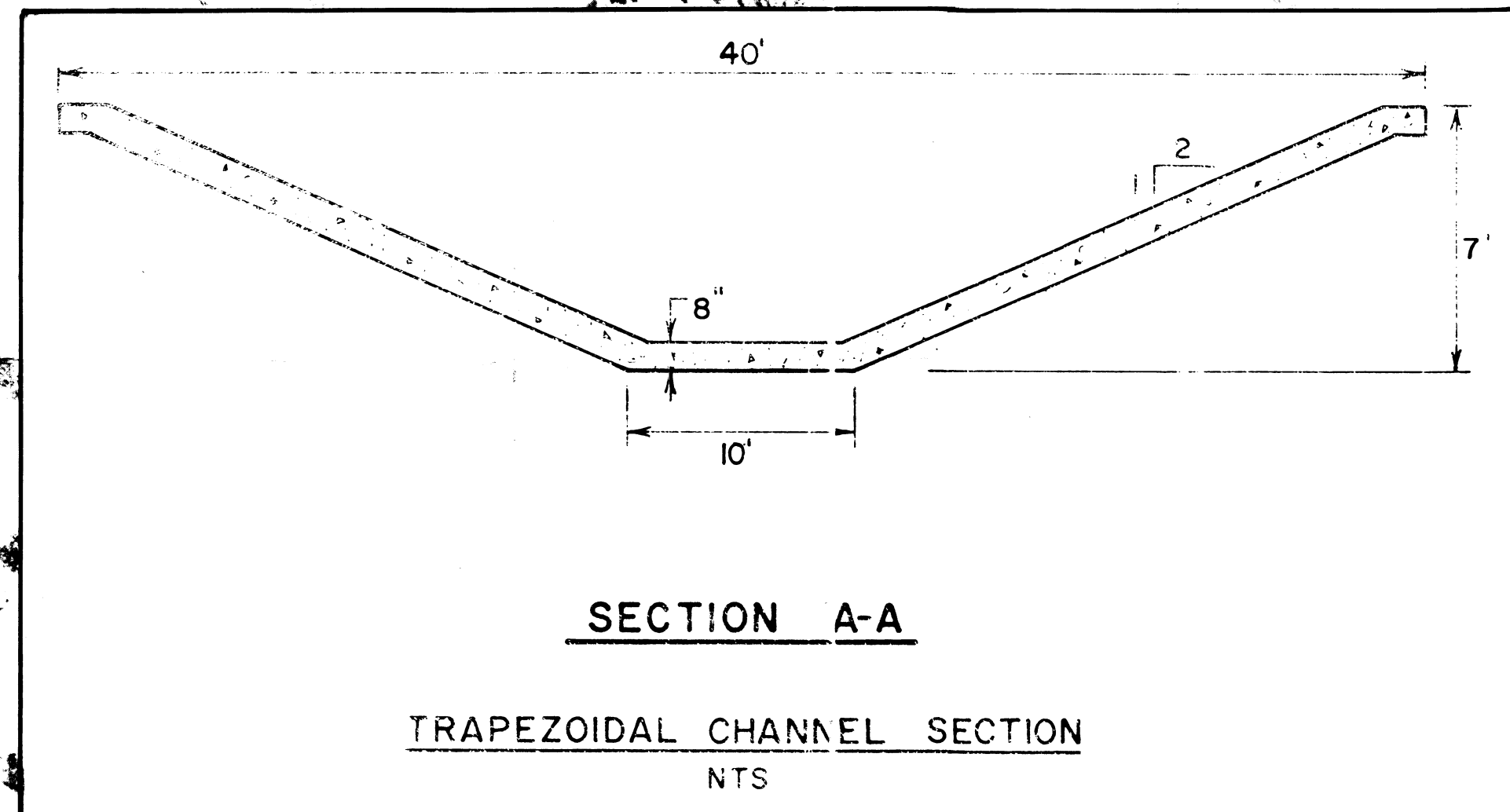
OPTION 1

OPTION 2 & 3

OPTION 3

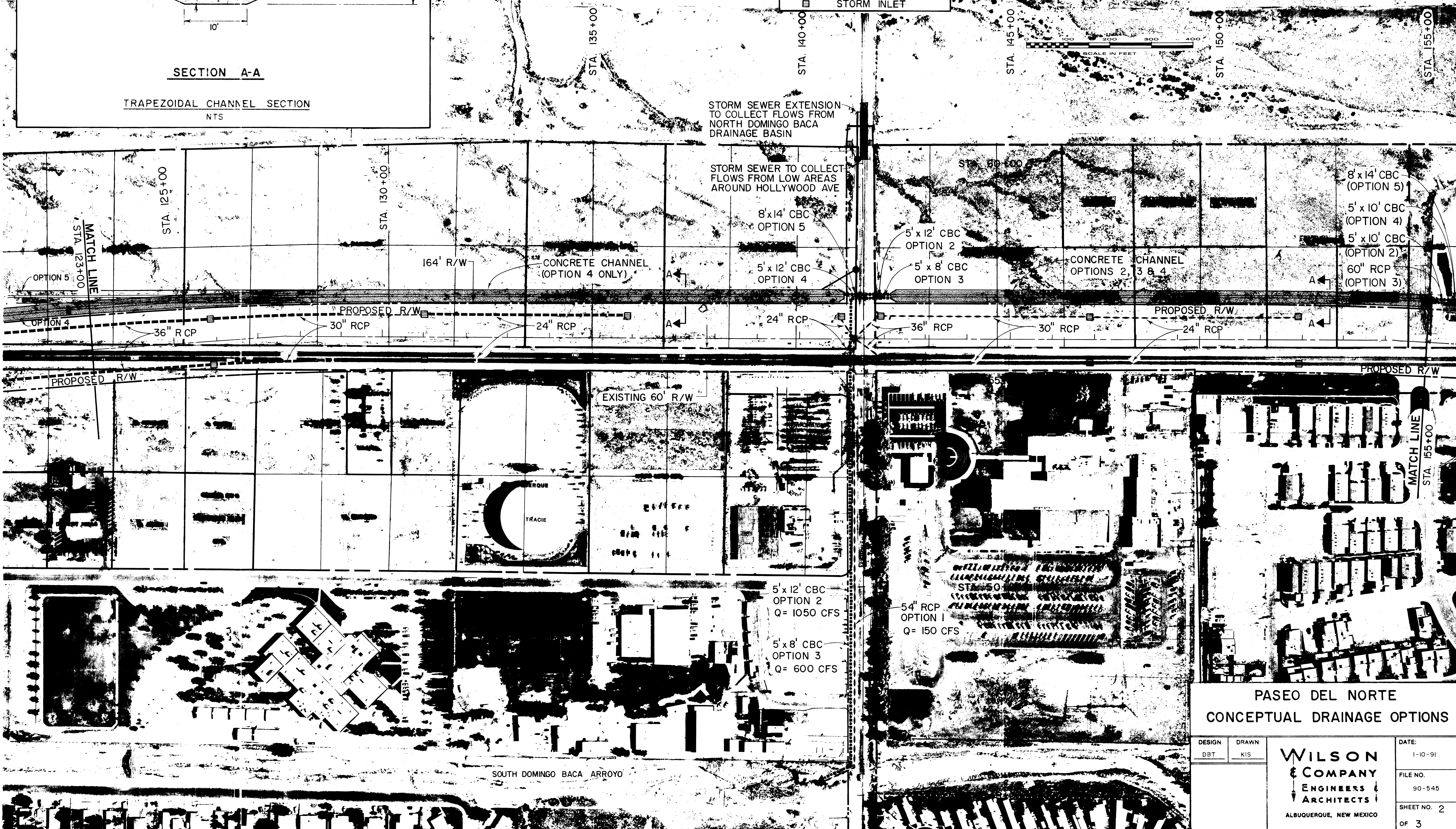
OPTION 4 & 5

NOTE: OPTION 5 WILL ALLOW FOR THE COLLECTING AND DISCHARGING OF BOTH THE NORTH DOMINGO BACA DRAINAGE BASIN FLOWS AND THE PASEO DEL NORTE DRAINAGE BASIN FLOWS.



