North and South Domingo Baca Arroyos and Paseo del Norte Corridor Drainage Management Plan

SUBMITTED TO:

Albuquerque Metropolitan Arroyo
Flood Control Authority
Albuquerque, New Mexico

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R.T.I. PROJECT NO. 90 - 090

DECEMBER 1991

ERRATA SHEET DATE: 2-18-92

ITEM/LOCATION	PREVIOUS VALUE (cfs)	CORRECT VALUE (cfs)	APPLIES TO FIGURE
Discharge at intersection of Holbrook and Carmel	330	800	5-5
Discharge at South Domingo Baca Arroyo at Louisiana Blvd.	3790	3970	5-7

Refer to Tables located at bottom right of Figures 5-5, 5-6 and 5-7. The following changes apply to each table.

Previous Correct	Storm Sewer #	100-yr. Qp (cfs)	Pipe Size dia. (ft)	Slope (%)
Previous	18	150	4.5	0.3
Correct	18	150	3.5	3.0
Previous	23	1100	5.5	0.3
Correct	23	800	5.5	3.2
Previous	52	460	5.5	0.3
Correct	52	460	5.5	3.0

NORTH AND SOUTH DOMINGO BACA ARROYOS

AND PASEO DEL NORTE CORRIDOR

DRAINAGE MANAGEMENT PLAN

Submitted to:

Albuquerque Metropolitan Arroyo
Flood Control Authority

Submitted by:

Resource Technology Incorporated
in association with
Holmes & Narver Inc.

December 26, 1991

EXECUTIVE SUMMARY

Because of the impending construction of Paseo del Norte and the anticipated corresponding land development along this roadway corridor, the Albuquerque Metropolitan Arroyo Flood Control Authority has developed this Drainage Management Plan for the North and South Domingo Baca Arroyos whose watersheds include the Paseo del Norte corridor. However, the study area only extends from the North Diversion Channel to the North and South Domingo Baca dams.

Hydrologic analyses were conducted using the AHYMO (391 Version) program; the results indicated a significant (two to threefold) increase in flows as compared to previous analyses. Consequently the design hydrology for projects already constructed in the study area should be re-evaluated. In some cases the freeboard criteria for these structures may be violated; however, additional unlined freeboard is available in several reaches.

The HEC-2 program was used to conduct hydraulic analyses of the main arroyos and major tributaries. These results show several areas where the existing Federal Emergency Management Agency maps are not accurate; one major area is the Coronado Mobile Home Park which is severely flood prone. In most other areas the flood plains are not greatly different even with the higher flows because the improved channels have freeboard and the unimproved channel floodplains are very wide under existing conditions.

After an exhaustive evaluation of numerous alternatives which included total diversion of the North Domingo Baca Arroyo into a concrete channel parallel to Paseo del Norte and eventual outfall into the South Domingo Baca channel west of San Pedro Blvd., the following improvements are recommended.

PASEO DEL NORTE CORRIDOR

1. Storm sewer to divert all flows from Tramway Blvd. to Lowell St. into the South Domingo Baca Reservoir.

2. Storm sewer to divert all flows from Lowell St. to a quarter mile east of Eubank Blvd. into the North Domingo Baca Reservoir.

3. Storm sewers in Paseo del Norte ROW to collect all roadway and adjacent area flows and discharge into a concrete box culvert along San Pedro Blvd. to outfall into the South Domingo Baca Arroyo.

NORTH DOMINGO BACA ARROYO

1. Detention dam east of Louisiana Blvd. to control flows from both North and South Branches of the arroyo.

2. Concrete lined channel through Coronado Mobile Home Park and beyond to the confluence with the South Domingo Baca Arroyo.

3. Soil cement bank lining, full soil cement or concrete channel to confine the arroyo between the new dam and Ventura St.

4. Prudent Line delineation of the arroyo from Ventura St. to the existing North Domingo Baca Dam; and, if the development density increases, a storm sewer to replace the arroyo.

5. Several tributary storm sewers.

SOUTH DOMINGO BACA ARROYO

1. Concrete lined channel from Washington St. to I-25 with future soil cement lining from the North Diversion Channel to Washington St.

2. Concrete lined channel from Holbrook St. to Eubank Blvd.

3. Prudent line delineation of the arroyo from Eubank Blvd. to the existing South Domingo Baca Dam; and, if the development density increases, a storm sewer to replace the arroyo.

4. Channel and bridge capacity improvements along existing concrete lined reaches.

5. Several tributary storm sewers.

OTHER IMPROVEMENTS

1. The La Cueva/Signal Avenue Training Dike extension.

2. Drainage analysis of the I-25/Paseo del Norte intersection based on the new drainage conditions.

3. Dikes near Pino and Signal Avenues at I-25 to prevent trans-basin diversions.

The total cost of these improvements is estimated at $22,458,000 of which $15,071,000 would be public expenditure and the remaining $7,387,000 would be privately financed.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) has authorized Resource Technology, Inc. (RTI) in association with Holmes & Narver, Inc. (H&N) to develop a Drainage Management Plan for the North Domingo Baca Arroyo and the South Domingo Baca Arroyo drainage basins from the existing North and South Domingo Baca Dams to the North Diversion Channel. This report provides the hydrologic and hydraulic analyses and resulting drainage master planning for both these watersheds which are located within Bernalillo County, New Mexico. This study was conducted under AMAFCA's responsibility of planning and providing for flood control throughout the general Albuquerque area.

A very significant feature of this Drainage Management Plan is the Paseo del Norte Transportation Corridor, which generally lies along the divide between the North and South Domingo Baca Arroyo basins; any development within this corridor will have a significant impact on future drainage developments in both basins. Therefore, much emphasis was placed on the Paseo del Norte drainage considerations and on the opportunities for coordination of design, real estate acquisition and possible construction efforts at an early stage in the development of this Drainage Management Plan.

Much of the North Domingo Baca Arroyo Basin and a smaller portion of the South Domingo Baca Arroyo Basin is presently undeveloped. However, development of these basins is iminent or already in progress. Therefore, AMAFCA has authorized this Drainage Management Plan to address and recommend drainage solutions to reduce the flooding that has occurred or will occur.

1.2 STUDY OBJECTIVES

The following is a general outline of the scope of the study:

1. Review of previous studies and reports for the study area.
2. Summary and comparison of all pertinent information.
3. Aerial photography and mapping.
4. Field surveying to identify and measure physical constraints.
5. Hydrologic analysis of total watershed area.
6. Hydraulic analysis of major arroyos.

7. Coordination with other public works agencies.

8. Coordination with planning agencies.

9. Development of drainage management options.

10. Progress evaluation and coordination meetings and periodic meetings with other governmental agencies, consultants involved in projects within the study area, landowners and developers, citizen advisory groups, and elected officials

1.3 PASEO DEL NORTE TRANSPORTATION CORRIDOR

Paseo del Norte has been designated as a limited access principal arterial on the Long Range Major Street Master Plan for the Albuquerque Urban Area. The proposed plan is to construct an east-west six lane divided, limited access principal arterial across Albuquerque.

The I-25 to Tramway Blvd. segment is currently under design with some portions already constructed. To date, the Paseo del Norte/I-25 frontage road intersection, the Tramway/Paseo del Norte intersection, and Tennyson Street Overpass have been constructed. The design of the remainder of the project is sponsored by Bernalillo County (from Lowell St. to Wyoming Blvd.) and the City of Albuquerque (from Wyoming Blvd. to I-25).

Paseo del Norte has already been constructed from Coors Rd. to I-25, and the only impact this portion of the roadway has on this Drainage Management Plan is the South Domingo Baca crossing under Paseo del Norte just west of I-25. The remainder of the roadway west of Jefferson St. is not within the study area.

1.4 OTHER AGENCY INVOLVEMENT

The Drainage Management Plan and the transportation design effort both involve multiple agency jurisdictions. These include AMAFCA, the New Mexico State Highway and Transportation Department, Bernalillo County, the City of Albuquerque, and the Federal Emergency Management Agency. Possible Federal funding for Paseo del Norte could also involve the Federal Highway Administration. Therefore, coordination of effort among all these agencies was essential in the drainage plan development.

2.0 GENERAL INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

The North and South Domingo Baca Arroyo drainage basins extend to the crest of the Sandia Mountains. The North Domingo Baca Arroyo outfalls to the South Domingo Baca Arroyo about 1,300 feet east of Jefferson Street. The South Domingo Baca Arroyo outfalls to the North Diversion Channel.

The Paseo del Norte (PDN) drainage basin, as defined in this Management Plan, begins at Tramway Blvd. and continues to Interstate 25 (I-25). The PDN area is roughly bounded on the north by Holly Avenue and on the south by Palomas Avenue. PDN from I-25 west to Jefferson Street is considered part of the South Domingo Baca Arroyo Basin.

The total existing drainage basin area of the combined North and South Domingo Baca Arroyos at the North Diversion Channel is 11.38 square miles. The drainage areas of the PDN, North Domingo Baca Arroyo and South Domingo Baca Arroyo Basins are 0.53, 3.55 and 7.30 square miles, respectively. Within the study area the drainage areas of the two arroyos are approximately equal; most of the difference in drainage areas occurs east of Tramway Blvd.

The existing drainage area for PDN is the area that drains to the I-25 frontage road culverts located immediately north and south of PDN at the frontage road. The drainage basins in the upper PDN corridor between Tramway Blvd. and Hamilton St. (Eubank Blvd.) currently drain to one or the other of the North or South Domingo Baca Arroyos.

The existing land development between the North Diversion Channel and I-25 is mostly commercial and industrial except for Coronado Mobile Home Park and a small residential area located west of the mobile home park. The area east of I-25 to Louisiana Blvd. is zoned for, and is partially developed with, mostly commercial and industrial uses except for San Pedro Estates mobile home park located north of PDN and west of Louisiana.

The area between Louisiana and Eubank Blvds. is generally residential and either developed or rapidly being developed. East of Eubank Blvd., development is scattered until Tennyson Street is reached. Except for La Cueva High School and Nor Este and Vineyard Subdivisions, existing platting is in a one dwelling unit per acre grid pattern which dominates existing development in this area. Residential development is dense along Tramway Blvd. and less dense east of Tramway Blvd. up to the Cibola National Forest boundary, located approximately one mile east of and parallel to Tramway Blvd.

2.2 BASIN CHARACTERISTICS

The dominant topographic features of the study basins are the alluvial fans and the Sandia Mountains which rise abruptly above the alluvial fans. Slopes of the mountainous sub-basins range from 25 to 80 percent and slopes from the base of the Sandia Mountains to Tramway Blvd. generally range from 3 to 9 percent with a few slopes increasing to 40 percent. The slopes between Tramway Blvd. and the North Diversion Channel generally range from 2.5 to 4.0 percent. All slopes generally trend from east to west.

Eroded sediment from the Sandia Mountains is transported by flow in steep channels which outfall onto the moderate slopes of the East Mesa. The abrupt decrease in velocities causes the sediment to deposit in fan shapes, generally called alluvial fans. A dynamic feature of the alluvial fans which form at the base of the Sandia Mountains is the continual channel braiding or formation of new channels. Therefore, the potential for channel redirection by natural geomorphological processes was considered when planning for drainage control structures throughout the study area.

2.3 SOILS AND VEGETATION

Most soils within the study area between the North Diversion Channel and Tramway Blvd. are largely decomposed granite up to 60 inches in depth within the Embudo or Embudo-Tijeras complex (Soil Conservation Service, 1977). These soils are moderately pervious and subject to erosion. The vegetation on the alluvial fans generally covers about 15 percent of the surface area. The vegetation density increases near and in arroyos due to the concentration of runoff.

The soils in the upper alluvial fans east of Tramway Blvd. and in the Sandia Mountains are generally shallow from 10 to 30 inches in depth and are classified into three soil series which are Tesajo-Millett stony sandy loams, Rock outcrop - Orthids complex and Rock outcrop (Soil Conservation Service, 1977). Runoff is very rapid and the soils are subject to moderate erosion. The upper alluvial fans have moderate vegetation density. The mountain slopes have sparse to moderate vegetation and include several brush and tree species.

2.4 EXISTING INFRASTRUCTURE

Paseo Del Norte Corridor

A small detention facility to serve local drainage only is located just west of Tramway Blvd. It was constructed as part of the recently completed Paseo del Norte-Tramway Blvd. intersection. This facility discharges into an asphalt lined channel north of Paseo del Norte, and the channel terminates midway between Tramway Blvd. and Lowell St. where it joins an unlined branch of the South Domingo Baca Arroyo.

The existing Paseo del Norte roadway is frequently crossed by minor branches of both the North Domingo Baca and South Domingo Baca Arroyos; there are no crossing structures at these locations. The main arroyos generally run parallel to the roadway.

The PDN corridor flows are conveyed under I-25 at two locations. North of the Paseo del Norte/I-25 intersection there are 4-48" corrugated metal pipes (CMPs) under the I-25 frontage road, and south of the intersection there are 2-60" CMPs under the I-25 frontage road.

These culverts outfall into shallow ponding areas between I-25 and the frontage roads. A series of similar culverts in the I-25 /PDN interchange convey runoff under PDN and I-25 with the outfall to the South Domingo Baca Arroyo located south of PDN and west of I-25. Figure 2-1 shows the arrangement of these culverts.

South Domingo Baca Arroyo

The upper South Domingo Baca Arroyo watershed east of Tramway Blvd. has two sub-basins called the Domingo Baca Tributary Arroyo and the South Domingo Baca Arroyo. Each of these arroyos pass under Tramway Blvd. through bridges. The South Domingo Baca Arroyo is concrete lined from 1,300 feet east of Tramway Blvd. to Tennyson Street; the Domingo Baca Tributary Arroyo is lined from Tramway Blvd. to the confluence with the South Domingo Baca Arroyo.

The arroyo is mostly unlined from Tennyson St. to the South Domingo Baca Dam and also from the dam to Holbrook St. The South Domingo Baca Arroyo from Holbrook St. to Wyoming Blvd. has been concrete lined and lining of the remainder from Wyoming Blvd. to I-25 is currently in design or construction. This reach of the channel currently has bridges/box culverts at Ventura St., Barstow St. and Wyoming Blvd.; in the near future bridges/box culverts will be constructed at Louisiana and San Pedro Blvds.

The arroyo crosses under I-25, the frontage roads, PDN and Jefferson Street through 4 - 8' tall X 10'wide concrete box culverts (CBCs) at each crossing. Washington Street is a dip section. The arroyo is unlined between the west I-25 frontage road and PDN, and from PDN to the North Diversion Channel.

North Domingo Baca Arroyo

The upper North Domingo Baca Arroyo watershed drainage east of Tramway Blvd. crosses under Tramway Blvd. through box culverts. From the box culvert outfall to Tennyson St. the arroyo is in a concrete channel. The arroyo is unlined from Tennyson St. to the North Domingo Baca Dam and also from the dam to its confluence with the South Domingo Baca Arroyo (located about 1,300 feet east of Jefferson St.).

Partial soil cement channel lining exists on the north bank of the arroyo along Anaheim Ave. beginning at Wyoming Blvd. and extending about half way to Barstow St. Most of the north - south streets do not have culverts or bridges and runoff passes over the streets through dip crossings. Barstow St., Wyoming and San Pedro Blvds. have several small CMPs to carry main arroyo flows.

A major tributary called the North Branch originates west of Ventura St. and flows parallel to the main North Domingo Baca Arroyo, which is also called the South Branch. Both branches eventually combine west of Coronado Mobile Home Park (located west of I-25).

The North Branch of the arroyo crosses under I-25 and the frontage roads through 8 - 4' diameter reinforced concrete pipes (RCPs). The arroyo is unlined between the west I-25 frontage road through Coronado Mobile Home Park until it joins a long underground conduit. This conduit (currently partially filled with sediment) outfalls to an open unlined channel which connects to the South Branch just west of the mobile home park.

The South Branch (or main arroyo) is conveyed under I-25 and the frontage roads through 4 - 4'tall X 9'wide concrete box culverts which outfall to an unlined channel through Coronado Mobile Home Park. Several large RCPs are used to convey the channel under several roads within the mobile home park. The unlined channel outfalls to a larger unlined channel located at the west end of the mobile home park. This larger unlined channel conveys flow from both the North and South Branches to its confuence with the South Domingo Baca Arroyo (located at the west side of the mobile home park).

2.5 EXISTING PROBLEM AREAS

General

Sedimentation in culverts is a common problem at many of the existing culverts. The loss of flow capacity due to sediment deposition at the entrance and within culverts is very significant at some culverts. As development increases and runoff rates increase, the loss of flow capacity will pose an even greater problem and therefore these culverts and certain channel reaches must be improved to prevent overtopping and flooding.

Paseo Del Norte

As mentioned previously, there are no crossing structures under the current Paseo del Norte facility east of I-25. Where flow lines cross or intersect the alignment they either cross directly over the road or run parallel to it until a dip section is reached. Due to the lack of drainage structures at major street intersections, frequent intersection flooding occurs as runoff in roadside ditches backs up until it achieves sufficient depth to cross the intersecting streets. These problem areas must be addressed with the construction of the new roadway.

South Domingo Baca Arroyo

The existing concrete channel between Holbrook St. and Wyoming Blvd. has several sections which have inadequate capacity under full development condition peak discharges.

In the reach from Holbrook St. to Louisiana Blvd., the South Domingo Baca is a concrete lined facility which was designed under previous hydrologic criteria. Existing bridges and channel sections have minimal flow capacity for future condition flows and consequently limit the amount of additional flows that can be diverted into this arroyo. From Louisiana to I-25 there is more flexibility because the channel is not yet under construction.

The South Domingo Baca Arroyo crosses I-25 through 4-8' tall X 10' wide CBCs which have capacity in excess of future needs with current drainage patterns. However, the short reach (100 ft) of open channel between the south bound lanes of I-25 and the I-25 frontage road should be lined to improve the hydraulic efficiency of the channel.

Another location that may cause problems in a large flood is at the intersection of Pino Avenue and the north bound I-25 frontage road. The basin divide between the Pino Arroyo and the South Domingo Baca Arroyo basin is located in the drainage ditch 30 feet north of this intersection. The problem is that the divide is a high point in the swale invert and flows from Pino Ave. could flow north in the drainage ditch to the South Domingo Baca Arroyo. Therefore a small berm will be required to prevent this problem.

North Domingo Baca Arroyo

The Northeast Heights Drainage Management Plan (Leonard Rice Consulting Engineers, 1975) recommended that AMAFCA build two training dikes along the drainage boundary between North Domingo Baca Arroyo and La Cueva Arroyo to ensure that the La Cueva Arroyo flows did not pass over the low drainage divide between the two basins. AMAFCA did build these dikes and they have served their function well except for one section of the dike which may be inadequate. The circumstances are as follows.

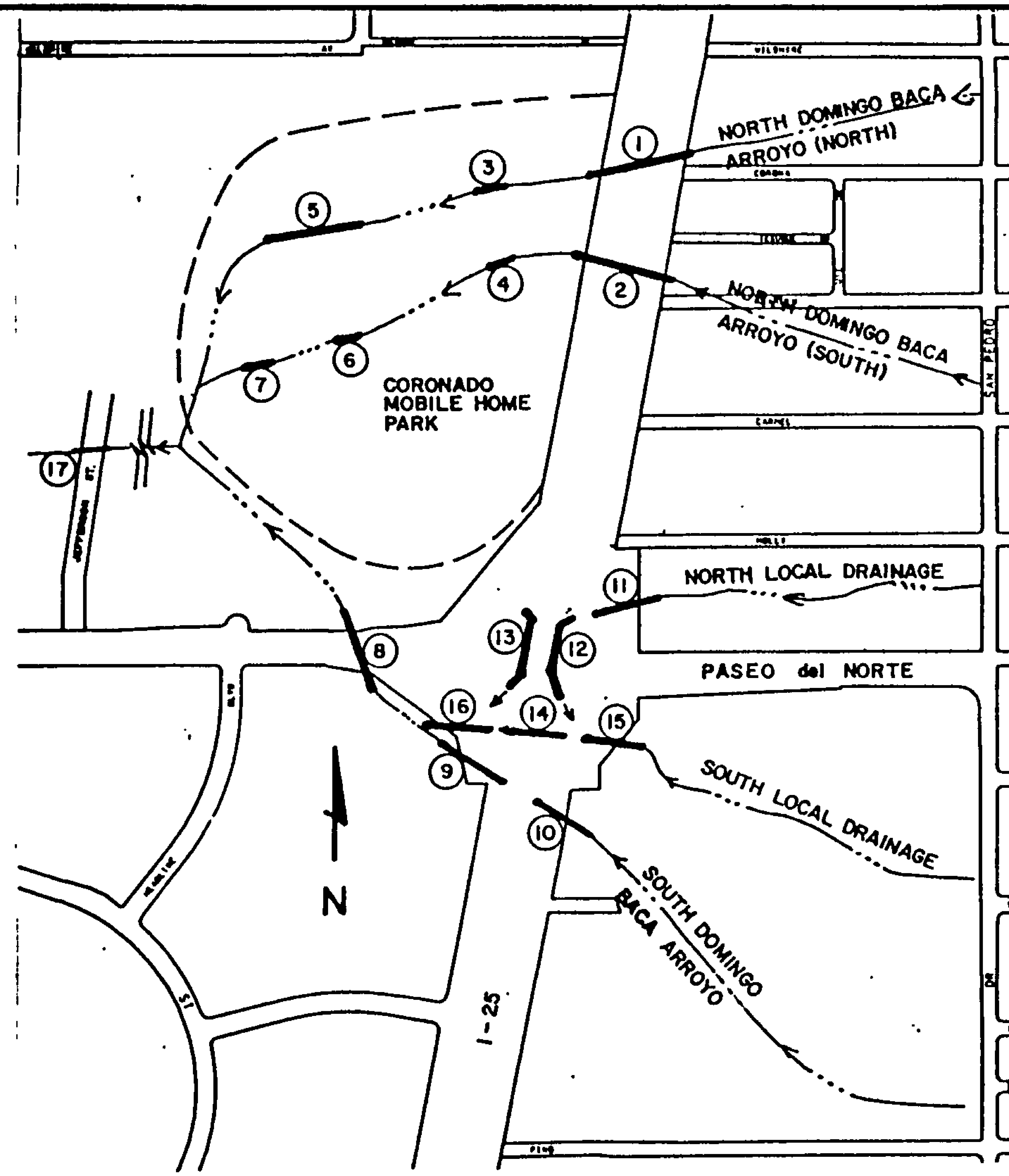
A large rainstorm on July 21, 1991 occurred over the La Cueva Arroyo basin and other areas in the Northeast Heights. La Cueva Arroyo experienced a very large discharge which spilled over the dike which is located between Barstow St. and Ventura St. Therefore, this dike must be elevated to prevent future flooding in the North Domingo Baca basin resulting from flooding in the La Cueva Arroyo basin.