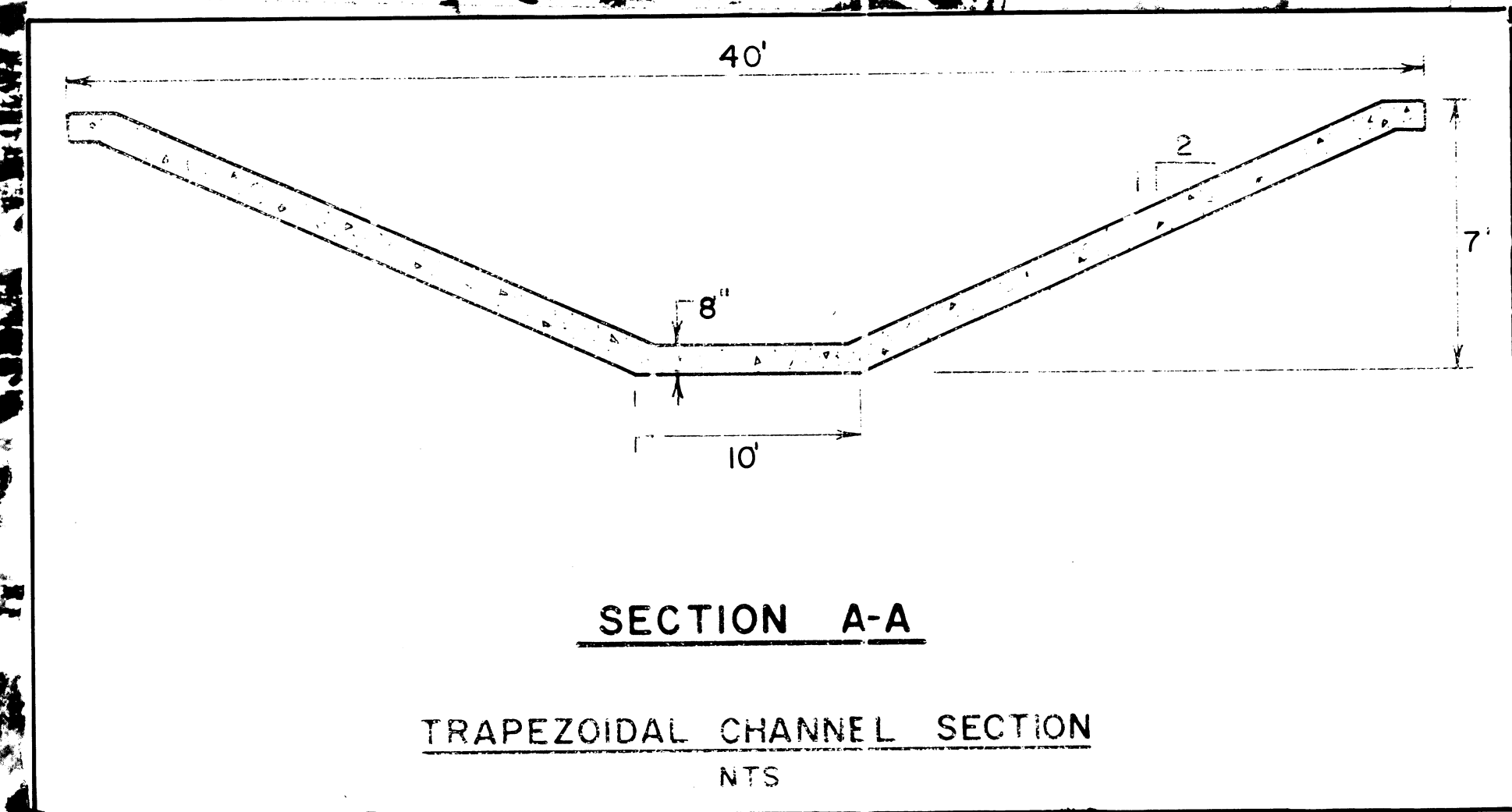
- LEGEND**
- OPTIONS 1, 2 & 3
 - OPTION 1
 - OPTIONS 2 & 3
 - OPTION 4 & 5
 - STORM INLET

NOTE: OPTION 5 WILL ALLOW FOR THE COLLECTING AND DISCHARGING OF BOTH THE NORTH DOMINGO BACA DRAINAGE BASIN FLOWS AND THE PASEO DEL NORTE DRAINAGE BASIN FLOWS.