The two crossings provided at I-25 for the North and South Branches of the North Domingo Baca Arroyo do not have sufficient capacity to pass the 100-year storm flows without extensive upstream flooding. The overflow during flooding at these culverts would be north along the I-25 frontage road and then to the I-25/Alameda Blvd. intersection or south along the I-25 frontage road to the I-25/Paseo del Norte intersection.

The problem is even more critical downstream (west) from I-25 where the two North Domingo Baca branches pass through the Coronado Mobile Home Park in channels with insufficient capacity, with constricted culvert crossings, and without drainage easements. The culverts through the mobile home park have significantly smaller capacity than the I-25 crossings.

STRUCTURE NUMBER	QUANTITY AND DESCRIPTION	MAXIMUM FLOW DEPTH NO SEDIMENT	EXISTING AVAILABLE FLOW DEPTH INLET	OUTLET
		(ft)	(ft)	(ft)
1	8 – CMP'S 4'	4.00	4.00	4.00
2	4 – CBC'S 4'H X 9'W	4.00	4.00	4.00
3	1 – CMP 5.67'H X 8.5'W	5.67	5.67	5.50
4	2 – CMP'S 5.67'H X 8'W	5.67	5.67	5.67
5	1 – CMP 5.5'H X 8'W	5.50	5.00	1.70
6	2 – CMP'S 5.5'H X 8'W	5.50	3.70	3.70
7	1 – CMP 5'H X 13'W	5.00	4.70	4.70
8	4 – CBC'S 8'H X 10'W	8.00	5.97	6.50
9	4 – CBC'S 8'H X 10'W	8.00	7.57	8.00
10	4 – CBC'S 8'H X 10'W	8.00	6.29	8.00*
11	4 – CMP'S 4'	4.00	4.00	4.00
12	2 – CMP'S 4'	4.00	4.00	4.00
13	1 – CMP 4'	4.00	4.00	4.00
14	2 – RCP'S 5'	5.00	5.00	5.00
15	2 – CMP/RCP' 5'	5.00	5.00	5.00
16	2 – RCP'S 5'	5.00	5.00	5.00
17	4– CBC's 8'H X 10'W	8.00	4.00	5.50

* Not surveyed.



SUMMARY OF I-25, PASEO DEL NORTE AND CORONADO MOBILE HOME PARK CULVERTS

FIGURE 2-1

3.0 RELATED MASTER DRAINAGE PLANS

General

Eight related master drainage plans which include either the North and/or South Domingo Baca Arroyos are briefly described in this section. The hydrologic methods and results from five of these plans are compared to the results from the present study in Section 4.

3.1 NORTHEAST HEIGHTS DRAINAGE MANAGEMENT PLAN (NEHDM Plan)

This plan was completed for AMAFCA in 1975 by Leonard Rice Consulting Water Engineers, Inc. The main recommendations from this plan concerning the North and South Domingo Baca Arroyos were to construct the North and South Domingo Baca Dams and the La Cueva Dikes between Barstow St. and Hamilton St. (Eubank Blvd.). These projects have been constructed. In addition, the NEHDM Plan recommended channel stabilization consisting of drop structures every 150-200 feet along most reaches of both arroyos.

South Domingo Baca Arroyo

The NEHDM Plan recommended check dams from the inlet to the North Diversion Channel to just east of Washington Street and numerous drop structures from this location to Hamilton St. (Eubank Blvd.) These structures have not been constructed. Instead, the arroyo has been concrete lined from Holbrook St. to Wyoming Blvd. and will be lined to I-25 in the very near future.

In addition to the detention dam, the NEHDM Plan recommended an unimproved arroyo from Hamilton St. (Eubank Blvd.) to a stilling basin located at the outfall of the proposed concrete channel recommended to convey the arroyo under Tramway Blvd. The plan also recommended diversion of the Domingo Baca Tributary Arroyo (located north of the South Domingo Baca Arroyo) to the South Domingo Baca Arroyo. These recommendations from Hamilton St. (Eubank Blvd.) to Tramway Blvd. have been implemented.

North Domingo Baca Arroyo

The NEHDM Plan recommended a concrete channel for the North Domingo Baca Arroyo from its confluence with the South Domingo Baca Arroyo to I-25. However, this channel was never constructed. Drop structures were recommended from I-25 to the North Domingo Baca Dam and upstream from the dam to Tramway Blvd.; however, these drop structures were also not constructed.

Furthermore, sediment trap basins east of Tramway Blvd., which were recommended in the NEHDM Plan, were not constructed. And finally, a diversion structure located just west of Tramway Blvd. to divert a small tributary of the La Cueva Arroyo (located north of the North Domingo Baca Arroyo) to the North Domingo Baca Arroyo was recommended but not implemented.

3.2 ARROYO DE DOMINGO BACA DETENTION DAM AND DIVERSION SYSTEM

This report was prepared for AMAFCA by Wilson & Company, 1977. The report recommended diversion of the Domingo Baca Tributary Arroyo to the South Domingo Baca Arroyo and construction of the dam. These structures have been constructed.

3.3 HYDROLOGIC AND HYDRAULIC IMPACTS OF THE DETENTION RESERVOIR ON ARROYO DE DOMINGO BACA

This report was prepared for AMAFCA by Espey, Huston and Associates, Inc. in 1979. This study analyzed the impacts of the South Domingo Baca on hydrology and hydraulics as a result of improved channels. The study recommended total control of the South Domingo Baca Arroyo with channelization.

3.4 REVIEW AND REFINEMENT OF THE NORTHEAST HEIGHTS DRAINAGE MANAGEMENT PLAN (RRNEHDM Plan)

Due to land development in the Northeast Heights after the NEHDM Plan was developed, AMAFCA authorized Espey Huston & Associates, Inc. in 1980 to refine the NEHDM Plan. However, the study area did not include the South Domingo Baca Arroyo.

This plan also (as did the NEHDM Plan) recommended a concrete channel for the North Domingo Baca Arroyo from its confluence with the South Domingo Baca Arroyo to I-25 through Coronado Mobile Home Park. As stated previously, this channel has not been constructed. The plan recommended sixteen drop structures ranging in height from four to eight feet with ten of these located immediately downstream of road crossing structures. The plan did not recommend any improvements upstream from the North Domingo Baca Dam.

The plan presented an alternative concrete lined channel between I-25 and Louisiana Blvd. However, neither drop structures nor a concrete channel have been constructed.

The RRNEHDM Plan also recommended extension of the La Cueva Dike as proposed in the NEHDM Plan (located for a short distance between Barstow St. and Ventura St.) to extend east just past Ventura St. It proposed an additional La Cueva Dike located between Ventura St. and Holbrook St. These dikes have been constructed.

3.5 NORTH ARROYO DE DOMINGO BACA DETENTION DAM AND LA CUEVA DIKES

This report was prepared for AMAFCA by Wilson & Company, 1980. The purpose of this report was to compute the total potential runoff from the upstream tributary including diversion from the La Cueva Arroyo. This report also recommended additional dikes between Browning St. and Ventura St. to preclude the La Cueva Arroyo flows from overtopping the small natural divide and entering the North Domingo Baca Arroyo. The North Domingo Baca Dam and the dikes have been constructed.

3.6 DRAINAGE REPORT FOR TRAMWAY BOULEVARD IMPROVEMENTS FROM MONTGOMERY BOULEVARD TO TRAMWAY ROAD

This report was prepared by Resource Technology, Inc. in 1987 for Holmes & Narver, Inc. The report presented the results of hydrologic analyses for an area extending from the crest of the Sandia Mountains to Tramway Blvd.

3.7 FAR NORTHEAST HEIGHTS MASTER DRAINAGE PLAN (FNHMD Plan)

This plan was completed in 1988 for the City of Albuquerque Public Works Department by Roy F. Weston, Inc. The South Domingo Baca Arroyo was included in this study; however, the North Domingo Baca Arroyo was not.

This plan recommended an elevated road dike on Holly Ave. between Wyoming Blvd. and Ventura St. to preclude the potential for runoff from the North Domingo Baca Arroyo to enter the South Domingo Baca Arroyo Basin at this location.

The FNHMD Plan recommended extending the existing concrete lined channel for the South Domingo Baca Arroyo from Wyoming Blvd. to the North Diversion channel. It also recommended a 36-inch storm sewer along Barstow St. from San Francisco Road to the South Domingo Baca Arroyo Channel to drain the residential area between Barstow St. and Ventura St. Another 42-inch storm sewer was proposed between Ventura St. and Barstow St. along PDN and south on Barstow St. to the South Domingo Baca Arroyo. A 54-inch storm sewer was proposed from PDN to the South Domingo Baca Arroyo along Wyoming Blvd. None of these improvements have been implemented at this time except for concrete channel lining of the South Domingo Baca Arroyo from Wyoming Blvd. to I-25 which is under construction between Wyoming and Louisiana Blvds. and is under design from Louisiana Blvd. to I-25.

3.8 DRAINAGE REPORT FOR TRAMWAY BOULEVARD FROM MONTGOMERY BLVD. TO TRAMWAY ROAD

This report was prepared for the County of Bernalillo Public Works Department and New Mexico State Highway and Transportation Department by Holmes & Narver, Inc. 1989. This report presented the required improvements for this major transportation facility which is currently under construction.

3.9 SUB-DIVISION DRAINAGE PLANS

Drainage Master Plan for Nor Este

This subdivision Master Plan was prepared by Espey, Huston & Associates in 1987. One main recommendation was a detention pond which has been constructed and is proposed to be eliminated in the future when downstream improvements are implemented.

Vineyard Estates Grading and Drainage Plan

This Drainage Plan was prepared by Tom Mann Associates, Inc., 1987. The main drainage feature was a detention pond which has been constructed. This pond will be abandoned when future downstream channel improvements are implemented.

Other Drainage Information

All construction plans and as-builts for storm sewers, concrete channels and other drainage structures applicable to the study area were reviewed and the information was utilized where required.

4.0 HYDROLOGIC ANALYSIS

4.1 HYDROLOGIC CRITERIA

The basic drainage design criteria for this project are listed in the "REVISION OF SECTION 22.2, DEVELOPMENT PROCESS MANUAL (January, 1991) - Draft". This revision includes the steeper slope and land treatment adjustment. This document was also issued as the Bernalillo County Drainage Ordinance in January of 1991. The Draft Revision to the DPM (Draft DPM) relies extensively on an AMAFCA adapted version of the U. S. Department of Agriculture HYMO computer program called AHYMO990. This was subsequently revised to incorporate Federal Emergency Management Agency comments, and called AHYMO391. The AHYMO391 version revised the rainfall distribution so that the peak rain occurred during the second hour of the storm. The hydrologic parameters required for analysis with these new procedures are listed in the following sub-sections. The hydrologic results from the AHYMO 391 model used in this plan are compatible to results using the latest AHYMO 991 version.

4.2 EXISTING AND FUTURE SUB-BASINS

Drainage Pattern Description

Paseo del Norte (PDN) Corridor

Currently, the PDN corridor drainage patterns can be summarized as follows:

From Lowell St. to Browning St.	- All flows drain to the South Domingo Baca Arroyo
From Browning St. to Holbrook St.	- All flows drain to the North Domingo Baca Arroyo
From Holbrook St. to I-25	- Flows become concentrated within the right-of-way (ROW) to Louisiana Blvd., then split 50% to 4-48" CMPs north of the Paseo del Norte/I-25 intersection, and 50% to 2-60" CMPs south of the intersection.

North and South Domingo Baca Arroyos

West of Tramway Blvd. these arroyos have relatively steep slopes of 2.5 to 4 percent, sandy beds and banks with very low or gradually sloping banks. The poorly defined arroyos result from the braided and meandering characteristics of flow over alluvial fans which generally allows for a wide floodplain. The arroyo thalweg may shift during a runoff event thus changing the previous floodplain location. East of Tramway Blvd. the arroyos are much steeper and the arroyos are better defined within the Sandia Mountains.

One exception to this pattern is the upper South Domingo Baca Arroyo between Tramway Blvd. and the South Domingo Baca Dam which has been deepened and now is a well defined channel.

Existing Sub-Basins

Sub-basin boundaries were determined from orthophoto-topographic maps with a 2-foot contour interval and scale 1"=200' based on aerial photography, dated April 1990. Early in the study phase of this project it was decided to give numerical designations to these sub-basins consistent with two previous drainage management plans in order to facilitate the comparison of results among these plans.

The Far Northeast Heights Drainage Management Plan (Weston, 1988) sub-basin numbers were used for the South Domingo Baca Arroyo Basin and the Review and Refinement of the Northeast Heights Drainage Management Plan (Espey - Huston, 1980) sub-basin numbers were used for the North Domingo Baca Arroyo Basin. However, due to more recent topographic information and large sub-basin areas used in these previous plans, many of the sub-basins were further subdivided and additional analysis points were required. These were incorporated into the present plan by the use of decimal extensions, i.e., Sub-Basin 408 was divided into 408.1, 408.2, etc.

The drainage sub-basins and analysis points east of Tramway Blvd. to the Sandia Mountains are shown on Figure 4-1. The existing drainage boundaries and analysis points between Tramway Blvd. and the North Diversion Channel are shown in Figure 4-2.

Future Sub-Basins

Paseo del Norte Corridor (PDN)

Future condition boundaries were determined based on the assumption that future grading would drain lots to adjacent streets or drainage facilities in the streets. Therefore, drainage boundaries follow either street lines or mid-block lot lines. At major intersecting side streets (i.e. Holbrook St., Barstow St., Wyoming Blvd., etc.) it was assumed that the Paseo del Norte drainage facilities would intercept as much of the runoff as possible in order to keep these intersections open during major rainfalls. The future drainage boundaries and analysis points from the North Diversions Channel to Tramway Blvd. are shown in Figure 4-3.

North Domingo Baca Arroyo Basin

The northern basin boundary between Hamilton St. (Eubank Blvd.) and Tramway Blvd. was increased to the north along mid-block lot lines between east - west streets. This increased area may be diverted to the North Domingo Baca Dam and is similar to the area proposed in the North Arroyo De Domingo Baca Dam and La Cueva Dikes Report (Wilson & Company, 1980). This proposed northern boundary will allow the La Cueva Tributary located east of Tramway Blvd. as shown on Figure 4-1 to discharge into the North Domingo Baca Arroyo Basin and be diverted to the North Domingo Baca Dam.

The remaining northern basin boundary was assumed to remain the same as for existing sub-basins except between I-25 and Wyoming Blvd. In this area, the mid-block lot line between Signal Ave. and Wilshire Ave. was assumed to be the basin divide. The future drainage sub-basin boundaries along the PDN Corridor coincide with the PDN Corridor boundaries as defined in the Final Environmental Documentation, 1989. All remaining boundaries were assumed to be the same as existing conditions.

The Long Range Major Street Plan was reviewed and the realignment of Alameda Blvd. between Barstow St. and Ventura St. was noted. Alameda Blvd. will be realigned to the present Wilshire Ave. at Ventura St. The drainage sub-basins north of and adjacent to Alameda Blvd. may be intercepted and/or diverted along the north side of Alameda Blvd. and out of the North Domingo Baca basin. However, this plan conservatively assumed that the runoff from these sub-basins would continue to discharge to the North Domingo Baca culverts at I-25.

South Domingo Baca Arroyo Basin

The southern basin boundary was moved south between Holbrook St. and Tramway Blvd. along mid-block lot lines between east - west streets. The future drainage basin boundaries along the PDN Corridor coincide with the PDN Corridor boundaries as defined in the Final Environmental Documentation, 1989. All remaining boundaries were assumed to be the same as existing conditions.

4.3 RAINFALL DATA

The Draft DPM utilizes the NOAA Atlas 2, Precipitation-Frequency Atlas of the Western United States, Vol. IV - New Mexico, to determine rainfall amounts for various return periods. The Draft DPM contains interpolated isopluvial maps so that each sub-basin can be examined independently. When the user specifies the 1-hour, 6-hour, and 24-hour rainfall amounts, the AHYMO program will generate a mass rainfall curve. The peak incremental rainfall amount occurs during the time increment 1.4 hours after beginning of the storm. Figure 4-4 illustrates a typical 100-yr. 24-hour storm hyetograph and Figure 4-5 illustrates the corresponding mass curve.

For the existing condition and the preferred future condition models, the 2-year, 10-year, and 100-year, 24-hour storms were modeled. For other future development options, only the 100-

year, 24-hour storm was analyzed. The typical rainfall depths used from the Sandia Mountains to the North Diversion Channel are shown in Table 4-1.

4.4 TIME OF CONCENTRATION AND TIME TO PEAK

The Draft Revision to the DPM lists three equations or methods to compute Time of Concentration (Tc) and Lag Time (tp) based on sub-basin reach length. The first, second and third methods correspond to reach lengths less than 4,000 feet, 4,000 - 12,000 feet, and greater than 12,000 feet, respectively. All sub-basins west of Tramway Blvd. had reach lengths less that 4,000 feet and therefore the first method was used. The equations and parameters listed in the DPM are listed below.

For sub-basins with a total length of less than 4000 feet, the Soil Conservation Service (SCS) Upland Method was used for computing the Time of Concentration as follows:

$$Tc = (L1/V1 + L2/V2 + \ldots) / 60 \text{ sec/min}$$

where: Tc = Time of Concentration, min.
L = length, ft
V = velocity, ft/sec

Velocity is determined by:

$$V = K * s^{.5}$$

where: K = conveyance factor
s = slope, %

Conveyance factors used in this study are as follows (additional changes to the conveyance factors, which are included in the August 1991 draft of the DPM, will not significantly affect these results):

K	Conveyance Condition
0.7	Grass and landscaped areas
1.0	Bare ground
2.0	Paved areas (sheet flow) and small upland gullies
3.0	Street flow and channels

As defined in the Draft DPM, if Tc is less than 12 minutes, 12 minutes was used as the Time of Concentration. Time to Peak, tp, is defined as 2/3 of Tc. The tp for the majority of all sub-basins was set at the minimum of 8 minutes.

Some of the sub-basins west of Tramway Blvd. had reach lengths between 4,000 - 12,000 feet and therefore the second method was used which is as follows:

$$Tc = ((12000 - L) / (120 * K * s^{.5})) + ((L - 4000) * Kn * (Lca/L)^{0.33} / (4.305 * s^{0.165}))$$

where: Tc = Time of Concentration, min.

K = Conveyance factor as listed for the first method. For composite reaches , K is equal to the basin length , L, divided by the sum of the tc's for each subreach as in the first method, and divided by s^.5.

L = distance of longest watercourse, feet.

Lca = distance along L from point of concentration to a point opposite centroid of drainage basin, feet.

s = overall slope of L, percent.

Kn = a basin factor based on an estimate of the weighted, by stream length, average Manning's n value for the principal watercourses in the drainage basin. For the Albuquerque area, values of Kn may be estimated from the following:

Kn	Basin Condition
0.042	Mountain Brush and Juniper
0.033	Desert Terrain (desert brush)
0.025	Low density urban (minimum improvements to watershed channels)
0.021	Medium density urban (flow in streets, storm sewers and improved channels)
0.016	High density urban (concrete and rip-rap lined channels)

4.5 LAND TREATMENTS

The Draft DPM categorizes Land Treatment in the following manner:

Treatment	Land Condition
A	Soil uncompacted by human activity with 0 to 10 percent slopes. Native grasses, weeds and shrubs in typical densities with minimal disturbance to grading, groundcover and infiltration capacity. Croplands. Unlined arroys.
B	Irrigated lawns, parks and golf courses with 0 to 10 percent slopes. Native grasses, weeds and shrubs, and soil uncompacted by human activity with slopes greater than 10 percent and less than 20 percent.
C	Soil compacted by human activity. Minimal vegetation. Unpaved parking, roads, trails. Most vacant lots. Gravel or rock on plastic (desert landscaping). Irrigated lawns and parks with slopes greater than 10 percent. Native grasses, weeds and shrubs, and soil

uncompacted by human activity with slopes at 20 percent or greater. Native grass, weed and shrub areas with clay or clay loam soils and other soils of very low permeability as classified by SCS Hydrologic Soil Group D.

D Impervious areas, pavement and roofs.

Utilizing these definitions, the sub-basins were characterized as follows:

<u>Existing Land Treatment</u>

Sources of information include (see Figure 4-6 for major developments and land use):

1. 1" = 200' orthophoto-topographic maps
2. Field inspection
3. Albuquerque Geographic Information System data

Assumptions:

All undeveloped areas are land treatment Type A except for some of the upper steep and rocky sub-basins east Tramway Blvd. which are mostly land treatment Type C.

Well developed off-road trails represent areas compacted by human activity and are land treatment Type C.

Depressed areas were considered to be either filled-in or full of water at the time of the rainfall event and, therefore, part of the contributing area, and the land treatment was assumed to be similar to that for the adjacent area.

The land treatment Type D percentages for specific types of land use for both existing and future development conditions are listed in Tables 4-2 and 4-3.

The existing development consists of residential, commercial, industrial, mobile homes, schools and cemeteries. The extent and density of these development types within each sub-basin were determined from the orthophoto-topographic maps. The existing development throughout the study area is described as follows.

South of Paseo del Norte and East of I-25

The area south of Paseo del Norte and west of Holbrook St. has experienced rapid development in recent years. With the exception of the area between Wyoming and Louisiana Blvds. this development has not yet reached the areas adjacent to Paseo del Norte. Scattered parcels along PDN have been assembled and developed by several churches, the YWCA and the City of Albuquerque Water Utility but they remain the exception.

The area south of Paseo del Norte and east of Holbrook St. has several residences but is basically undeveloped.

North of Paseo del Norte and East of I-25

North of Paseo del Norte between I-25 and Lowell St. the undeveloped areas are still characterized by the original one acre grid platting of North Albuquerque Acres. The area between I-25 and Louisiana Blvd. is partially developed commercial and industrial except for San Pedro Estates mobile home park. The area between Louisiana and Wyoming Blvds. is basically undeveloped. Between Wyoming Blvd. and a short distance east of Barstow St., the area is partially developed with the Nor Este and Vineyard Developments and La Cueva High School.

There is very little development between Barstow St. and Tennyson St., but a high density development called Tramway Terrace is located between Tennyson St. and Tramway Blvd.

East of Tramway Blvd.

Adjacent to Tramway Blvd. the development density is high in some locations. Generally, however, the development density is low up to the Cibola National Forest boundary.

West of I-25

Most of the area west of I-25 is developed with commercial and industrial development except for Coronado Mobile Home Park and a small residential development on the west side of the mobile home park.

Future Land Use

Future development assumptions were based on three approved sector development plans or the City of Albuquerque Comprehensive Plan (City of Albuquerque Planning Department, 1988). Figure 4-6 illustrates the sector plan locations, the approved development type and the range of development density. If a range of development densities was given, the upper level of development is assumed for use in this study.

The "North I-25 Sector Development Plan" (City of Albuquerque Planning Department,1986) indicates that most of the area from the North Diversion Channel and areas in the Paseo del Norte corridor from Louisiana Blvd. to I-25 will be characterized by light industrial, office and commercial development. The areas east of Louisiana were not addressed by the plan.

In this study it was assumed that this same type of development would continue in the Paseo del Norte Corridor plus high density residential would prevail as far east as Wyoming Blvd. From Wyoming Blvd. to Lowell St. in the Paseo del Norte Corridor it was assumed that high density residential development would predominate within the corridor even though the surrounding areas would be low density residential according to the City of Albuquerque Comprehensive Plan.

The Nor Este Sector Development Plan (Espey, Huston & Associates, 1986) area within this study area extends from Wilshire Ave. to Anaheim Ave. just west of Barstow St. This plan calls for residential, office, institutional and related development.

The Vineyard Sector Development Plan (Jim Smith, 1991) area is just east of Ventura St. from Alameda Blvd. on the north to Carmel Ave. on the south. This plan calls for residential, office, institutional and related development.

Assumptions on future development in the remainder of the study area were based on the Comprehensive Plan except for some areas in North Albuquerque Acres north of Paseo del Norte. More specifically medium to high density (3-5 DU/acre) residential development is assumed to continue from Louisiana Blvd. to Ventura St. based on the current development of Nor Este Estates and Vineyard Development. However, due to the large number of individual property owners and the difficulty in collating these into a large tract for a subdivision type development, the remaining area from Ventura St. to Lowell St. was assumed to develop at a lower density residential development; however, as a conservative estimate for hydrologic modeling, 5 DU/acre was used from Ventura St. to Eubank Blvd. as defined by the Comprehensive Plan.

Another location of assumed development which exceeds the Comprehensive Plan is the Primrose Point development which was assumed to develop at 4 DU/acre. This area is located north of Paseo del Norte between Lowell St. and Tramway Blvd.

Paseo del Norte Corridor

I-25 to Wyoming Blvd. - Commercial/Light Industrial was assumed with 70% land treatment Type D (impervious) and the remaining 30% land treatment Type B. The percentage of Type B reflects the extensive use of landscaped medians shown in the Paseo del Norte Final Environmental Documentation, 1989, in addition to the assumed use of landscaping around buildings and offices in the developed area.

Wyoming Blvd. to Lowell St. - Developing Urban with up to 5 DU/acre was assumed to be the composite level of development in areas adjacent to the future major transportation corridor. Land treatment Type D (impervious) will comprise 50% of the area. Of the remainder, 30% is land treatment Type B, reflecting extensive use of landscaped medians in parking areas and the ROW adjacent to Paseo del Norte, and the final 20% was considered to be land treatment Type C.

4.6 ROUTING

The AHYM0391 program utilizes the routing features of the parent HYMO program. This allows both channels (lined and unlined) and storm drains to be modeled. The following paragraphs summarize the key routing features used for existing and future conditions.

Existing Conditions

Paseo del Norte

In the Paseo del Norte Corridor there is only one short section of asphalt lined channel with the remainder of concentrated flows either in roadside ditches or in more or less natural arroyos. For each reach used in the routing procedure one of the following cross-sections was selected as being representative:

1. Narrow, unlined channel, bottom width = 6 ft, 4H:1V side slopes. Manning's n = 0.030.

2. Wide, unlined channel, bottom width = 10 ft, 3H:1V side slopes. Manning's n = 0.030.

3. Asphalt lined channel, bottom width = 10 ft, 3H:1V side slopes. Manning's n = 0.015.

4. Street section, 0.5-ft crown, 1 ft deep side ditches, and total width of 90 ft (including roadside ditches). Manning's n = 0.020.

Channel slopes were computed from orthophoto-topographic maps.

North and South Domingo Baca Arroyos

The arroyos vary greatly in bottom width from about 3 feet to 200 feet and most have very gradually sloping banks which were assumed to be 15H:1V. The widths of the arroyos in each of the routings were determined from the orthophoto-topographic maps and were generalized to one of the following bottom widths :3, 30, 50, 75, 100, 150, or 200 feet.

For each reach used in the routing procedure one of the following cross-sections was selected as being representative:

1. Light to moderate vegetation in natural arroyo bottoms and overbanks. Manning's n = 0.03 for channel bottom and n = 0.035 for overbanks.

2. Wide unlined excavated channel, sand bottom and side slopes. Manning's n = 0.024 bottom and overbanks.

3. Rip-rap between Washington and North Diversion Channel. Manning's n = 0.03 bottom, n = 0.04 side slopes. (The City of Albuquerque Development Process Manual lists n=0.04 for wire-tired rip-rap.)

4. Asphalt streets. Manning's n = 0.02

5. Concrete channels Manning's n = 0.015

6. Storm sewers. Manning's n = 0.015

Future Conditions

Paseo del Norte

For the fully developed condition, it was assumed that all routed flows would be confined to storm drains or lined channels. Storm drain pipe diameters were varied to accommodate the required flow without pressurizing the system and were assumed to be laid on the same slope as the natural ground. Channels were given a uniform bottom width of 10 ft. with 2H:1V side slopes. In both cases, Manning's n was set at 0.015.

North and South Domingo Baca Arroyos

The same assumptions were applied to the North and South Domingo Baca Arroyos except that the sizes of existing storm sewers were not increased if they went under pressure. The results from AHYMO391 for the storm sewers located in Jefferson St. and Wyoming Blvd. (where the pipes outfall to the arroyo) indicated that each pipe capacity was much to small to convey the 100-year peak discharge. However, AHYMO391 only models uniform flow. These two storm sewers were analyzed external to AHYMO391 and were determined to be of adequate capacity assuming pressure flow.

The AHYMO391 model only routes flows in channels and pipes' as open channel flow. An error message is listed in the AHYMO output if the channel or pipe capacity is exceeded by the inflow. The effect on the peak discharges in those cases was determined by experimenting with the routings for a small pipe which went under pressure and a large pipe in which open channel flow remained. The routed peak discharge was about 5% less for the small pipe (under pressure compared to the large pipe which remained as open channel flow. Runoff volume was conserved in each case. Therefore, 5% reduction in routed peak discharge rates was assumed to be insignificant in terms of the Drainage Management Plan peak discharge results.

4.7 SEDIMENT YIELD AND FLOW BULKING

A detailed sediment yield analysis was not performed; however, the sediment yield was assumed to be 1.0 acre-foot per square mile per year. This value was presented in a report titled "Draft, Black Arroyo Sediment Issues" (Bohannan-Huston Inc., 1990). This value was applied to the drainage areas contributing flow to the detention dam options discussed later in this report. A 10-year sediment accumulation in the reservoir was assumed because this is a reasonable maintenance period for sediment removal.

Due to the large sediment loads carried in the runoff from the undeveloped alluvial fan areas, all drainage projects must consider the increased flow volume resulting from the sediment being transported with the flow. This procedure, called flow bulking, was not included in this study but will have to be considered for final design analysis. The range of flow bulking for a 100-year storm may be between 7% for fully developed watershed conditions to 20% for undeveloped conditions (Bohannan-Huston, Inc., 1990).

4.8 HYDROLOGIC RESULTS

Existing and Future Basins

The land treatment assumptions, drainage areas, rainfall amounts and time to peak parameters used for both the existing condition and fully developed condition hydrologic models for all basins are included in Supplement 1 to this report.

Table 4-4 lists the following parameter values for existing and future conditions in the Paseo del Norte sub-basins: Runoff Depth, Runoff Volume, Time to Peak, and Peak Discharge for the 100-yr. 24-hour storm. Input files and full summary printouts are included in Supplement 2 to this report.

Tables 4-5 and 4-6 list the same types of sub-basin information as Table 4-4 for the South Domingo Baca Arroyo for existing and future conditions, respectively. Tables 4-7 and 4-8 list the sub-basin hydrologic results for the North Domingo Baca Arroyo for existing and future conditions, respectively.

The reservoir routing results for the existing North and South Domingo Baca Arroyo Dams for existing and future conditions and for the drainage options considered in this report are included and discussed in Section 5.

Comparison to Previous Drainage Management Plans

The recommendations (and resulting infrastructure construction) as presented in previous major master drainage plans were described in Section 3 . The results from the following studies were compared:

NORTHEAST HEIGHTS DRAINAGE MANAGEMENT PLAN (NEHDM Plan)
Leonard Rice Consulting Water Engineers, Inc., 1975.

ARROYO DE DOMINGO BACA DETENTION DAM AND DIVERSION SYSTEM
Wilson & Company, 1977.

REVIEW AND REFINEMENT OF THE NORTHEAST HEIGHTS DRAINAGE MANAGEMENT PLAN (RRNEHDM Plan)
Espey, Huston & Associates, Inc., 1980

NORTH ARROYO DE DOMINGO BACA DETENTION DAM AND LA CUEVA DIKES
Wilson & Company, 1980.

FAR NORTHEAST HEIGHTS MASTER DRAINAGE PLAN (FNHMD Plan)
Roy F. Weston, Inc., 1988

Supplement 3 presents the assumptions, modeling procedures and comments pertaining to the previous and current drainage management plans. The geographic area covered by the previous and this plan are also presented in Supplement 3.

Table 4-9 compares drainage area data and results from all six previous and present master drainage plans at select analysis points.

TABLE 4-1

RAINFALL DATA

LOCATION	2-YEAR (in.) 1-HR	6-HR	24-HR	10-YEAR (in.) 1-HR	6-HR	24-HR	100-YEAR (in.) 1-HR	6-HR	24-HR
Sandia Mountains to Tramway	0.94	1.32	1.73	1.12	2.03	2.67	2.25	3.05	4.00
Tramway To Hamilton	0.95	1.21	1.45	1.12	1.87	2.23	2.23	2.80	3.35
Hamilton To Eubank	0.92	1.17	1.38	1.12	1.80	2.13	2.23	2.70	3.20
Eubank To Barstow	0.90	1.12	1.32	1.11	1.73	2.03	2.18	2.60	3.05
Barstow To Louisiana	0.89	1.10	1.28	1.11	1.70	1.97	2.13	2.55	2.95
Louisiana To I-25	0.85	1.06	1.23	1.11	1.63	1.90	2.08	2.45	2.85
I-25 to North Diversion Channel	0.86	1.04	1.17	1.11	1.60	1.80	2.05	2.40	2.70

The PMP depths applied to the entire North Domingo Baca AHYM0391 Model are as follows:

PMP (in.) .25-HR	1-HR	6-HR	24-HR
7.04	10.94	15.48	0.0

TABLE 4-2

ASSUMPTIONS FOR LAND TREATMENT TYPE D

LAND USE	PERCENT OF LAND TREATMENT TYPE D
Single Family Residential(a)	7 * ((N*N) + (5*N))^ .5
N = Dwelling Units/Acre, N for ≤ 6	
1 Dwelling Units/Acre	17
2 Dwelling Units/Acre	26
3 Dwelling Units/Acre	34
4 Dwelling Units/Acre	42
5 Dwelling Units/Acre	50
6 Dwelling Units/Acre	57
Multiple unit residential	
Detached (a)	60
Attached (a)	70
Commercial (a)	90
Industrial	
Light (a)	70
Heavy (a)	80
Parks, cemeteries	7
Playgrounds	13
Schools	50
Collector & Arterial Streets	90

(a) Includes local streets

(Section 22.2, COA DPM Jan 1991)

TABLE 4-3

PERCENTAGE OF FUTURE DEVELOPMENT LAND TREATMENT
TYPES A, B, C OR D PER
ZONING / LAND USE

ZONING / LAND USE		PERCENTAGE OF LAND TREATMENT TYPE A	B	C	D
Paseo Del Norte Corridor					
DU, EU	Developing and Existing Urban	0	30	20	50
IP	Commercial/Light Industrial was assumed in the PDN Corridor from I-25 to Wyoming	0	30	0	70
North and South Domingo Baca Arroyos					
SU-1	Special Use Semi-Urban (3 du/ac)	0	44	22	34
DU, EU	Developing and Existing Urban	0	34	16	50
	Fractions of Land Use Types				
	(2/3 DU, EU) 1/3 EU	0	37	18	45
	(3/4 DU, EU) 1/4 SU	0	36	18	46
	(1/2 DU, EU) 1/2 SU	0	39	19	42
	(1/4 DU, EU) 3/4 SU	0	42	20	38
MH	Mobile Homes	0	20	20	60
R-T	Town Homes	0	30	0	70
IP	Industrial Lt. 70% D, Hvy, 80% D	0	25	0	75
SU-2	M-1 Residential, Light Manufacturing	0	20	10	70
SU-2,	IP, C-2 Residential, Light Industrial/ Commercial	0	20	10	70

TABLE 4-4

PASEO DEL NORTE CORRIDOR SUB-BASINS EXISTING AND FUTURE CONDITIONS
100-YR 24-HR STORM

	SUB-BASIN ID NUMBER	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (3) (hrs)	100-YR PEAK DISCHARGE (cfs)
EXISTING	402.10	0.0150	2.47948	1.9836	1.50	43
FUTURE	402.10	0.0190	2.55204	2.5860	1.50	56
EXISTING	402.20	0.0080	1.35538	0.5783	1.50	16
FUTURE	402.20	0.0110	2.13650	1.2534	1.50	29
EXISTING	402.30	0.0320	1.20804	2.0617	1.50	61
FUTURE	402.30	0.0400	2.13650	4.5578	1.50	106
EXISTING	402.40	0.0280	1.20804	1.8040	1.50	53
FUTURE	402.40	0.0200	2.13650	2.2789	1.50	53
EXISTING	402.50	0.0240	1.06697	1.3657	1.50	40
FUTURE	402.50	0.0240	2.13650	2.7347	1.50	64
EXISTING	402.60	0.0160	1.06697	0.9105	1.50	27
FUTURE	402.60	0.0260	2.13650	2.9626	1.50	69
FUTURE (1)	915.10	0.0260	2.13650	2.9626	1.50	69
FUTURE (1)	915.20	0.0370	2.13650	4.2160	1.50	98
EXISTING	408.10	0.0190	0.76751	0.7777	0.55	24
FUTURE (1)	408.10	0.0260	2.04557	2.8365	1.50	68
EXISTING	408.20	0.0710	1.13055	4.2810	1.55	98
FUTURE	408.20	0.0740	2.03072	8.0145	1.55	163
EXISTING	408.30	0.004	1.01829	0.2172	1.55	6
EXISTING	408.40	0.0060	0.99145	0.3173	1.50	9
FUTURE	408.40	0.0260	2.04557	2.8365	1.50	68
EXISTING	408.50	0.0140	0.95438	0.7126	1.50	22
FUTURE	408.50	0.0260	1.94209	2.6930	1.50	66
EXISTING (2)	408.60	0.0230	0.95438	1.1707	1.50	35
EXISTING	408.70	0.0160	0.95438	0.8144	1.50	25
FUTURE	408.70	0.0260	1.94209	2.6930	1.50	66
EXISTING (2)	408.80	0.0220	0.95438	1.1198	1.50	34
EXISTING	419.10	0.0310	0.95438	1.5779	1.50	48
FUTURE	419.10	0.0220	1.94210	2.2787	1.50	56

(1) Existing condition flows do not impact PDN corridor but under future conditions they will be intercepted by PDN facilities.
(2) Future condition flows will not be intercepted by PDN facilities.
(3) This is time to peak of flood hydrograph.

TABLE 4-4 (CONTINUED)

PASEO DEL NORTE CORRIDOR SUB-BASINS EXISTING AND FUTURE CONDITIONS
100-YR 24 HOUR STORM

	SUB-BASIN ID NUMBER	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (3) (hrs)	100-YR PEAK DISCHARGE (cfs)
EXISTING	419.20	0.0130	0.95438	0.6617	1.50	20
FUTURE	419.20	0.0160	1.94209	1.6572	1.50	41
EXISTING	419.30	0.0350	1.39873	2.6109	1.50	69
FUTURE	419.30	0.0230	1.94210	2.3823	1.50	59
EXISTING	419.40	0.0220	0.95438	1.1198	1.50	34
FUTURE	419.40	0.0160	1.94209	1.6572	1.50	41
EXISTING	421.10	0.0280	1.17409	1.7533	1.50	50
FUTURE	421.10	0.0230	1.87027	2.2942	1.50	57
EXISTING	421.20	0.0230	1.04225	1.2785	1.50	38
FUTURE	421.20	0.0140	1.87027	1.3965	1.50	35
EXISTING	421.30	0.0380	0.93772	1.9004	1.50	58
FUTURE	421.30	0.0140	1.87027	1.3965	1.50	35
FUTURE (1)	421.40	0.0230	1.87027	2.2942	1.50	57
EXISTING	436.10	0.0130	1.29286	0.8964	1.50	25
FUTURE	436.10	0.0240	2.16738	2.7742	1.50	65
EXISTING	436.20	0.0110	1.41338	0.8292	1.50	22
FUTURE	436.20	0.0260	2.16739	3.0054	1.50	70
EXISTING	443.10	0.0770	0.83214	3.4173	1.50	105
FUTURE	443.10	0.0670	2.08399	7.4468	1.50	175
EXISTING (2)	443.20	0.0780	1.37493	5.7197	1.50	157
EXISTING	436.30	0.0180	1.34499	1.2912	1.50	35
FUTURE	436.30	0.0280	2.08399	3.1121	1.50	73
EXISTING	436.40	0.0200	0.97026	1.0349	1.50	30
FUTURE	436.40	0.0280	2.08399	3.1121	1.50	73
EXISTING (4)	442.00	0.0390	0.83214	1.7308	1.50	53
FUTURE (4)	442.1	0.0110	2.08768	1.2248	1.50	29

(1) Existing condition flows do not impact PDN corridor but under future conditions they will be intercepted by PDN facilities.
(2) Future condition flows will not be intercepted by PDN facilities.
(3) This is time to peak of flood hydrograph.
(4) Future condition flows may discharge to the two 5 ft. dia RCP's located south of PDN at the PDN off-ramp from I-25.