PASEO DEL NORTE
CONCEPTUAL DRAINAGE OPTIONS

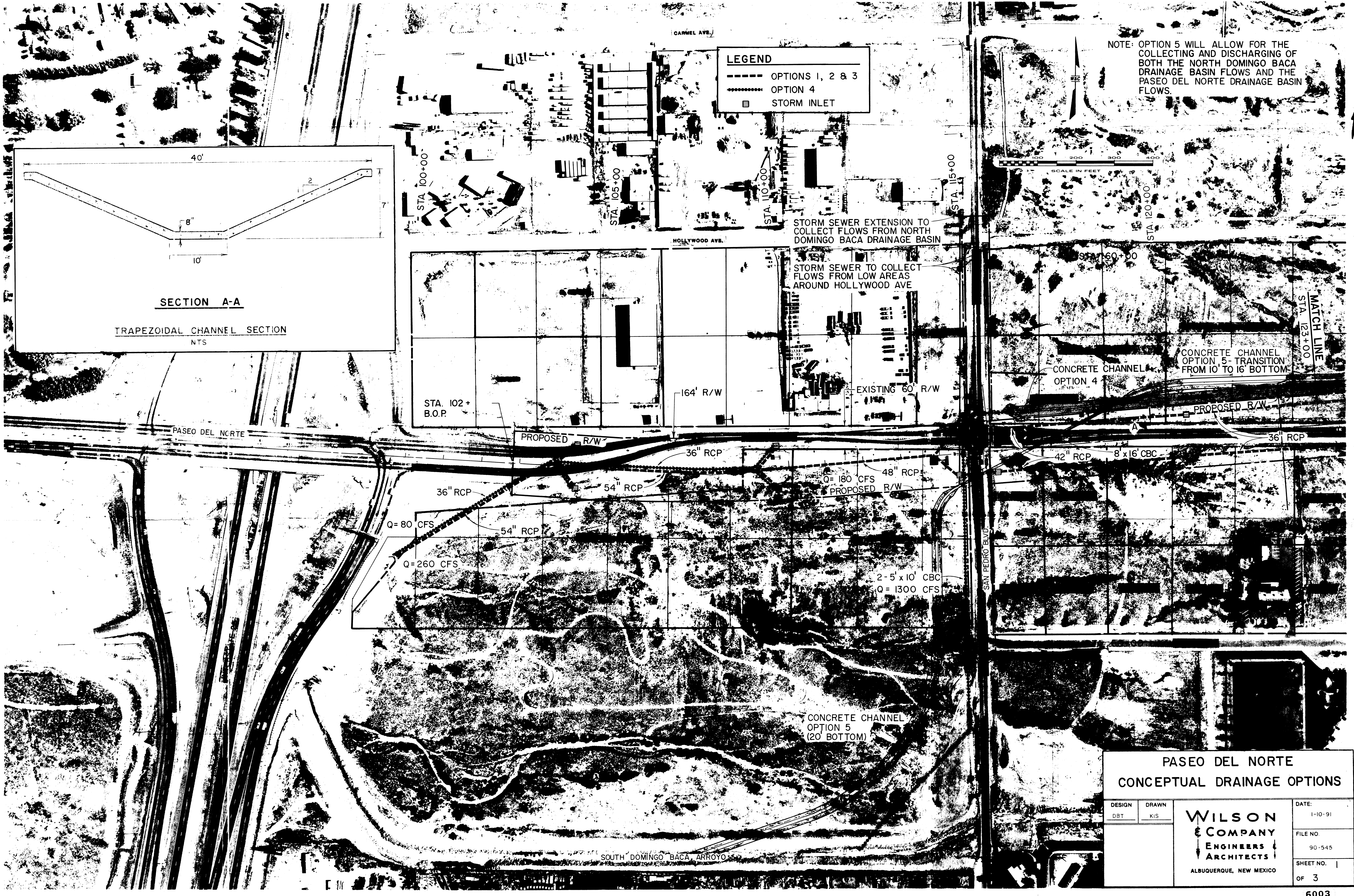
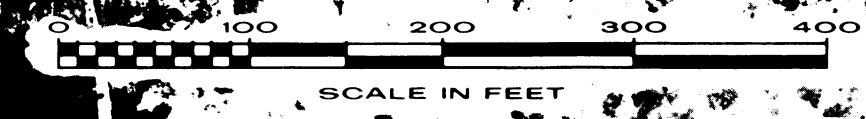
DESIGN DBT	DRAWN KIS	DATE: 1-10-91
WILSON & COMPANY ENGINEERS & ARCHITECTS ALBUQUERQUE, NEW MEXICO		FILE NO. 90-545
		SHEET NO. 2 OF 3



LEGEND

- OPTIONS 1, 2 & 3
- OPTION 4
- STORM INLET

NOTE: OPTION 5 WILL ALLOW FOR THE COLLECTING AND DISCHARGING OF BOTH THE NORTH DOMINGO BACA DRAINAGE BASIN FLOWS AND THE PASEO DEL NORTE DRAINAGE BASIN FLOWS.



PASEO DEL NORTE CONCEPTUAL DRAINAGE OPTIONS		
DESIGN DBT	DRAWN KIS	DATE: 1-10-91
 WILSON & COMPANY ENGINEERS & ARCHITECTS ALBUQUERQUE, NEW MEXICO		FILE NO. 90-545
		SHEET NO. 1
		OF 3