TABLE 4-5

SOUTH DOMINGO BACA ARROYO SUB-BASINS AND PASEO DEL NORTE CORRIDOR
EXISTING CONDITIONS 100-YR. 24-HR. STORM

SUB-BASIN	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
408.2	408.20	0.07	1.13	4	1.55	98
408.4	408.40	0.00	0.99	0	1.50	9
408.5	408.50	0.01	0.95	0	1.50	22
408.6	408.60	0.02	0.95	1	1.50	35
408.7	408.70	0.01	0.95	0	1.50	25
408.8	408.80	0.02	0.95	1	1.50	34
419.2	419.20	0.01	0.95	0	1.50	20
419.4	419.40	0.02	0.95	1	1.50	34
419.1	419.10	0.03	0.95	1	1.50	48
419.3	419.30	0.03	1.39	2	1.50	69
421.1	421.10	0.02	1.17	1	1.50	50
421.2	421.20	0.02	1.04	1	1.50	38
421.3	421.30	0.03	0.93	1	1.50	58
436.1	436.10	0.01	1.29	0	1.50	25
436.2	436.20	0.01	1.41	0	1.50	22
443.1	443.10	0.07	0.83	3	1.50	105
443.2	443.20	0.07	1.37	5	1.50	157
436.3	436.30	0.01	1.34	1	1.50	35
436.4	436.40	0.02	0.97	1	1.50	30
437.2	437.20	0.02	1.17	1	1.50	45
442.0	442.00	0.03	0.83	1	1.50	53
400	400.00	2.06	1.44	159	1.85	2274
400.5	400.50	1.18	1.31	82	1.90	1010
400.3	400.30	0.25	1.47	20	1.55	540
400.6	400.60	0.86	1.30	60	1.60	1238
400.1	400.10	0.26	0.97	13	1.50	468
403.1	403.10	0.07	1.05	4	1.50	131
403.2	403.20	0.02	0.74	1	1.50	36
404.3	404.30	0.05	0.78	2	1.50	71
404.2	404.20	0.10	0.76	4	1.50	143
402.31	402.31	0.00	0.74	0	1.50	8
401.4	401.40	0.03	1.29	2	1.50	72
401.32	401.32	0.05	0.87	2	1.50	78
401.5	401.50	0.02	1.03	1	1.50	45
401.33	401.33	0.04	0.87	2	1.50	64
401.31	401.31	0.05	0.85	2	1.50	77
401.2	401.20	0.08	0.74	3	1.50	114
401.1	401.10	0.02	0.74	0	1.50	32
402.1	402.10	0.01	2.47	1	1.50	43
402.2	402.20	0.00	1.35	0	1.50	16

TABLE 4-5 (Con't)

SOUTH DOMINGO BACA ARROYO SUB-BASINS AND PASEO DEL NORTE CORRIDOR
EXISTING CONDITIONS 100-YR. 24-HR. STORM

SUB-BASIN	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
402.3						
402.4	402.30	0.03	1.20	2	1.50	61
402.5	402.40	0.02	1.20	1	1.50	53
402.6	402.50	0.02	1.06	1	1.50	40
402.32	402.60	0.01	1.06	0	1.50	27
404.1	402.32	0.03	0.85	1	1.50	56
406.1	404.10	0.06	0.74	2	1.55	76
405.1	406.10	0.02	0.81	1	1.50	37
405.11	405.10	0.00	0.76	0	1.50	11
405.2	405.11	0.02	0.76	0	1.50	31
410.1	405.20	0.07	1.82	7	1.50	193
416.1	410.10	0.15	2.09	16	1.55	362
416.2	416.10	0.13	2.06	14	1.50	351
414.1	416.20	0.02	1.53	1	1.50	52
410.2	414.10	0.04	2.09	4	1.50	111
414.2	410.20	0.02	1.83	1	1.50	51
425	414.20	0.06	2.06	7	1.50	172
427.1	425.00	0.12	1.99	12	1.50	313
427.2	427.10	0.05	1.70	4	1.60	86
432.1	427.20	0.04	1.90	4	1.50	125
434.2	432.10	0.08	1.74	7	1.50	198
434.1	434.20	0.05	2.19	5	1.50	140
437.11	434.10	0.09	1.53	7	1.50	220
442.21	437.11	0.11	1.79	11	1.50	277
443.3	442.21	0.10	2.19	12	1.50	286
442.3	443.30	0.02	2.19	2	1.50	70
445.1	442.30	0.02	1.97	2	1.50	61
450.1	445.10	0.06	1.81	6	1.50	144
946	450.10	0.03	1.88	3	1.50	83
947	946.00	0.01	2.01	1	1.50	42
446.1	947.00	0.06	0.85	3	1.70	46
448	446.10	0.03	1.19	2	1.50	72
446.2	448.00	0.04	1.19	2	1.50	92
447	446.20	0.03	1.26	2	1.50	73
450.2	447.00	0.03	1.46	2	1.50	66
948	450.20	0.02	1.86	2	1.55	58
451.2	948.00	0.01	0.96	0	1.60	14
451.1	451.20	0.01	2.27	1	1.50	29
	451.10	0.03	1.81	3	1.55	79

TABLE 4-6

SOUTH DOMINGO BACA ARROYO SUB-BASINS
FUTURE CONDITIONS 100-YR. 24-HR. STORM

SUB-BASIN	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
400	400.00	2.06	1.44	159	1.85	2274
400.5	400.50	1.18	1.31	82	1.90	1010
400.3	400.30	0.25	1.47	20	1.55	540
400.6	400.60	0.86	1.30	60	1.60	1238
400.1	400.10	0.25	1.81	25	1.50	650
401.4	401.40	0.03	1.81	3	1.50	85
401.5	401.50	0.03	1.81	3	1.50	83
403.1	403.10	0.06	2.02	6	1.50	159
403.2	403.20	0.02	2.03	2	1.50	70
402.32	402.32	0.03	2.03	3	1.50	86
402.31	402.31	0.00	2.03	0	1.50	16
404.3	404.30	0.05	2.02	5	1.50	131
401.31	401.31	0.05	1.96	6	1.50	147
404.2	404.20	0.10	2.03	11	1.50	272
401.51	401.51	0.05	1.81	5	1.50	138
401.33	401.33	0.05	1.81	5	1.50	126
401.32	401.32	0.05	1.81	5	1.50	126
401.2	401.20	0.08	1.93	8	1.50	214
401.1	401.10	0.03	2.03	3	1.50	89
404.1	404.10	0.06	2.03	7	1.50	162
406.1	406.10	0.02	2.03	2	1.50	68
405.1	405.10	0.01	2.03	2	1.50	50
405.2	405.20	0.09	1.92	9	1.50	241
410.1	410.10	0.15	1.80	14	1.55	332
416.1	416.10	0.13	1.92	13	1.50	342
416.2	416.20	0.03	1.92	3	1.50	76
414.1	414.10	0.04	1.75	3	1.50	103
410.2	410.20	0.02	1.92	2	1.50	51
414.2	414.20	0.06	1.92	6	1.50	167
425	425.00	0.12	1.83	11	1.50	301

TABLE 4-6 (Con't)

SOUTH DOMINGO BACA ARROYO SUB-BASINS
FUTURE CONDITIONS 100-YR. 24-HR. STORM

SUB-BASIN	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
427.1	427.10	0.08	2.01	8	1.60	151
427.2	427.20	0.04	1.85	4	1.50	121
432.1	432.10	0.08	1.85	8	1.50	203
434.2	434.20	0.05	2.13	5	1.50	138
434.1	434.10	0.09	2.10	10	1.50	253
437.11	437.11	0.09	1.86	9	1.50	239
442.21	442.21	0.08	2.11	9	1.50	229
443.3	443.30	0.02	2.08	2	1.50	66
442.3	442.30	0.02	1.97	2	1.50	61
445.1	445.10	0.06	2.06	7	1.50	158
450.1	450.10	0.03	2.00	3	1.50	84
946	946.00	0.01	2.00	1	1.50	42
947	947.00	0.06	2.00	7	1.70	107
446.1	446.10	0.03	2.05	3	1.50	92
448	448.00	0.04	2.05	4	1.50	118
446.2	446.20	0.03	2.05	3	1.50	92
447	447.00	0.03	2.05	3	1.50	79
450.2	450.20	0.02	2.00	2	1.55	60
948	948.00	0.01	2.00	1	1.60	27
451.2	451.20	0.01	2.00	1	1.50	26
451.1	451.10	0.03	2.00	3	1.55	83

TABLE 4-7

NORTH DOMINGO BACA ARROYO SUB-BASINS
EXISTING CONDITIONS 100-YR. 24-HR. STORM

SUB-BASIN	ANALYSIS POINT	DRAINAGE AREA (sq mi) (a)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
900	900.00	0.441	1.47	34	1.80	540
901	901.00	0.118	1.47	9	1.50	283
902	902.00	0.365	1.40	27	1.90	325
910.1	910.10	0.118	0.99	6	1.65	117
910.2	910.20	0.126	1.02	6	1.50	207
910.3	910.30	0.055	0.90	2	1.50	84
912.1	912.10	0.115	0.87	5	1.50	174
912.2	912.20	0.055	0.99	2	1.50	87
914.3	914.30	0.058	0.88	2	1.50	86
914.1	914.10	0.082	0.96	4	1.50	136
914.2	914.20	0.035	0.99	1	1.50	63
919.1	919.10	0.079	1.06	4	1.50	144
915.1	915.10	0.009	0.74	0	1.50	12
915.2	915.20	0.028	0.83	1	1.50	39
408.1	408.10	0.019	0.76	0	1.55	24
919.2	919.20	0.061	0.97	3	1.50	102
913.2	913.20	0.017	0.83	0	1.50	24
918	918.00	0.114	0.74	4	1.65	90
921.1	921.10	0.046	0.70	1	1.50	56
921.2	921.20	0.085	0.82	3	1.50	122
911	911.00	0.032	0.87	1	1.55	39
913.1	913.10	0.052	0.83	2	1.50	73
917	917.00	0.050	0.94	2	1.50	75
920	920.00	0.105	0.82	4	1.55	130
926	926.00	0.098	0.92	4	1.50	151
923	923.00	0.013	0.71	0	1.50	17
925	925.00	0.077	1.23	5	1.55	114
930	930.00	0.148	1.20	9	1.50	284
935	935.00	0.097	0.79	4	1.50	136
421.4	421.40	0.012	0.66	0	1.50	15
937	937.00	0.044	0.74	1	1.50	57
936	936.00	0.018	0.88	0	1.50	27
940	940.00	0.077	0.88	3	1.50	115
943	943.00	0.025	1.59	2	1.50	59
945	945.00	0.015	2.08	1	1.50	41
922	922.00	0.021	0.71	0	1.50	28
924	924.00	0.064	0.74	2	1.50	86
927	927.00	0.010	0.69	0	1.50	13
928	928.00	0.011	0.73	0	1.65	8
929	929.00	0.019	1.12	1	1.50	36
931	931.00	0.060	1.73	5	1.65	96
933	933.00	0.053	0.79	2	1.50	73
938	938.00	0.020	0.68	0	1.50	24
941	941.00	0.008	1.76	0	1.50	20
932	932.00	0.078	1.74	7	1.50	192
934	934.00	0.065	0.68	2	1.50	83
939.2	939.20	0.056	0.66	1	1.50	70
939.1	939.10	0.028	2.01	3	1.50	75
942	942.00	0.030	1.59	2	1.55	62
944	944.00	0.036	2.03	3	1.50	97

TABLE 4-8

NORTH DOMINGO BACA ARROYO SUB-BASINS
FUTURE COND. 100-YR. 24-HR. STORM

SUB-BASIN	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
900	900.00	0.44	1.47	34	1.80	540
901	901.00	0.11	1.47	9	1.50	283
902	902.00	0.36	1.53	29	1.90	346
910.1	910.10	0.25	2.03	27	1.60	477
910.2	910.20	0.12	2.03	13	1.50	329
910.3	910.30	0.05	2.03	5	1.50	144
912.1	912.10	0.11	1.81	11	1.50	287
912.2	912.20	0.07	1.81	6	1.50	176
914.3	914.30	0.05	1.89	5	1.50	147
914.1	914.10	0.12	1.73	11	1.50	311
911	911.00	0.06	1.73	5	1.55	133
914.2	914.20	0.03	1.73	3	1.50	85
919.1	919.10	0.07	2.03	8	1.50	208
919.2	919.20	0.05	2.03	5	1.50	134
913.2	913.20	0.01	1.73	0	1.50	24
918	918.00	0.11	2.03	12	1.65	205
921.1	921.10	0.04	1.92	4	1.50	113
921.2	921.20	0.09	1.92	10	1.50	254
913.1	913.10	0.02	1.73	2	1.50	53
917	917.00	0.05	2.03	5	1.50	132
920	920.00	0.10	1.92	10	1.55	238
926	926.00	0.11	2.01	12	1.50	309
923	923.00	0.01	1.92	1	1.50	33
925	925.00	0.07	2.14	8	1.55	174
930	930.00	0.13	1.93	13	1.50	349
935	935.00	0.09	1.86	9	1.50	245
937	937.00	0.01	1.86	1	1.50	43
940	940.00	0.08	2.11	9	1.50	217
943	943.00	0.03	2.11	3	1.50	92
945	945.00	0.01	2.06	1	1.50	40
922	922.00	0.02	1.92	2	1.50	54
924	924.00	0.06	2.10	7	1.50	173
927	927.00	0.01	2.62	1	1.50	31
928	928.00	0.01	1.86	1	1.65	19
929	929.00	0.01	2.05	2	1.50	56
931	931.00	0.06	1.82	5	1.65	100
933	933.00	0.04	1.86	4	1.50	103
938	938.00	0.03	2.11	4	1.50	95
941	941.00	0.01	2.11	2	1.50	49
932	932.00	0.07	2.20	9	1.50	218
934	934.00	0.06	1.86	6	1.50	163
939.2	939.20	0.05	2.08	6	1.50	149
939.1	939.10	0.02	1.97	2	1.50	73
942	942.00	0.03	2.11	3	1.55	72

TABLE 4-9

COMPARISON OF RESULTS FROM PREVIOUS MASTER PLANS

ANALYSIS POINT LOCATION	WESTON 1988 Drainage Area (sq mi)	WESTON 1988 100-Yr. Qp (cfs)	ESPEY 1980 Drainage Area (sq mi)	ESPEY 1980 100-Yr. Qp (cfs)	RICE 1974 Drainage Area (sq mi)	RICE 1974 100-Yr. Qp (cfs)	WILSON 1980 Drainage Area (sq mi)	WILSON 1980 100-Yr. Qp (cfs)	WILSON 1977 Drainage Area (sq mi)	WILSON 1977 100-Yr. Qp (cfs)	RESOURCE TECHNOLOGY INC. 1991 Drainage Area (sq mi)	RESOURCE TECHNOLOGY INC. 1991 100-Yr. Qp (cfs) (a)
							NORTH DOMINGO BACA ARROYO					
Tramway Blvd.	NM		0.949	1470	0.995	1060	--	--	NM		0.920	930
Inflow NDB Dam	NM		1.640	1760	3.114	1560	1.908	1960	NM		2.060	2420
N Branch @ I-25	NM		0.405	680	NG		NM		NM		0.530	1140
S Branch @ I-25	NM		3.155	2270	4.986	1390	NM		NM		3.250	2210
Total N @ S Baca	NM		3.253	2110	5.039	1400	NM		NM		3.830	3330
							SOUTH DOMINGO BACA ARROYO					
Tramway Blvd.	NM		NM		--	--	NM		--	--	--	--
Inflow SDB Dam	NM		NM		4.430	3850	NM		4.400	5000	4.780	4190
Ventura	5.275	520	NM		5.841	1140	NM		NM		5.760	2430
I-25	6.437	2270	NM		7.464	2170	NM		NM		7.240	5450
North Diversion Channel	NM		NM		12.730	3620	NM		NM		11.740	7050

NM - Not Modeled

NG - Not Given

(a) - South Domingo Baca under Future development conditions with Option G2/J (Paseo del Norte diversion to SDB Arroyo at San Pedro and a proposed detention dam on the North Domingo Baca Arroyo near Louisiana).

EXISTING AND FUTURE BASINS AND ANALYSIS POINTS EAST OF TRAMWAY

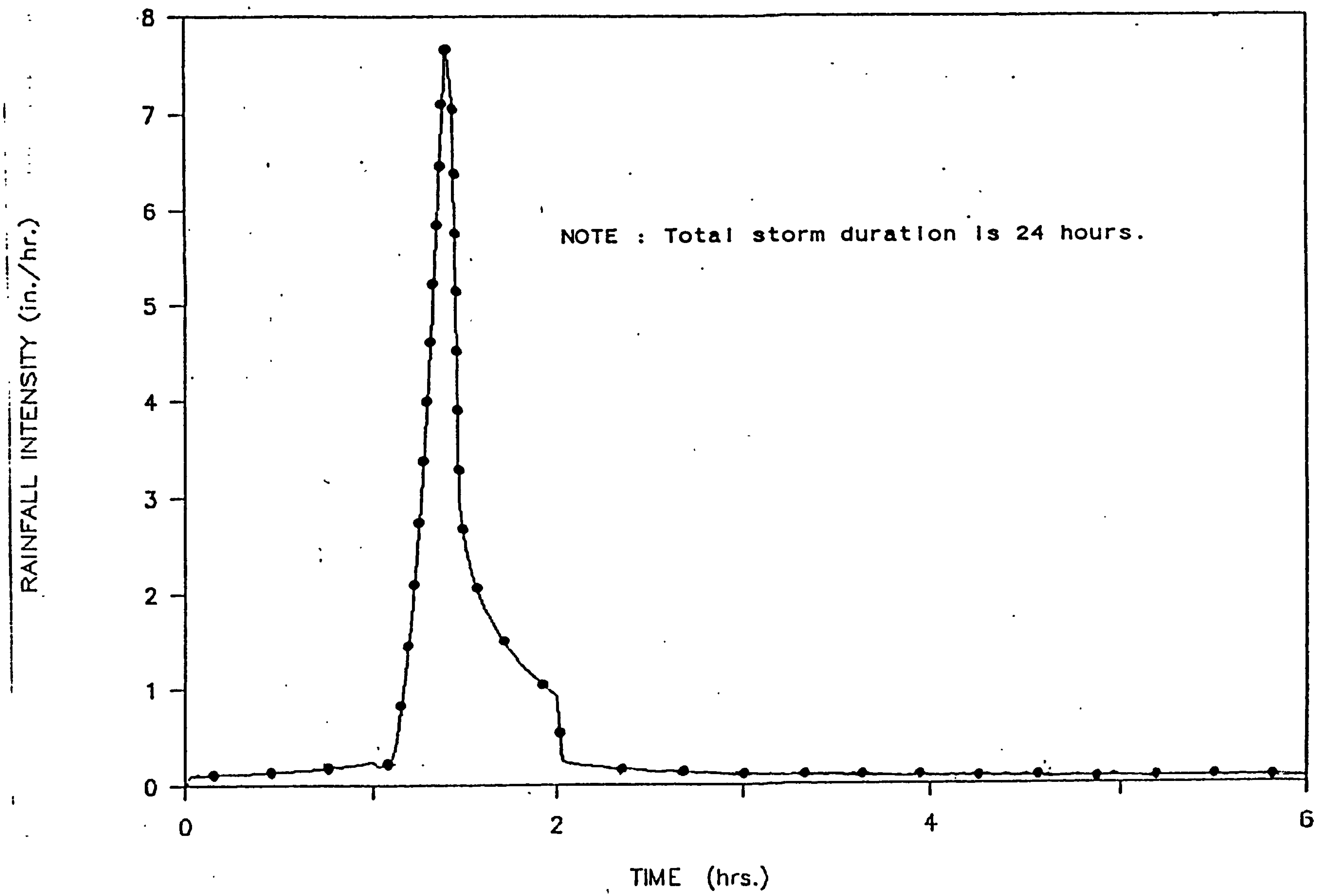
FIGURE 4-1


MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
EXISTING BASINS
AND ANALYSIS POINTS
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
1991
FIGURE
4-2
LEGEND
PASEO DEL NORTE BASIN
EXISTING BASIN BOUNDARY
ARROYO / CHANNEL
ANALYSIS NODE
BASIN NUMBER
FLOW DIRECTION
N
500
0
500
1000
MODESTO AVE.
AGLE ROCK AVE.
OAKLAND AVE.
ALAMEDA BLVD.
SIGNAL AVE.
WILSHIRE AVE.
CORONA AVE.
ANAHEIM AVE.
CARMEL AVE.
HOLLY AVE.
PASEO DEL NORTE
PALOMAS AVE.
SAN BERNARDINO DR.
RANCHITOS RD.
PINO AVE.
SAN FRANCISCO DR.
CORONADO AVE.
SAN RAFAEL AVE.
TENNYSON ST.
LOWELL ST.
BROWNING ST.
EUBANK BLVD.
HOLBROOK ST.
VENTURA ST.
WYOMING BLVD.
LOUISIANA BLVD.
SAN PEDRO DR.
SAN MATEO BLVD.
WASHINGTON ST.
JEFFERSON ST.
TIBURON ST.
BARSTOW ST.
I-25
LA CUEVA HIGH SCHOOL
LA CUEVA TRIBUTARY ARROYO
NORTH DOMINGO BACA ARROYO WATERSHED
SOUTH DOMINGO BACA ARROYO WATERSHED
NORTH DOMINGO BACA DAM
SOUTH DOMINGO BACA DAM
NORTH DIVERSION CHANNEL

*****

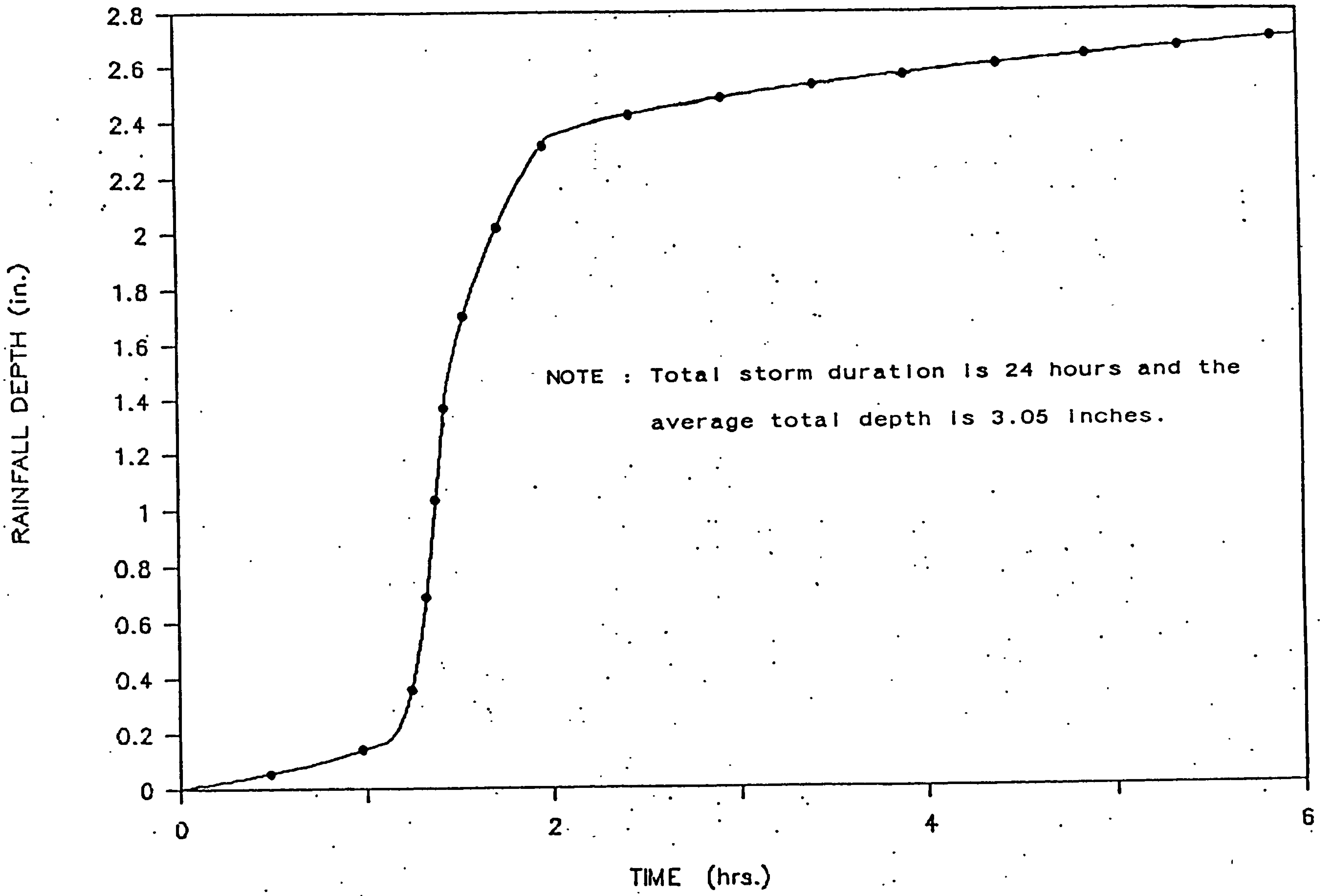
LEGEND
PASEO DEL NORTE BASIN
EXISTING BASIN BOUNDARY
FUTURE BASIN BOUNDARY
ARROYO / CHANNEL
ANALYSIS NODE
945 BASIN NUMBER
FLOW DIRECTION
N
500 0 500 1000
NORTH DIVERSION CHANNEL
PASEO DEL NORTE
WASHINGTON ST
SAN MATEO BLVD
WILSHIRE AVE.
I-25
PINO AVE
SAN FRANCISCO DR
SAN PEDRO DR
LOUISIANA BLVD
WYOMING BLVD
BARSTOW ST
VENTURA ST
HOLBROOK ST
EUBANK BLVD
BROWNING ST
TENNYSON ST
MODESTO AVE
EAGLE ROCK AVE
ALAMEDA BLVD
SIGNAL AVE.
CORONA AVE
ANAHEIM AVE
CARMEL AVE
PALOMAS AVE
SAN BERNARDINO DR
RANCHITOS RD
CORONADO AVE
SAN RAFAEL AVE
LA CUEVA HIGH SCHOOL
LA CUEVA TRIBUTARY ARROYO
NORTH DOMINGO BACA ARROYO WATERSHED
SOUTH DOMINGO BACA ARROYO WATERSHED
NORTH DOMINGO BACA DAM
SOUTH DOMINGO BACA DAM
FUTURE DIVERSION
FUTURE PASEO DEL NORTE DIVERSION, OPTION G2/3
MASTER DRAINAGE PLAN
NORTH AND SOUTH DOMINGO BACA ARROYOS
FUTURE BASINS AND ANALYSIS POINTS
ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY
Resource Technology, Inc.
1991
FIGURE 4-3

*****



TYPICAL RAINFALL HYETOGRAPH

FIGURE 4-4



TYPICAL RAINFALL MASS CURVE

FIGURE 4-5


MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
LAND USE
ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY
1991
FIGURE 4-6
LEGEND
PASEO DEL NORTE BASIN
EXISTING BASIN BOUNDARY
FUTURE BASIN BOUNDARY
ARROYO / CHANNEL
ANALYSIS NODE
945 BASIN NUMBER
FLOW DIRECTION
COMPREHENSIVE PLAN BOUNDARIES
SECTOR PLAN BOUNDARIES
EXISTING DEVELOPED LANDS
STUDY AREA BOUNDARY
NOTE: DEVELOPMENT DENSITIES SHOWN ARE FROM THE ALBUQUERQUE BERNALILLO COUNTY COMPREHENSIVE PLAN UNLESS NOTED.
NOTE: DU'S / ACRE DESIGNATES DWELLING UNITS PER ACRE
FROM ALBUQUERQUE BERNALILLO COUNTY COMPREHENSIVE PLAN
DEVELOPING URBAN
3 – 5 DU'S / ACRE
SEMI-URBAN
1 – 3 DU'S / ACRE
ESTABLISHED URBAN
3 – 5 DU'S / ACRE
DEVELOPING URBAN
ESTABLISHED URBAN
ASSUMED
4 DU'S / ACRE
Primrose Point
(Proposed)
North Albuquerque Acres
NOR ESTE SECTOR
DEVELOPMENT PLAN
THE VINEYARD SECTOR DEVELOPMENT PLAN
LA CUEVA HIGH SCHOOL
YWCA
San Pedro Estates
LIGHT INDUSTRIAL AND MULTIPLE UNIT RESIDENTIAL
Coronado Mobile Home Park
NORTH I-25 SECTOR DEVELOPMENT PLAN
LIGHT TO HEAVY INDUSTRIAL
Journal Center
NORTH DIVERSION CHANNEL
PASEO DEL NORTE
MODESTO AVE.
EAGLE ROCK AVE.
OAKLAND AVE.
ALAMEDA AVE.
ALAMEDA BLVD
SIGNAL AVE.
WILSHIRE AVE.
CORONA AVE.
ANAHEIM AVE.
CARMEL AVE.
HOLLY AVE.
PALOMAS AVE.
SAN BERNARDINO DR
RANCHITOS RD
PINO AVE
SAN FRANCISCO DR
CORONADO AVE
SAN RAFAEL AVE
VENTURA ST.
HOLBROOK ST.
EUBANK BLVD.
BROWNING ST
TENNYSON ST.
TRAMWAY BLVD.
WYOMING BLVD
LOUISIANA BLVD
SAN PEDRO
SAN MATEO BLVD
JEFFERSON ST.
BARSTOW ST.
I-25
Sandia Heights
Tramway Terrace

5.0 DRAINAGE MANAGEMENT SYSTEM

5.1 DRAINAGE MANAGEMENT OPTIONS

As discussed previously, a goal of this Drainage Management Plan was to integrate the drainage solutions for the North Domingo Baca Arroyo, Paseo del Norte (PDN) Corridor and the South Domingo Baca Arroyo, if possible. In addition, because the Paseo del Norte Transportation Corridor is a major feature of this Plan, the PDN drainage basin was analyzed independently of the North and South Domingo Baca Arroyo basins. Therefore, all drainage options consider the corresponding drainage effects on each of the three basins. Four general approaches to storm drainage management in the Paseo del Norte corridor were examined.

These were:

1. Collect and convey all highway and right-of-way flows as well as off-site flows approaching the Paseo del Norte alignment to an existing I-25 crossing structure using either storm drains or channels.

2. Collect all highway and right-of-way flows as well as side flows approaching Paseo del Norte and convey them to the nearest practical location for diversion to the South Domingo Baca channel.

3. Intercept a major portion of the North Domingo Baca basin flows and transfer them with storm water diversion projects to the multi-box crossing structure at I-25 and the South Domingo Baca Channel. These major diversions from the North Domingo Baca system would require a channel running parallel to Paseo del Norte that merges with the South Domingo Baca Channel west of San Pedro Blvd.

4. Construct a second major storm water detention facility for the North Domingo Baca system between Wyoming and San Pedro Blvds. to reduce North Domingo Baca flows at I-25 and utilize either 1 or 2 above to control the Paseo del Norte and related drainage basin flows.

Each of these four approaches were examined and developed into several options which are depicted in Figure 5-1. This figure may be folded out so that the following option descriptions can be cross-referenced to the graphical representations of the options.

Drainage Features Common to all Drainage Options

For all options with the exception of Option A (no action option), the PDN flows between Tramway Blvd. and Lowell St. would be diverted to the South Domingo Baca Dam and PDN flows between Lowell St. and half way between Browning St. and Hamilton St. (Eubank Blvd.) would be diverted to the existing North Domingo Baca Dam.

Paseo del Norte Flows Only

Option A No Action - Existing drainage basin areas and flow patterns, but with future land treatment. No diversions to South Domingo Baca (SDB) channel.

Option B PDN diversion to the SDB channel in a storm drain at Barstow St. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.

Option C PDN diversions to SDB channel in a storm drain at Ventura St. and Wyoming Blvd. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.

Option D PDN diversions to SDB channel in a storm drain at Ventura St., Barstow St., Wyoming and Louisiana Blvds. and San Pedro Blvd.

Option E PDN diversions to SDB channel in a storm drain at Wyoming and Louisiana Blvds. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.

Option F Storm drain along PDN to San Pedro Blvd. with outfall to SDB channel west of San Pedro Blvd.

Option G Storm drain along PDN to Barstow St. Channel along PDN from Barstow St. to SDB channel with outfall west of San Pedro Blvd.

Option G2 Storm drain along PDN to San Pedro Blvd. The storm drain will join a box culvert along San Pedro Blvd. which will outfall to the SDB channel west of San Pedro Blvd.

North Domingo Baca Arroyo Diversions to PDN Channel with Outfall to SDB Arroyo Located West of San Pedro Blvd.

Option H1 NDB flows diverted to PDN channel at Holbrook St. Remainder of NDB flows to I-25.

Option H2 NDB flows diverted to PDN channel at Holbrook St. and Ventura St. Remainder of NDB flows to I-25.

Option H3 NDB flows diverted to PDN channel at Holbrook St., Ventura St. and Barstow St. Remainder of NDB flows to I-25.

Option H4 NDB flows diverted to PDN channel at Holbrook St., Ventura St., Barstow St. and Wyoming Blvd. Remainder of NDB flows to I-25.

Option H5 NDB flows diverted to PDN channel at Holbrook St., Ventura St., Barstow St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.

Option H6 NDB flows diverted to PDN channel at Holbrook St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.

Option H6-1 NDB flows diverted to PDN channel at Ventura St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.

North Domingo Baca Arroyo with No Diversions to PDN Corridor

Option I Detention dam located between Louisiana and San Pedro Blvds. and south of Anaheim Ave.

Option J Detention dam located immediately east of Louisiana Blvd. and north of Carmel Ave.

Option K Detention dam located immediately west of Louisiana Blvd. and north of Anaheim Ave.

5.2 INITIAL OPTION ELIMINATION

Option A was discarded because it would require future construction of several major drainage crossing structures on Paseo del Norte that would preclude future land development near these structures. It was decided that the best overall approach was to intercept flows that crossed the proposed PDN alignment and convey them to a single facility parallel to the roadway instead of allowing several channel crossings.

Option C and D were quickly discarded because a diversion at Ventura St. to the South Domingo Baca Channel proved to be impractical due to grade problems.

Option F was eliminated because it was very similar to Option G and an open channel was initially preferred to a closed conveyance due to ease of maintenance.

Option G was eliminated because the cost of an open channel was more than that for a closed conduit. Option G2 was developed to allow better analysis of the RCP/CBC being analyzed.

intercept enough flow from the North Domingo Baca system to take care of the multiple problems (limited culvert and downstream channel capacity) where the North Domingo Baca Arroyo crosses I-25. Option H6 was eliminated because it was more practical to divert flows at Ventura St. (Option H6-1) than at Holbrook St. (H6) because more flow could be diverted from the NDB Arroyo to the PDN Channel with Option H6-1.

5.3 SELECTED OPTIONS

The remaining nine options (B, E, G2, H4, H5, H6-1, I, J or K) were refined and further analyzed. The results, showing the flows immediately down stream from each of the major PDN intersections, are presented in Table 5-1 with the exception of Option I, J or K, the dam options.

After discussion with AMAFCA staff, these initial nine options were pared down to six. Option B was eliminated due to limited channel capacity in the existing South Domingo Baca Channel. Options H4, and H5 were dropped because the numerous diversions from the North Domingo Baca system to the proposed Paseo del Norte Channel would involve considerably more expense than Option H6-1 without offering any relative advantages.

5.4 PREFERRED OPTIONS AND DESIGN HYDROLOGY

Paseo Del Norte

The six remaining options: E, G2, H6-1, and I, J or K were further refined, including redefining some of the future condition drainage boundaries to address the capacity problems that the hydraulic analysis of the upper portion of the South Domingo Baca channel had revealed. Tables 5-2, 5-3 and 5-4 summarize the PDN hydrologic results for Options E, G2 and H6-1, respectively. The PDN basin peak discharge results for Options E, G2, and H6-1 at major analysis points are presented in Table 5-5. The AHYMO data and full output are included in Supplement 2.

As can be seen in Figures 5-2, 5-3 and 5-4, which are schematics of PDN Options E, G2 and H6-1, respectively, all three options have diversions to the South Domingo Baca Dam at Lowell St., and to the North Domingo Baca Dam east of Eubank Blvd. All three options also have a storm sewer in Paseo del Norte from the diversion to the North Domingo Baca Dam to Holbrook St.

Options E and G2 do not direct flows from the North Domingo Baca Arroyo to the PDN corridor. Therefore, in terms of a Drainage Management Plan for the North and South Domingo Baca Arroyos, additional drainage improvements must be considered for the North Domingo Baca Arroyo. As described previously, due to very limited capacities of the I-25 culverts on the North Domingo Baca Arroyo, major improvements and/or detention is required. Based on this discussion, Options E and G2 must be considered together with Option I, or J, or K (a detention dam on the North Domingo Baca Arroyo between Wyoming and San Pedro Blvds.).

Option E (see Figure 5-2) would provide a storm drain along Paseo del Norte west from Eubank Blvd. with diversions to the South Domingo Baca Channel at Wyoming and Louisiana Blvds. This analysis was based on the assumption that all flows reaching these intersections could be completely diverted at these locations. The remaining flow of 140 cfs from Louisiana Blvd. to I-25 would be discharged to the South Domingo Baca/I-25 box culverts or to the 2-60" CMPs south of the Frontage Road/Paseo del Norte intersection. North Domingo Baca flows would be addressed by the construction of a detention dam between Wyoming and Louisiana Blvds. (Option I, or J, or K).

Option G2 (see Figure 5-3) consists of a storm sewer in PDN from Holbrook St. to San Pedro Blvd. where it would connect to a box culvert and turn south and discharge into the South Domingo Baca channel. This option is feasible because less right-of-way and no other diversions to the South Domingo Baca Arroyo are required. As with Option E, North Domingo Baca Arroyo problems would be addressed by the construction of an additional detention dam (Option I, or J, or K).

Option H6-1 (Figure 5-4) would combine the drainage solutions for the North Domingo Baca Arroyo and the Paseo del Norte transportation corridor with the construction of a major concrete lined channel north of and parallel to, the roadway. Flows from the North Domingo Baca basin would be diverted in channels to the Paseo del Norte Channel at Ventura St., Wyoming and San Pedro Blvds.

The depth of the PDN channel would vary from 5.5 feet at Ventura St. to 7.0 feet in the reach from Louisiana to San Pedro Blvds. Bridges or box culverts would be required at all major intersections and several reaches of channel would have to be underground to avoid major building relocations. The PDN channel would cross Paseo del Norte east of San Pedro Blvd. and then turn south to join the South Domingo Baca Channel.

Option H6-1 would involve significant right-of-way acquisition for not only the main PDN channel but also for the three major diversion channels. This option would reduce the flows reaching I-25 from the North Domingo Baca Arroyo and take substantial areas out of the flood plain without the necessity for a new dam.

The combined flow in the South Domingo Baca channel after the junction with the Paseo del Norte channel could be passed through the four 8' tall X 10' wide concrete box culverts at I-25 if appropriate transition structures are designed. However, west of I-25 the existing drainage structure at Jefferson St. may require modification or replacement to accommodate the predicted runoff for fully developed conditions. Furthermore, the significant increase in discharge would exceed the existing capacity of the

Domingo Baca Inlet to the North Diversion Channel and would increase flow rates in the North Diversion Channel. These conditions would require extensive improvements to that facility.

North Domingo Baca Arroyo

The hydrologic results for existing conditions, future development conditions with no improvements, Option H6-1 and Option J for major analysis points are presented in Tables 5-6, 5-7, 5-8 and 5-9 respectively. Table 5-10 summarizes the peak discharges at the major analysis points for development conditions and options presented in Tables 5-6 through 5-9.

The proposed detention dam options I, J and K will all have similar impacts with respect to the upstream drainage area. The reservoir routings and responses to the various storms are therefore assumed to be very similar all three options and consequently, the reservoir routings for option J are used to illustrate the effect of any proposed detention dam. Table 5-11 lists the reservoir routing summaries for the existing North and South Domingo Baca Arroyo Dams and for Option J.

<u>Effects of the Proposed Detention Dam</u>

The effects of constructing a proposed detention dam (Options I, J, K) are described as follows:

- o Eliminates the need for large diversions, which if done, would overload downstream facilities.
- o Solves limitations on culvert capacities at I-25 and downstream drainage facilities.
- o Achieves detention of runoff and reduction of peak discharge rates needed to preserve capacity of the North Diversion Channel as well as the inlet to the channel.
- o Intercepts all possible drainage areas upstream of the dam.

South Domingo Baca Arroyo

The hydrologic results for existing conditions, and future conditions with Option E, Option G2 and Option H6-1 at major analysis points are presented in Tables 5-12, 5-13, 5-14 and 5-15, respectively. Table 5-16 summarizes the peak discharges at the major analysis points for development conditions and options presented in Tables 5-12 through 5-15.

Summary of Preferred Options E/J, G2/J and H6-1

The 100-yr. peak discharges at major analysis points, proposed storm sewer sizes, locations of proposed channel improvements and other features of Options E/J, G2/J and H6-1 are illustrated on Figures 5-5, 5-6 and 5-7, respectively. For all three options, a Prudent Line between the North Domingo Baca Dam and Ventura Street is recommended as an interim measure; however a storm sewer is recommended as the long term solution if development densities should increase significantly. Similarly, a Prudent Line is the recommended interim measure between the South Domingo Baca Dam and Eubank Blvd. and a storm sewer is the long term solution for all three options.

Figures 5-8 and 5-9 represent the 100-yr. hydrographs for North Domingo Baca Arroyo at the proposed dam site for Option J and the South Domingo Baca Arroyo at the North Diversion Channel, respectively.

5.5 COMPARISON OF DAM SITE OPTIONS I, J and K

Dam site Options I, J and K were compared based on the following factors: drainage diversions to each site, road re-construction, principal and emergency spillway, embankment, other infrastructure and right-of-way acquisition. Figures 5-10, 5-11 and 5-12 show the general dam and reservoir layout, road relocations, and flow diversions for each of the options.

5.6 CHANNEL IMPROVEMENT ALTERNATIVES

Natural Channel with Prudent Line

A Prudent Line may be defined as a line along a watercourse beyond which development would not be prudent because of flood and erosion hazards. Bernalillo County Ordinance Number 90-6 defines the Prudent Line as follows:

> "Prudent line" also referred to as "Erosion Limit Line" means that line which will not be disturbed by erosion, scour, or meandering of a natural (unlined) arroyo, channel or watercourse over a period of thirty (30) years and which will not be disturbed by a 100-year storm occurring at any time during the 30-year period. The Prudent Line shall be so located as to include all freeboard required to contain the wave action of the 100-year design.

The Prudent Line may be applicable in sparse development areas such as most areas within North Albuquerque Acres. This is because individual lot owners typically could not fund major drainage improvements such as storm sewers, channels, etc. Figure 5-13 illustrates that the Prudent Line is always greater than the 100-yr. flood plain.

The Prudent Line is an interim measure that will most likely require revision due to changing watershed conditions (upstream sediment supply and developed condition discharge rates) and due to the difficulty in predicting future geomorphic changes. Furthermore, the Prudent Line may be eliminated if drainage structures such as lined channels or partially lined channels are constructed.

Partial Lining with Grade Control

This type of channel treatment could be useful in locations where the bank must be stabilized or controlled due to proposed development and right-of-way constraints or where the Prudent Line is so wide as to be impractical. Grade control structures may also be required below bridges and other locations to reduce the damage associated with " head cutting". Figure 5-13 illustrates a typical bank protection assuming the use of soil cement; a soil cement grade control structure is also shown. The bottom width of partial lining will generally be much wider than a fully lined channel. Also, local scour in a partially lined channel section can become a maintenance problem.

Soil Cement or Concrete Channel Lining

Either soil cement or concrete may be viable channel treatments for high density development areas where a Prudent Line or partial lining with grade control is not acceptable or where these treatments are losing their effectiveness. Figure 5-14 illustrates a typical soil cement or concrete channel section.

TABLE 5-1
SUMMARY OF PASEO DEL NORTE FLOWS FOR SELECTED OPTIONS
(100-YR Qp)

(cfs)

INTERSECTION OR LOCATION	OPTION B	OPTION E (b)	OPTION G2 (b)	OPTION H4	OPTION H5	OPTION H6-1 (b)
SOUTH BACA DAM AT LOWELL	200	200	200	200	200	200
NORTH BACA DAM AT EUBANK	200	200	200	200	200	200
WEST OF HOLBROOK	330	380	380	810	810	380
WEST OF VENTURA	460	500	500	1690	1690	1560
WEST OF BARSTOW	640(a)	670	670	2330	2330	1720
WEST OF WYOMING	180	840(a)	820	3340	3340	3140
WEST OF LOUISIANA	300	130(a)	910	3490	3490	3300
WEST OF SAN PEDRO	450	140	1020	3660	4200	3980
JUNCTION WITH S. DOM. BACA CHANNEL	450(a)	140(a)	1030(a)	3630(a)	4100(a)	3960(a)

PDN FLOWS ONLY	OPTION B:	DIVERT ALL FLOW TO SDB CHANNEL AT BARSTOW AND SAN PEDRO
	OPTION E:	DIVERT ALL FLOW TO SDB CHANNEL AT WYOMING, LOUISIANA, AND SAN PEDRO
	OPTION G2:	DIVERSION TO SDB CHANNEL AT SAN PEDRO
N. D. BACA ARROYO AND PDN FLOWS	OPTION H4:	NDB DIVERSIONS TO PDN CHANNEL AT HOLBROOK (480 CFS), VENTURA (740 CFS), BARSTOW (480 CFS) AND WYOMING (900 CFS) (OUTFALL TO SDB WEST OF SAN PEDRO).
	OPTION H5:	NDB DIVERSIONS TO PDN CHANNEL SAME AS H4 PLUS SAN PEDRO (450 CFS) (OUTFALL TO SDB WEST OF SAN PEDRO).
	OPTION H6-1:	NDB DIVERSIONS TO PDN CHANNEL AT VENTURA (1090 CFS), WYOMING (1380 CFS) AND SAN PEDRO (450 CFS) (OUTFALL TO SDB WEST OF SAN PEDRO).

(a) Flow diverted to SDB channel
(b) Options selected for additional analysis

TABLE 5-2

SUMMARY OF PASEO DEL NORTE FLOWS AT MAJOR ANALYSIS POINTS - OPTION E
Paseo del Norte Corridor - closed conduit to SDB Channel at Wyoming & Louisiana
Option E - Future conditions 100-YR 24-HR Storm

STREET NAME OR COMMENT		ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
			PASEO DEL NORTE SYSTEM				
TOTAL LOWELL DIV	-	402.49	0.09	2.22	11	1.50	200
TOTAL NDB DAM DIV	-	915.13	0.07	2.13	9	1.50	200
WEST OF HOLBROOK	-	408.49	0.16	2.05	18	1.55	380
WEST OF VENTURA	-	408.99	0.21	2.03	23	1.55	500
WEST OF BARSTOW	-	419.99	0.29	2.00	31	1.55	670
TOTAL DIVR. TO SDB CHANNEL AT WYOMING	-	421.99	0.36	1.97	39	1.55	840
TOTAL DIVR. TO SDB CHANNEL AT LOUISIANA	-	436.29	0.05	2.16	6	1.50	130
AT SAN PEDRO	-	421.10	0.05	2.08	6	1.50	140
AT SDB CHANNEL	-	442.27	0.05	2.08	6	1.55	140
			SOUTH DOMINGO BACA ARROYO SYSTEM				
SOUTH DOMINGO BACA AT I-25 SDB/PDN	-	442.29	7.24	1.6	621	1.60	5530

TABLE 5-3

SUMMARY OF PASEO DEL NORTE FLOWS AT MAJOR ANALYSIS POINTS - OPTION G2
Paseo del Norte Corridor- closed conduit to SDB West of San Pedro
Option G2 - Future condiditions 100-YR 24-HR Storm

STREET NAME OR COMMENT		ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
			PASEO DEL NORTE SYSTEM				
TOTAL LOWELL DIV	-	402.49	0.09	2.22	11	1.50	200
TOTAL NDB DAM DIV	-	915.13	0.07	2.13	9	1.50	200
WEST OF HOLBROOK	-	408.49	0.16	2.05	18	1.55	380
WEST OF VENTURA	-	408.99	0.21	2.03	23	1.55	500
WEST OF BARSTOW	-	419.99	0.29	2.00	31	1.55	670
WEST OF WYOMING	-	421.99	0.36	1.97	39	1.55	820
WEST OF LOUISIANA	-	436.29	0.41	2.00	44	1.60	920
AT SAN PEDRO	-	436.99	0.47	2.01	51	1.60	1020
AT SDB CHANNEL	-	442.27	0.47	2.01	51	1.60	1030
			SOUTH DOMINGO BACA ARROYO SYSTEM				
SOUTH DOMINGO BACA AT I-25	-	442.29	7.24	1.60	621	1.60	5450

TABLE 5-4

SUMMARY OF PASEO DEL NORTE FLOWS AT MAJOR ANALYSIS POINTS - OPTION H6-1
Paseo del Norte Corridor - Channel North of PDN
Option H6-1 Pick up NDB Flow From Ventura, Wyoming and San Pedro
100-YR. 24-Hr Storm

STREET NAME OR COMMENT		ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
PASEO DEL NORTE SYSTEM							
TOTAL LOWELL DIV	-	402.49	0.09	2.22	10	1.50	200
TOTAL NDB DAM DIV	-	915.13	0.07	2.13	8	1.50	200
HOLBROOK	-	408.49	0.16	2.05	17	1.55	380
PDN + NDB @ VENTURA		408.99	2.89	1.77	273	1.60	1560
BARSTOW		419.99	2.97	1.77	281	1.60	1720
TOTAL PDN @ WYOMING		421.99	3.65	1.82	354	1.60	3140
LOUISIANA	-	436.29	3.70	1.82	360	1.60	3300
AT S.DOM.BACA CHANNEL		436.99	4.01	1.84	394	1.60	3990
N&S PDN CHAN		442.99	4.01	1.84	394	1.60	3960
SOUTH DOMINGO BACA ARROYO SYSTEM							
S. D. BACA AT I-25		442.29	10.79	1.68	964	1.65	8150

TABLE 5-5

SUMMARY OF PASEO DEL NORTE FLOWS FOR PREFERRED OPTIONS
(100-YR. Qp)

INTERSECTION OR LOCATION	OPTION E	OPTION G2	OPTION H6-1
	(cfs)		
SOUTH BACA DAM AT LOWELL	200	200	200
NORTH BACA DAM AT EUBANK	200	200	200
WEST OF HOLBROOK	380	380	380
WEST OF VENTURA	500	500	1560
WEST OF BARSTOW	670	670	1720
WEST OF WYOMING	840(a)	820	3140
WEST OF LOUISIANA	130(a)	910	3300
WEST OF SAN PEDRO	140	1020	3980
JUNCTION WITH S. DOM. BACA CHANNEL	140(a)	1030(a)	3960(a)
TOTAL FLOW IN SOUTH DOMINGO BACA CHANNEL AT I-25	5720	5650	8150

OPTION E: DIVERT ALL FLOW FROM PDN TO SDB CHANNEL AT WYOMING, LOUISIANA AND SAN PEDRO
OPTION G2: DIVERSION TO SDB CHANNEL AT SAN PEDRO
OPTION H6-1: NDB DIVERSIONS TO PDN CHANNEL AT VENTURA (1090 CFS), WYOMING (1380 CFS) AND SAN PEDRO (450 CFS).

(a) Flow diverted to SDB channel

TABLE 5-6

SUMMARY OF FLOWS
NORTH DOMINGO BACA ARROYO
EXISTING CONDITIONS 100-YR. 24-HR. STORM

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT FLOW @ TRAMWAY	902.90	0.92	1.44	71	1.90	912
MAIN ARROYO AT LOWELL	910.19	1.04	1.39	77	1.95	912
MAIN ARROYO AT BROWNIN	912.90	1.33	1.29	92	2.00	966
TOTAL INFLOW AT N DAM	914.19	1.53	1.25	102	2.10	963
OUTFLOW HYD N DAM HAMI	914.99	1.53	1.25	102	3.35	144
DAM HYD @ HOLBROOK	919.19	1.64	1.23	108	1.55	185
DAM HYD AT VENTURA	921.99	2.02	1.15	124	2.10	228
DAM HYD AT BARSTOW	926.79	2.36	1.11	140	1.70	360
DAM HYD @ WYOMING	930.99	2.60	1.12	155	1.65	535
DAM HYD @ LOUISIANA	935.99	2.69	1.11	159	1.75	535
DAM HYD @ SAN PEDRO	940.99	1.60	1.08	92	1.85	380
NB S ARROYO AT I-25	943.99	1.62	1.08	94	1.90	392
NBSA OUTFALL CM H PARK	945.99	1.64	1.09	96	1.90	402
NB N ARROYO AT I-25	942.99	1.87	1.11	111	1.80	626
NBNA OUTFALL CMH PARK	944.99	1.90	1.13	115	1.85	648
CONF N&S NB A CMH PARK	945.09	3.55	1.11	211	1.90	1049

TABLE 5-7

SUMMARY OF FLOWS
NORTH DOMINGO BACA ARROYO
NO IMPROVEMENTS - FUTURE COND. 100-YR. 24-HR. STORM

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT FLOW @ TRAMWAY	902.90	0.92	1.49	73	1.90	933
LA CUEVA TRIB.	902.10	0.19	1.53	16	1.60	292
TOTAL INFLOW AT N DAM	914.19	2.06	1.69	187	1.60	2422
OUTFLOW HYD N DAM HAMI	914.99	2.06	1.69	186	3.20	147
DAM HYD @ HOLBROOK	919.19	2.18	1.70	198	1.55	315
DAM HYD AT VENTURA	921.99	2.50	1.73	232	1.65	756
DAM HYD AT BARSTOW	926.79	2.79	1.76	263	1.60	1300
DAM HYD @ WYOMING	930.99	3.02	1.78	287	1.60	1749
DAM HYD @ LOUISIANA	935.99	3.11	1.78	296	1.60	1939
DAM HYD @ SAN PEDRO	940.99	3.21	1.79	307	1.60	2135
NB S ARROYO AT I-25	943.99	3.25	1.79	311	1.60	2207
NB N ARROYO AT I-25	942.99	0.53	2.03	58	1.55	1140
CONF N&S NB A CMH PARK	945.09	3.83	1.83	375	1.65	3328

TABLE 5-8

SUMMARY OF FLOWS
NORTH DOMINGO BACA ARROYO
OPTION H6-1 - FUTURE COND. 100-YR. 24-HR. STORM
DIVERSIONS TO PDN CHNNEL AT VENTURA, WYOMING AND SAN PEDRO

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT FLOW @ TRAMWAY	902.90	0.92	1.49	73	1.90	933
LA CUEVA TRIB.	902.10	0.19	1.53	16	1.60	292
MAIN ARROYO AT LOWELL	910.19	1.37	1.60	117	1.80	1396
MAIN ARROYO AT BROWNIN	912.90	1.67	1.66	148	1.70	1725
TOTAL INFLOW AT N DAM	914.19	2.06	1.69	187	1.60	2422
OUTFLOW HYD N DAM HAMI	914.99	2.06	1.69	186	3.20	147
DAM HYD @ HOLBROOK	919.19	2.18	1.70	198	1.55	315
TO PDN CHAN-VENTURA	920.99	2.68	1.75	250	1.60	1096
DAM HYD @ WYOMING	930.99	0.34	2.00	36	1.55	798
DAM HYD @ LOUISIANA	935.00	0.09	1.86	9	1.50	245
ROUTE TO PDN @ SAN PED	940.00	0.08	2.11	9	1.50	217
ROUTE TO PDN AT SAN P	940.99	0.19	1.96	20	1.50	455
NB S ARROYO AT I-25	943.00	0.03	2.11	3	1.50	92
NBSA OUTFALL CM H PARK	945.99	0.04	2.10	5	1.55	122
TO PDN CHAN AT WYOM	932.49	0.60	2.03	65	1.55	1378
NB N ARROYO AT I-25	942.99	0.27	1.99	29	1.55	645
CONF N&S NB A CMH PARK	945.09	0.35	2.02	38	1.60	788

TABLE 5-9

SUMMARY OF FLOWS
NORTH DOMINGO BACA ARROYO - OPTION J
DETENTION DAM EAST LOUISIANNA - FUTURE COND. 100-YR. 24-HR. STORM

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT FLOW @ TRAMWAY	902.90	0.92	1.49	73	1.90	933
LA CUEVA TRIB.	902.10	0.19	1.53	16	1.60	292
MAIN ARROYO AT LOWELL	910.19	1.37	1.60	117	1.80	1396
MAIN ARROYO AT BROWNIN	912.90	1.67	1.66	148	1.70	1728
TOTAL INFLOW AT N DAM	914.19	2.06	1.69	187	1.60	2428
OUTFLOW HYD N DAM HAMI	914.99	2.06	1.69	186	3.20	147
DAM HYD @ HOLBROOK	919.19	2.18	1.70	198	1.50	329
CONC CHAN.@ VENTURA	920.99	2.71	1.75	253	1.55	1420
CONC CHAN @ WYOMING	930.99	3.28	1.80	316	1.55	2646
TOT INFLOW NEW DAM	935.99	3.50	1.80	337	1.55	3113
OUTF DAM HYD E. LOUI	940.57	3.50	1.60	300	10.00	144
NB S ARROYO AT I-25	943.99	3.61	1.62	313	1.50	357
NB N ARROYO AT I-25	942.99	0.16	2.08	18	1.55	415
TOT. WEST OF I-25	943.82	3.78	1.64	331	1.55	781
TOT. N B ARROYO	945.09	3.83	1.64	337	1.55	902

TABLE 5-10

NORTH DOMINGO BACA ARROYO

100-YR PEAK DISCHARGE SUMMARY

LOCATION	EXISTING CONDITION	FUTURE CONDITION NO IMPROVEMENTS (100-YR	FUTURE CONDITION OPTION J Qp cfs)	FUTURE CONDITION OPTION H6-1
N.D.B. Dam Inflow	960	2430	2430	2430
N.D.B. Dam Outflow	140	150	150	150
Holbrook	190	320	330	320
Ventura	230	760	1420	1100(a)
Barstow	360	1300	2030	310
Wyoming	540	1750	2650	1380(a)
Louisiana	540	1940	3110	240
San Pedro	380	2140	270	460(a)
N. Branch @ I-25	630	1140	420	650
S. Branch @ I-25	390	2210	360	90
Total @ Confluence with S.D. Baca	1050	3330	900	790

(a) Diverted to Paseo del Norte Concrete Channel.

TABLE 5-11

EXISTING AND PROPOSED DETENTION DAM RESERVOIR ROUTING SUMMARY

RETURN PERIOD/ EXISTING (E) OR FUTURE (F) CONDITION	PEAK INFLOW (cfs)	TIME OF PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)	TIME OF PEAK OUTFLOW (hrs)	EMERGENCY SPILLWAY ELEVATION (ft)	PEAK STAGE m.s.l. (ft)	MAXIMUM WATER DEPTH (ac-ft)	MAXIMUM STORAGE VOLUME (ac-ft)	BASIN AREA (sq mi)
SOUTH DOMINGO BACA DAM									
100/E	3990	1.90	180	4.05	5918	5914	38	274	4.63
100/F	4190	1.90	180	4.10	5918	5915	39	296	4.78
NORTH DOMINGO BACA DAM									
100/E	960	2.10	140	3.35	5749	5741	21	70	1.53
100/F(a)	2430	1.60	150	3.20	5749	5743	23	140	2.07
PMP (a)	17390	2.35	15790	2.50	5749	5757	37	292	2.07
PROPOSED NORTH DOMINGO BACA DAM (NEAR LOUISIANA)									
100/F	3110	1.55	140	10.00	5308	5306	21	135	3.51
PMP	23560	2.55	23502	2.60	5308	5311	26	199	3.51

(a) Note: The future conditions and PMF routings utilized the "ultimate" storage capacity curve as defined in the North Domingo Baca Dam and La Cueva Dikes Plan Set (Wilson & Company, Jan. 1981).

TABLE 5-12

SUMMARY OF FLOWS
SOUTH DOMINGO BACA ARROYO AND PASEO DEL NORTE CORRIDOR
EXISTING CONDITIONS 100-YR. 24-HR. STORM

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
I-25 N. OF PDN	443.99	0.28	1.09	16	1.55	244
S PDN @ I-25	442.99	0.24	1.06	13	1.85	164
TOT S BACA @ TRAMWAY	400.89	4.36	1.38	322	1.85	3942
TOTAL INFLOW TO S DAM	400.99	4.62	1.36	336	1.90	3993
S DAM OUTFLOW HYDROGRA	400.81	4.62	1.36	336	4.05	179
DAM HYD. AT BROWNING	403.99	4.70	1.35	340	1.55	210
DAM HYD @ HAMILTON	404.39	4.88	1.33	347	1.60	351
CONCRETE CH @ HOLBROOK	405.19	5.47	1.29	377	1.70	806
CONCRETE CH @ VENTURA	410.19	5.72	1.32	403	1.60	1150
CONCRETE CH @ BARSTOW	414.19	5.92	1.34	424	1.60	1508
CONCRETE CH @ WYOMING	427.29	6.22	1.37	456	1.60	2098
CONC. CH @ LOUISIANA	434.29	6.36	1.38	469	1.60	2363
CONC. CH @ SAN PEDRO	437.19	6.57	1.39	488	1.60	2675
E. I-25 PASEO EXIT	442.29	6.67	1.40	500	1.65	2837
2 5' DIA CMPS I-25 S&N	443.84	0.57	1.16	36	1.60	485
2 5' DIA CMPS I-25 S&N	443.48	0.57	1.16	36	1.60	488
S. PASEO DEL NORTE	442.68	7.25	1.38	536	1.65	3337
TOT S BACA AT N BACA	445.18	7.31	1.39	542	1.65	3501
TOT N BACA @ S BACA	945.09	3.55	1.11	211	1.90	1049
CONF. N & S BACA ARROY	445.19	10.86	1.30	754	1.65	4257
DOM BACA @ JEFFERSON	947.18	10.98	1.30	762	1.70	4364
@ WASHINGTON	451.29	11.17	1.30	777	1.65	4642
TOT D BACA @ N DIV CHAN	451.19	11.38	1.30	792	1.75	4423

TABLE 5-13

SUMMARY OF FLOWS
SOUTH DOMINGO BACA ARROYO AND PASEO DEL NORTE CORRIDOR
OPTION E - FUTURE CONDITIONS 100-YR. 24-HR. STORM
PDN CLOSED CONDUIT DIVERSIONS TO S.D.B. ARROYO AT WYOMING AND LOUISIANA

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT S BACA @ TRAMWAY	400.89	4.36	1.38	322	1.85	3942
TOT INFLOW HYD S DAM	400.97	4.78	1.43	364	1.90	4194
S DAM OUTFLOW HYDROGRA	400.81	4.78	1.43	364	4.10	182
3 SS @ HAMILTON	404.99	5.36	1.48	425	1.55	1503
CONCRETE CH @ HOLBROOK	405.19	5.51	1.50	441	1.55	1867
CONCRETE CH @ VENTURA	410.19	5.76	1.51	465	1.55	2429
CONCRETE CH @ BARSTOW	414.19	5.96	1.52	486	1.55	2866
CONCRETE CH @ WYOMING	427.29	6.30	1.54	520	1.60	3458
CONC. CH @ WYO+PDN	427.28	6.67	1.57	559	1.55	4279
LOUISIANA W/OUT PDN	434.29	6.80	1.58	573	1.60	4599
C. CH @ LOUI+PDN	434.28	6.85	1.58	579	1.60	4698
SAN PEDRO W/OUT PDN	437.19	7.10	1.59	605	1.60	5225
SAN PEDRO + PDN	442.27	7.16	1.60	611	1.60	5348
I-25 BOX CULVERTS	442.29	7.24	1.60	620	1.60	5528
I-25 4-48 CMP	443.99	0.13	2.08	15	1.50	329
2 5' DIA CMP E PASEO E	442.99	0.06	2.08	7	1.50	169
2 5' DIA CMPS I-25 S&N	443.84	0.24	2.07	27	1.55	616
S. PASEO DEL NORTE	442.68	7.49	1.62	648	1.60	6074
TOT S BACA AT N BACA	445.18	7.55	1.62	655	1.60	6199
TOT. N BACA @ S BACA	945.09	3.83	1.64	337	1.55	902
CONF. N & S BACA ARROY	445.19	11.39	1.63	992	1.60	7031
DOM BACA @ JEFFERSON	947.18	11.51	1.63	1004	1.60	7204
@ WASHINGTON	451.29	11.70	1.64	1025	1.60	7635
T D BACA @ N DIV CHAN	451.19	11.74	1.64	1027	1.65	7173

TABLE 5-14

SUMMARY OF FLOWS
SOUTH DOMINGO BACA ARROYO AND PASEO DEL NORTE CORRIDOR
OPTION G2 - FUTURE CONDITIONS 100-YR. 24-HR. STORM
PDN CLOSED CONDUIT DIVERSION TO S.D.B. ARROYO WEST OF SAN PEDRO

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT. S BACA @ TRAMWAY	400.89	4.36	1.38	322	1.85	3942
TOT INFLOW HYD S DAM	400.97	4.78	1.43	364	1.90	4194
S DAM OUTFLOW HYDROGRA	400.81	4.78	1.43	364	4.10	182
3 SS @ HAMILTON	404.99	5.36	1.48	425	1.55	1503
CONCRETE CH @ HOLBROOK	405.19	5.51	1.50	441	1.55	1867
CONCRETE CH @ VENTURA	410.19	5.76	1.51	465	1.55	2427
BARSTOW CONC CHANN	414.19	5.96	1.52	486	1.55	2864
CONCRETE CH @ WYOMING	427.29	6.30	1.54	520	1.60	3456
CONC. CH @ LOUISIANA	434.29	6.43	1.55	534	1.60	3789
SAN PEDRO W/OUT PDN	437.19	6.68	1.57	560	1.60	4277
SAN PEDRO + PDN	442.27	7.16	1.60	611	1.60	5304
I-25 BOX CULVERTS	442.29	7.24	1.60	620	1.60	5446
I-25 4-48 CMP	443.99	0.13	2.08	15	1.50	329
2 5' DIA CMP E PASEO E	442.99	0.06	2.08	7	1.50	169
2 5' DIA COMPS I-25 S&N	443.84	0.24	2.07	27	1.55	616
2 5' DIA CMPS I-25 S&N	443.48	0.24	2.07	27	1.55	618
S. PASEO DEL NORTE	442.68	7.49	1.62	648	1.60	5983
TOT S BACA AT N BACA	445.18	7.55	1.62	655	1.60	6089
TOT. N BACA @ S BACA	945.09	3.83	1.64	337	1.55	902
CONF. N & S BACA ARROY	445.19	11.39	1.63	992	1.60	6921
DOM BACA @ JEFFERSON	947.18	11.51	1.63	1004	1.60	7075
@ WASHINGTON	451.29	11.70	1.64	1025	1.60	7506
T D BACA @ N DIV CHAN	451.19	11.74	1.64	1027	1.65	7049

TABLE 5-15

SUMMARY OF FLOWS
SOUTH DOMINGO BACA ARROYO AND PASEO DEL NORTE CORRIDOR
OPTION H6-1 - FUTURE CONDITIONS 100-YR. 24-HR. STORM
DIVERSIONS FROM NDB ARROYO AT VENTURA, WYOMING AND SAN PEDRO TO PDN CHANNEL,
PDN CHANNEL OUTFALL TO S.D.B. ARROYO WEST OF SAN PEDRO

STREET NAME OR COMMENT	ANALYSIS POINT	DRAINAGE AREA (sq mi)	RUNOFF DEPTH (in.)	RUNOFF VOLUME (ac-ft)	TIME TO PEAK (hrs)	100-YR PEAK DISCHARGE (cfs)
TOT. S BACA @ TRAM	400.89	4.36	1.38	322	1.85	3942
TOT INFLOW HYD S DAM	400.97	4.78	1.43	364	1.90	4194
S DAM OUTFLOW HYDROGRA	400.81	4.78	1.43	364	4.10	182
3 SS @ HAMILTON	404.99	5.36	1.48	425	1.55	1503
CONCRETE CH @ HOLBROOK	405.19	5.51	1.50	441	1.55	1867
CONCRETE CH @ VENTURA	410.19	5.76	1.51	465	1.55	2427
CONCRETE CH @ BARSTOW	414.19	5.96	1.52	486	1.55	2864
CONCRETE CH @ WYOMING	427.38	6.30	1.54	520	1.60	3520
CONC. CH @ LOUISIANA	434.29	6.43	1.55	534	1.60	3786
SAN PEDRO W/OUT PDN	437.19	6.68	1.57	560	1.60	4274
SAN PEDRO +PDN	442.27	10.70	1.67	954	1.60	8237
I-25 BOX CULVERTS	442.29	10.79	1.67	964	1.65	8145
S. PASEO DEL NORTE	442.68	11.04	1.68	991	1.65	8694
TOT S BACA AT N BACA	445.18	11.10	1.68	998	1.65	8785
TOT. N BACA @ S BACA	945.09	0.35	2.02	38	1.60	788
CONF. N & S BACA ARROY	445.19	11.46	1.69	1037	1.65	9502
DOM BACA @ JEFFERSON	947.18	11.57	1.69	1049	1.65	9657
@ WASHINGTON	451.29	11.77	1.70	1070	1.65	10011
T D BACA @ N DIV CHAN	451.19	11.81	1.70	1073	1.70	9706

TABLE 5-16

SOUTH DOMINGO BACA ARROYO
100-YR PEAK DISCHARGE SUMMARY

LOCATION	EXISTING CONDITION	FUTURE CONDITION		
		OPTION H6-1	OPTION E/J	OPTION G2/J
		(100-YR.	Qp	cfs)
S.D.B. Dam Inflow	3990	4190	4190	4190
S.D.B.Dam Outflow	180	180	180	180
Hamilton	350	1500	1500	1500
Holbrook	810	1870	1870	1870
Ventura	1150	2430	2430	2430
Barstow	1510	2870	2870	2870
Wyoming	2100	3520	3460	3460
Wyoming & PDN	NA	NA	4280	NA
Louisiana	2360	3790	4600	3790
Louisiana & PDN	NA	NA	4700	NA
San Pedro	2680	4270	5230	4280
San Pedro & PDN	NA	8240	5350	5300
I-25	2840	8150	5530	5450
Paseo del Norte	3340	8690	6070	5980
Total S. Baca	3500	8790	6200	6090
Total N. Baca	1050	790	900	900
Confluence N & S Baca	4260	9500	7030	6920
Jefferson	4360	9660	7200	7080
Washington	4640	10010	7640	7510
North Diversion Chann.	4420	9710	7170	7050

Drainage Features Common to all Drainage Options

For all options with the exception of Option A (no action option), the PDN flows between Tramway Blvd. and Lowell St. would be diverted to the South Domingo Baca Dam and PDN flows between Lowell St. and half way between Browning St. and Hamilton St. (Eubank Blvd.) would be diverted to the existing North Domingo Baca Dam.

Paseo del Norte Flows Only

Option A No Action - Existing drainage basin areas and flow patterns, but with future land treatment. No diversions to South Domingo Baca (SDB) channel.

Option B PDN diversion to the SDB channel in a storm drain at Barstow St. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.

Option C PDN diversions to SDB channel in a storm drain at Ventura St. and Wyoming Blvd. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.

Option D PDN diversions to SDB channel in a storm drain at Ventura St., Barstow St., Wyoming and Louisiana Blvds. and San Pedro Blvd.

Option E PDN diversions to SDB channel in a storm drain at Wyoming and Louisiana Blvds. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.

Option F Storm drain along PDN to San Pedro Blvd. with outfall to SDB channel west of San Pedro Blvd.

Option G Storm drain along PDN to Barstow St. Channel along PDN from Barstow St. to SDB channel with outfall west of San Pedro Blvd.

Option G2 Storm drain along PDN to San Pedro Blvd. The storm drain will join a box culvert along San Pedro Blvd. which will outfall to the SDB channel west of San Pedro Blvd.

North Domingo Baca Arroyo Diversions to PDN Channel with Outfall to SDB Arroyo Located West of San Pedro Blvd.

Option H1 NDB flows diverted to PDN channel at Holbrook St. Remainder of NDB flows to I-25.

Option H2 NDB flows diverted to PDN channel at Holbrook St. and Ventura St. Remainder of NDB flows to I-25.

Option H3 NDB flows diverted to PDN channel at Holbrook St., Ventura St. and Barstow St. Remainder of NDB flows to I-25.

Option H4 NDB flows diverted to PDN channel at Holbrook St., Ventura St., Barstow St. and Wyoming Blvd. Remainder of NDB flows to I-25.

Option H5 NDB flows diverted to PDN channel at Holbrook St., Ventura St., Barstow St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.

Option H6 NDB flows diverted to PDN channel at Holbrook St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.

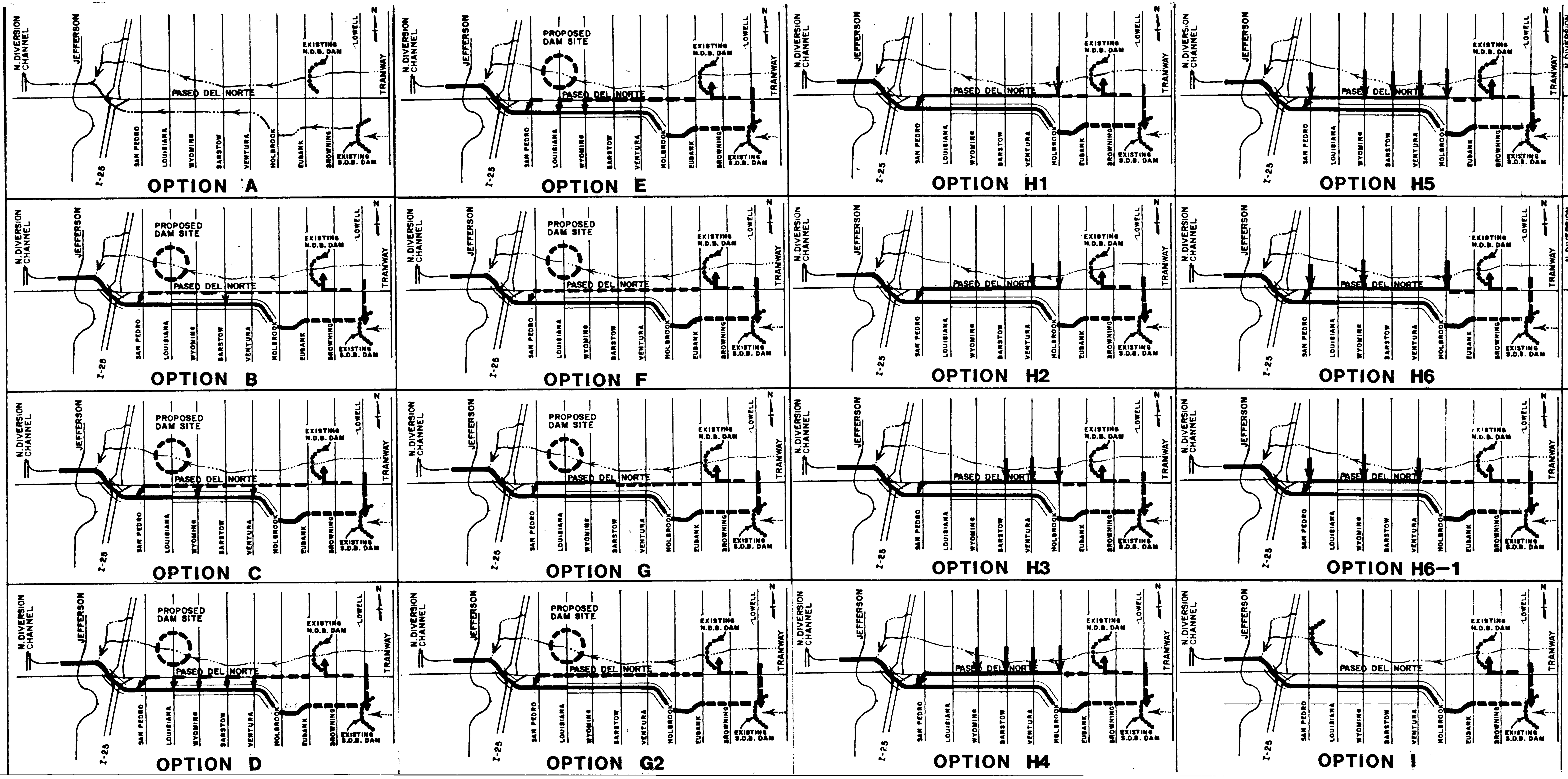
Option H6-1 NDB flows diverted to PDN channel at Ventura St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.

North Domingo Baca Arroyo with No Diversions to PDN Corridor

Option I Detention dam located between Louisiana and San Pedro Blvds. and south of Anaheim Ave.

Option J Detention dam located immediately east of Louisiana Blvd. and north of Carmel Ave.

Option K Detention dam located immediately west of Louisiana Blvd. and north of Anaheim Ave.



LEGEND

EXISTING DETENTION DAMS
EXISTING ARROYO'S
EXISTING CONCRETE CHANNEL
PROPOSED CONCRETE CHANNEL
PROPOSED STORM SEWER
PROPOSED DETENTION DAM

MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS

DRAINAGE MANAGEMENT
OPTIONS

ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY

Resource Technology, Inc.

FILE NAME:

1991

FIGURE 5–1

LOWELL
200cfs
SDB DAM (existing)
BROWNING
Future Diversion
280cfs
200cfs
NDB DAM (existing)
1500 cfs
EUBANK
1870 cfs
360 cfs
HOLBROOK
PASEO DEL NORTE
380 cfs
990 cfs
2430cfs
VENTURA
SDB CHANNEL
1620 cfs
500 cfs
2860cfs
BARSTOW
PASEO DEL NORTE STORM DRAIN LOCAL FLOWS ONLY DIVERSIONS AT WYOMING AND LOUISIANA
670 cfs
3460cfs
1920 cfs
WYOMING
840 cfs
PROPOSED DAM (OPTION J)
130 cfs
4280cfs
LOUISIANA
130 cfs
OPTION I
PROPOSED DAM (OPTION I)
4700cfs
SAN PEDRO
140 cfs
(alternate)
140 cfs
5530cfs
420 cfs
360cfs
CBC - 4 @ 4'H X 10'W
I-25
CBC - 4 @ 8'H X 10'W
CMP - 8 @ 4' Dia.
N
LEGEND
Natural Arroyo
Lined Channel (Existing)
Proposed Channel
Storm Drain
MASTER DRAINAGE PLAN NORTH AND SOUTH DOMINGO BACA ARROYOS
OPTION E SCHEMATIC
ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY
Resource Technology, Inc.
Holmes & Narver Inc.
FILE NAME:
JULY 1991
FIGURE 5-2

MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
OPTION G2
SCHEMATIC
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
Resource Technology, Inc.
Holmes & Narver inc.
FILE NAME:
JULY
1991
FIGURE
5-3
LEGEND
Natural Arroyo
Lined Channel (Existing)
Proposed Channel
Storm Drain
Underground CBC
LOWELL
BROWNING
EUBANK
HOLBROOK
VENTURA
BARSTOW
WYOMING
LOUISIANA
SAN PEDRO
SDB DAM
(existing)
200cfs
280 cfs
1500 cfs
1870 cfs
Future Diversion
NDB DAM
(existing)
200cfs
360 cfs
990 cfs
1620 cfs
1920 cfs
380cfs
500 cfs
670cfs
820cfs
910cfs
1030cfs
PASEO DEL NORTE
SDB CHANNEL
PDN CHANNEL
2430cfs
2860cfs
3460 cfs
3790cfs
4270cfs
5450cfs
PASEO DEL NORTE CHANNEL
LOCAL FLOWS ONLY
PROPOSED DAM
(OPTION J)
OPTION I
PROPOSED DAM
(OPTION I)
N
420 cfs
360cfs
CBC - 4 @ 4'H X 10'W
I-25
CBC - 4 @ 8'H X 10'W
CMP - 8 @ 4' Dia.

MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
OPTION H6-1
SCHEMATIC
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
FILE NAME:
JULY 1991
FIGURE
5-4
Resource Technology, Inc.
Holmes & Narver Inc.
LOWELL
BROWNING
EUBANK
HOLBROOK
VENTURA
BARSTOW
WYOMING
LOUISIANA
SAN PEDRO
I-25
SDB DAM
(existing)
NDB DAM
(existing)
Future Diversion
200cfs
280 cfs
1500 cfs
1870 cfs
2430 cfs
2860 cfs
3460 cfs
3790 cfs
4270 cfs
4150 cfs
380 cfs
1100cfs
1560 cfs
1720 cfs
1380 cfs
3140 cfs
3440 cfs
450 cfs
3960cfs
650 cfs
92 cfs
PASEO DEL NORTE
PDN CHANNEL
SDB CHANNEL
PASEO DEL NORTE
CHANNEL OPTION
WITH DIVERSIONS
FROM NDB
LEGEND
Natural Arroyo
Lined Channel (Existing)
Proposed Channel
Storm Drain
N
CBC - 4 @ 4'H X 10'W
CBC - 4 @ 8'W X 10'W
CMP - 8 @ 4' Dia.

Storm Sewer #	100-yr QP (cfs)	Pipe Size dia. (ft)	Slope (%)
1	160	4.5	1.6
2	180	4.0	3.2
3	[illegible]	[illegible]	3.1
4	270	[illegible]	[illegible]
5	130	4.0	3.[illegible]
6	250	4.5	0.2
7	370	5.5	3.0
8	570	5.5	1.8
9	330	5.0	2.5
10	[illegible]	[illegible]	[illegible]
11	370	5.5	1.4
12	130	5.0	0.5
13	280	5.0	2.3
14	80	4.0	0.5
15	330	5.5	1.7
16	190	3.0	1.3
17	360	4.5	0.8
18	160	4.5	0.3

Storm Sewer #	100-yr. QP (cfs)	Pipe Size dia. (ft)	Slope (%)
19	140	3.5	2.5
20	270	4.0	2.8
21	[illegible]	[illegible]	[illegible]
22	230	4.0	2.5
23	1100	6.5	0.3
24	180	5.0	0.8
25	340	5.0	0.5
26	200	5.0	1.0
27	[illegible]	[illegible]	[illegible]
28	130	4.0	3.8
29	300	4.0	2.0
30	100	3.0	3.2
31	160	3.5	4.0
32	380	4.5	4.1
33	460	5.0	3.6
34	600	5.5	3.1
35	600	6.0	2.6

Storm Sewer #	100-yr. QP (cfs)	Pipe Size dia. (ft)	Slope (%)
36	570	6.0	2.8
37	740	6.5	3.0
38	[illegible]	[illegible]	3.0
39	800	6.5	2.9
40	910	7.0	3.0
41	986	7.0	3.2
42	1020	CBC	1.0
43	70	3.0	2.7
44	30	[illegible]	3.3
45	80	3.5	1.0
46	180	4.0	2.7
47	240	5.0	1.0
48	480	5.5	2.5
49	100	3.0	2.8
50	320	5.0	1.0
51	100	3.0	2.8
52	480	5.5	0.3

MASTER DRAINAGE PLAN
NORTH AND SOUTH DOMINGO BACA ARROYOS

OPTION E / J

ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY

Resource Technology, Inc.

FILE NAME

1991

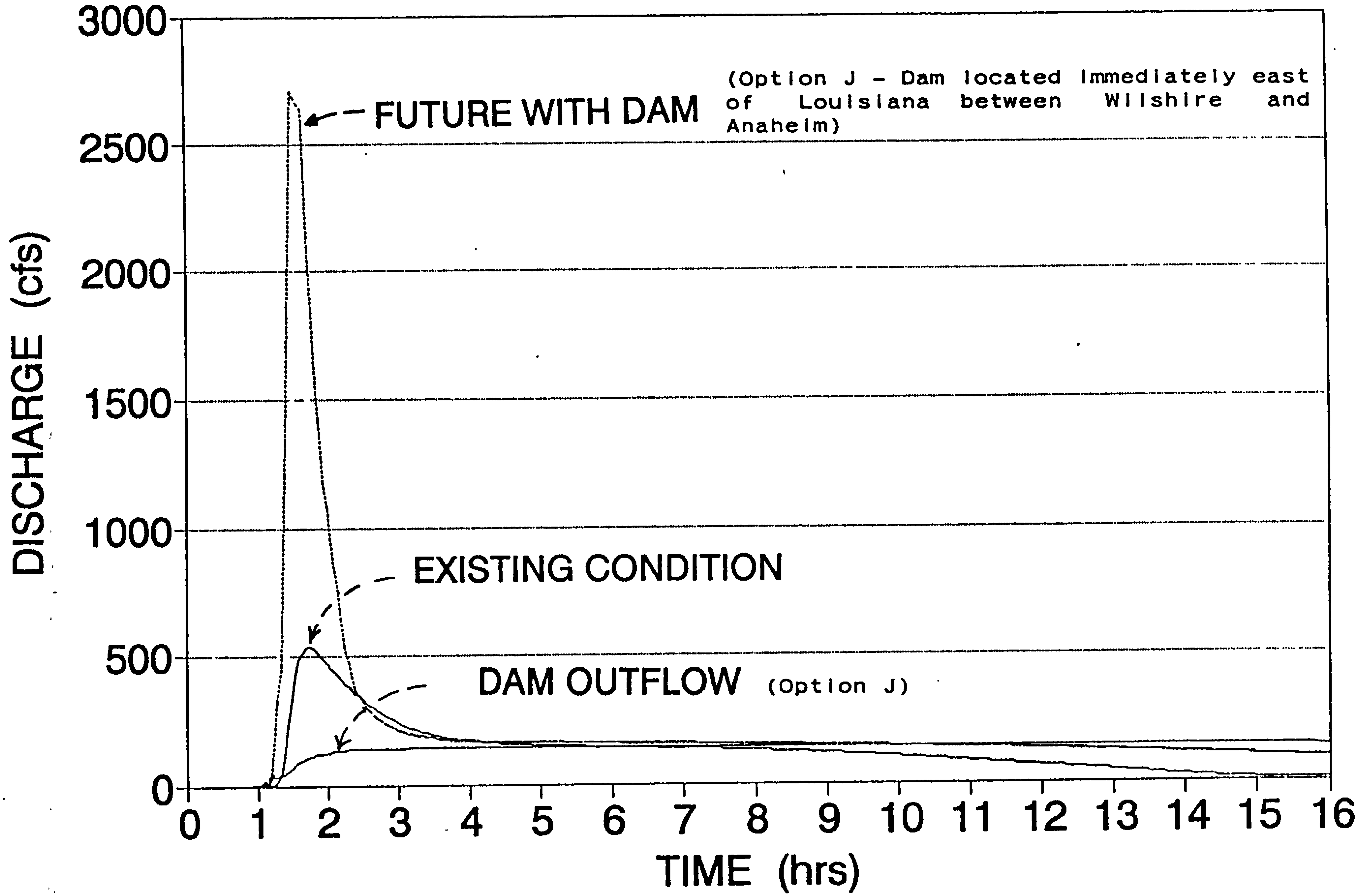
FIGURE 5-5

MODESTO AVE.
EAGLE ROCK AVE.
OAKLAND AVE.
ALAMEDA BLVD.
SIGNAL AVE.
WILSHIRE AVE.
CORONA AVE.
ANAHEIM AVE.
CARMEL AVE.
HOLLY AVE.
PASEO DEL NORTE
PALOMAS AVE.
SAN BERNARDINO DR.
RANCHITOS RD.
PINO AVE.
SAN FRANCISCO DR.
CORONADO AVE.
SAN RAFAEL AVE
WASHINGTON ST.
JEFFERSON ST.
SAN MATEO BLVD.
SAN PEDRO DR.
LOUISIANA BLVD.
WYOMING BLVD.
BARSTOW ST.
VENTURA ST.
HOLBROOK ST.
EUBANK BLVD.
BROWNING ST.
LOWELL ST.
TENNYSON ST.
TRAMWAY BLVD.
TIBURON ST.
I-25
LA CUEVA HIGH SCHOOL
DOMINGO BACA ARROYO INLET
MAY REQUIRE SOIL CEMENT IN FULL DEVELOPMENT CONDITION
RE-ESTABLISH DIKE
EXAMPLE: 2430 = 100 YEAR PEAK DISCHARGE (FULL DEVELOPMENT CONDITIONS)
NOTE: PRUDENT LINE IS INTERIM. STORM SEWER FOR HIGHER DENSITIES.
PUBLIC-PRIVATE STORM SEWER
PROPOSED EARTH DIKE
LEGEND
PASEO DEL NORTE BASIN
EXISTING BASIN BOUNDARY
FUTURE BASIN BOUNDARY
ARROYO / CHANNEL
ANALYSIS NODE
945 BASIN NUMBER
FLOW DIRECTION
EXISTING DRAINAGE INFRASTRUCTURE
UNIMPROVED ARROYO REACHES
CONCRETE CHANNEL
STORM SEWER
CULVERTS
PROPOSED DRAINAGE INFRASTRUCTURE
PRIVATE CONCRETE CHANNEL
PUBLIC CONCRETE CHANNEL
EARTH / RIP-RAP DIVERSION CHANNEL
PRIVATE STORM SEWER
PUBLIC STORM SEWER
TRAPEZOIDAL BRIDGE
GRADE CONTROL STRUCTURE
EXISTING ARROYO / PRUDENT LINE
MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
OPTION G2 / J
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
Resource Technology, Inc.
FILE NAME
1991
FIGURE 5-6

Storm Sewer #	100-yr. QP (cfs)	Pipe Size dia. (ft)	Slope (%)
1	180	4.5	1.6
2	180	4.0	3.2
3	[illegible]	4.5	3.1
4	270	[illegible]	3.7
5	130	4.0	3.8
6	250	4.5	0.2
7	370	5.5	3.0
8	570	5.5	1.5
9	330	5.0	2.6
10	130	3.5	3.7
11	370	5.5	1.4
12	130	5.0	0.5
13	250	5.0	2.3
14	80	4.0	0.5
15	330	5.5	1.7
16	190	3.0	1.3
17	360	4.5	0.8
18	150	4.5	0.3

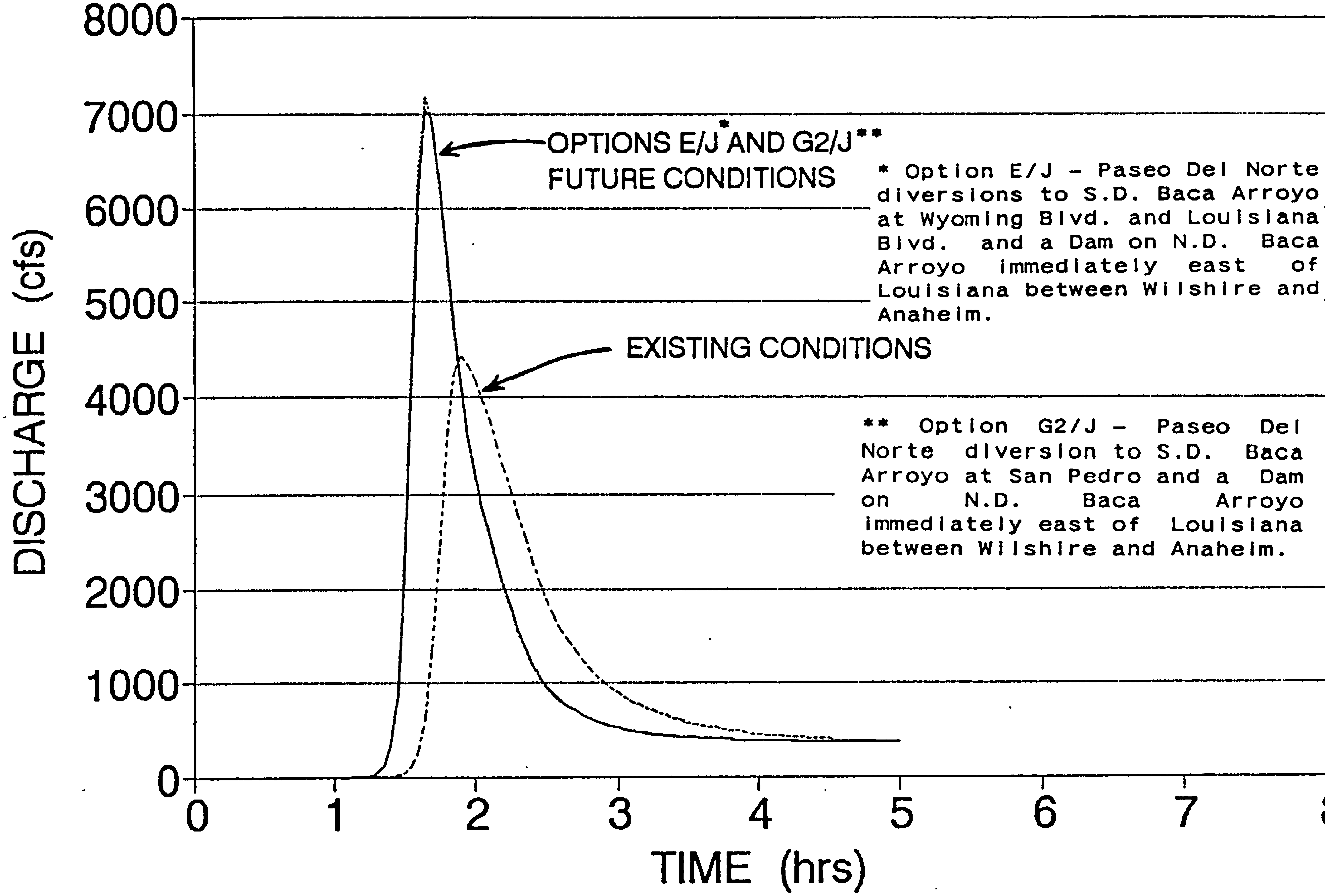
Storm Sewer #	100-yr. QP (cfs)	Pipe Size dia (ft)	Slope (%)
19	140	3.5	2.5
20	270	4.0	2.8
21	[illegible]	[illegible]	[illegible]
22	230	4.0	2.5
23	1100	5.5	0.3
24	150	5.0	0.8
25	340	5.0	0.5
26	300	5.0	1.0
27	[illegible]	[illegible]	[illegible]
28	130	4.0	3.8
29	200	4.0	2.0
30	100	3.0	3.2
31	160	3.5	4.0
32	380	4.5	4.1
33	480	5.0	3.6
34	600	5.5	3.1
35	590	6.0	2.6

Storm Sewer #	100-yr QP (cfs)	Pipe Size dia. (ft)	Slope (%)
36	670	6.0	2.8
37	740	6.5	3.0
38	[illegible]	[illegible]	3.0
39	880	6.5	2.9
40	910	7.0	3.0
41	966	7.0	3.2
42	1060	CBC	1.0
43	70	3.0	2.7
44	[illegible]	[illegible]	[illegible]
45	80	3.5	1.0
46	180	4.0	2.7
47	340	5.0	1.0
48	480	5.5	2.5
49	160	3.0	2.8
50	320	5.0	1.0
51	100	3.0	2.8
52	480	5.5	0.3



100-YR. FLOOD HYDROGRAPHS
PROPOSED NORTH DOMINGO BACA DAM

FIGURE 5-8



100-YR. FLOOD HYDROGRAPHS
NORTH DIVERSION CHANNEL

FIGURE 5-9

PROPOSED DRAINAGE INFRASTRUCTURE
PRIVATE CONCRETE CHANNEL
PUBLIC CONCRETE CHANNEL
EARTH / RIP-RAP DIVERSION CHANNEL
PRIVATE STORM SEWER
PUBLIC STORM SEWER
TRAPEZOIDAL BRIDGE
GRADE CONTROL STRUCTURE
EXISTING ARROYO / PRUDENT LINE
NEW ROADWAY
LOT TO BE ACQUIRED
N
200 0 200 400
SIGNAL AVE.
WILSHIRE AVE.
CORONA AVE.
ANAHEIM AVE.
CARMEL AVE.
HOLLY AVE.
SAN PEDRO DR.
LOUISIANA BLVD.
WYOMING BLVD.
3.5' PIPE
SPILLWAY
ACQUIRE 50-FT RIGHT-OF-WAY
REMAINING FLOWS COLLECTED BY PASEO DEL NORTE DRAINAGE SYSTEM
MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
DAM SITE OPTION I
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
FILE NAME.
Resource Technology, Inc.
1991
FIGURE 5-10


PROPOSED DRAINAGE INFRASTRUCTURE
PRIVATE CONCRETE CHANNEL
PUBLIC CONCRETE CHANNEL
EARTH / RIP-RAP DIVERSION CHANNEL
PRIVATE STORM SEWER
PUBLIC STORM SEWER
TRAPEZOIDAL BRIDGE
GRADE CONTROL STRUCTURE
EXISTING ARROYO / PRUDENT LINE
NEW ROADWAY
LOT TO BE ACQUIRED
N
200 0 200 400
SIGNAL AVE.
WILSHIRE AVE.
CORONA AVE.
ANAHEIM AVE.
CARMEL AVE.
HOLLY AVE.
SAN PEDRO DR.
WYOMING BLVD.
STREET FLOW
EMERGENCY SPILLWAY
OPEN CHANNEL
PRIVATE CONSTRUCTION
SEE FIGURE 5-6
3.5' PIPE
ACQUIRE 25 FT. RIGHT-OF-WAY
REMAINING FLOWS COLLECTED BY PASEO DEL NORTE DRAINAGE SYSTEM
MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
DAM SITE OPTION J
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
FILE NAME:
Resource Technology, Inc.
1991
FIGURE 5-11

MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS

DAM SITE OPTION K

ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY

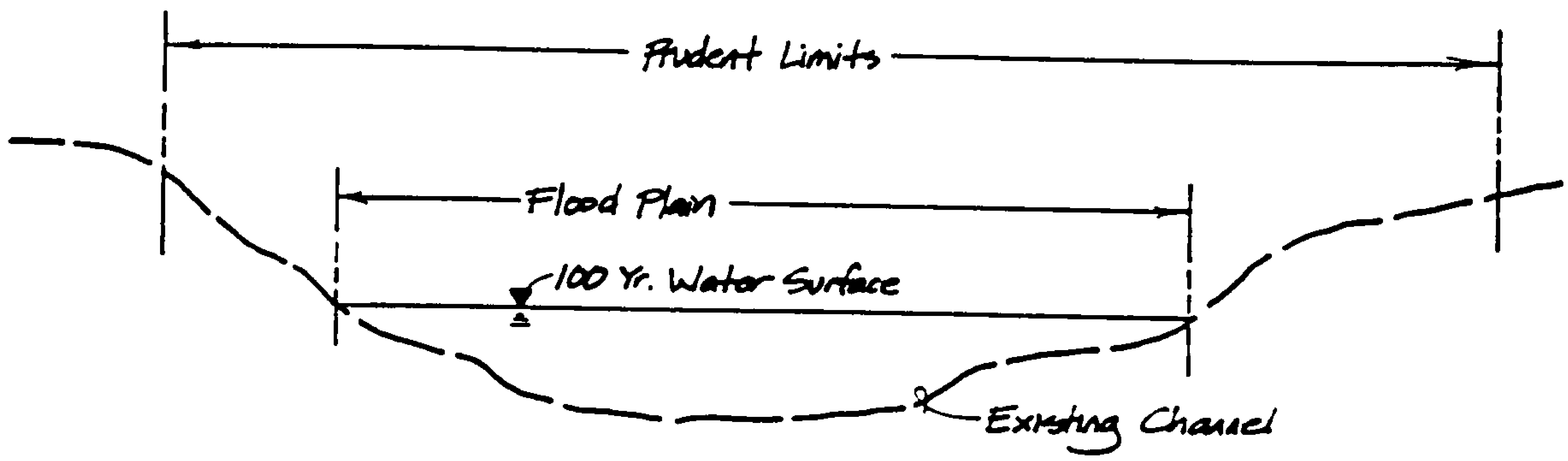
Resource Technology, Inc.

FILE NAME:

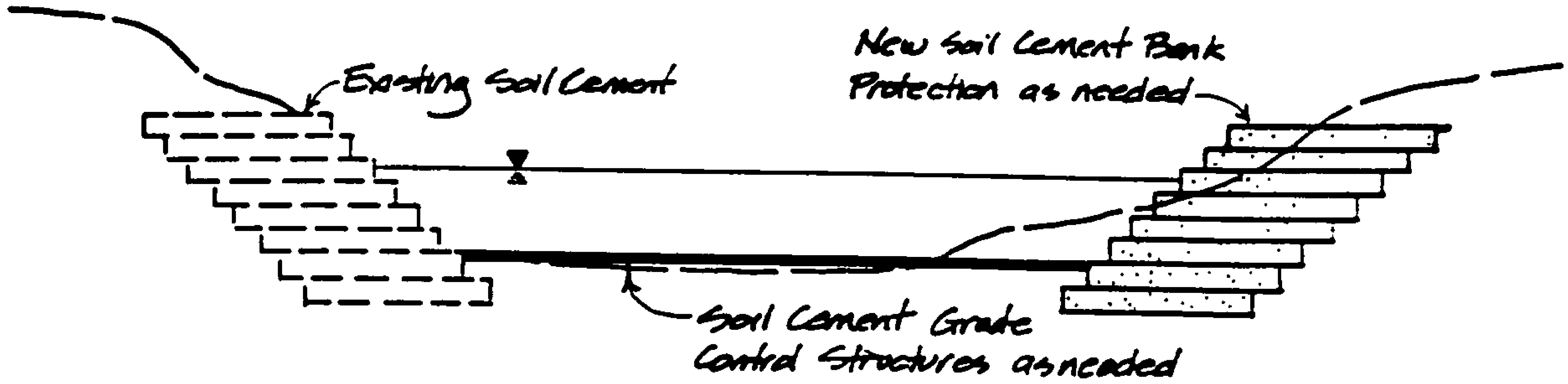
1991

FIGURE 5-12

PRUDENT LINES



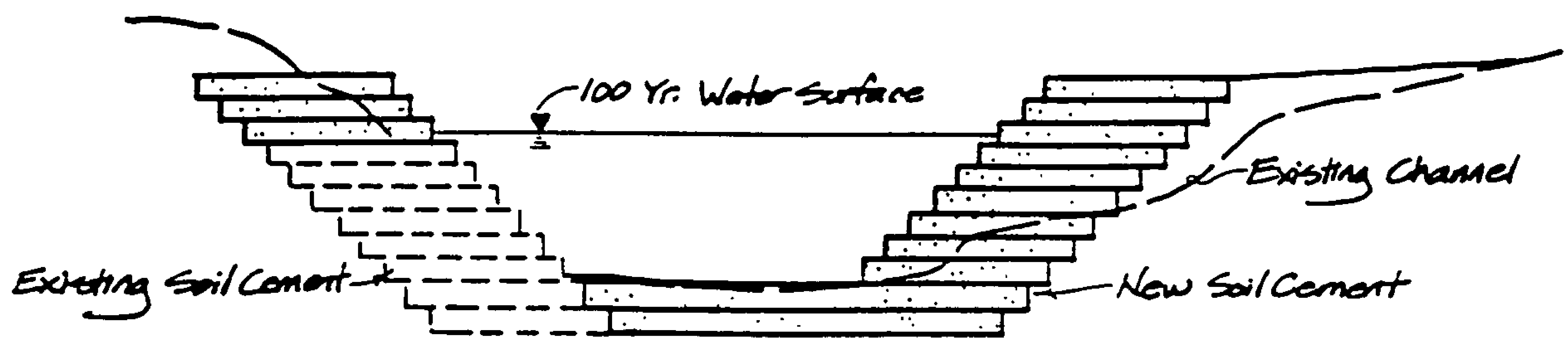
BANK PROTECTION
with Drop Structures



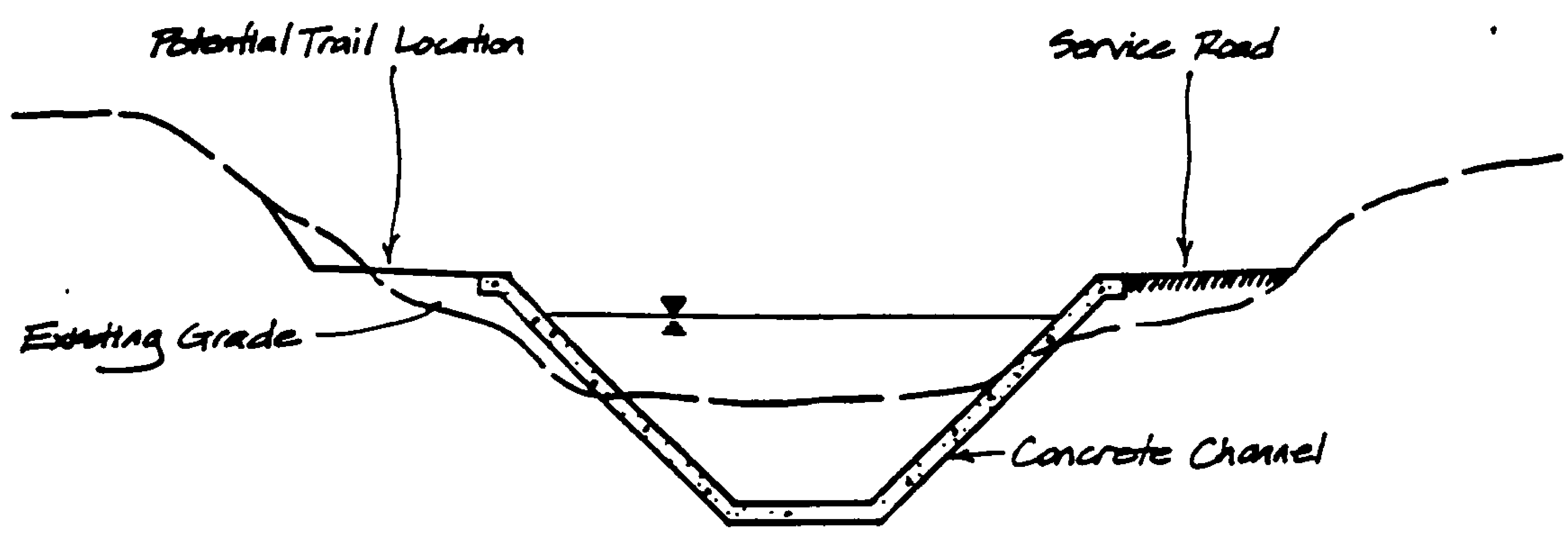
TYPICAL PRUDENT LINE AND
BANK PROTECTION CHANNEL SECTIONS

FIGURE 5–13

SOIL CEMENT CHANNEL



CONCRETE CHANNEL



TYPICAL SOIL CEMENT AND
CONCRETE CHANNEL SECTIONS
FIGURE 5—14

6.0 HYDRAULIC ANALYSIS

6.1 PREFERRED DRAINAGE MANAGEMENT OPTIONS

All drainage options analyzed in this Drainage Management Plan are described in detail in Section 5. The preferred options were selected in part based on the capacity of existing drainage structures relative to the peak discharge rates as computed for the preferred options.

A brief description of each preferred option is given here and a more detailed discussion is presented in Section 5.

Option E	PDN diversions to SDB channel in a storm drain at Wyoming and Louisiana Blvds. Remainder in a storm drain along PDN with outfall to SDB arroyo west of San Pedro Blvd.
Option G2	Storm drain along PDN from Lowell St. to San Pedro Blvd. The storm drain will join a box culvert along San Pedro Blvd. which will outfall to the SDB channel west of San Pedro Blvd.
Option H6-1	NDB flows diverted to PDN channel at Ventura St., Wyoming and San Pedro Blvds. Remainder of NDB flows to I-25.
Option J	Detention dam located immediately east of Louisiana Blvd. and north of Carmel Ave.

6.2 EXISTING DRAINAGE STRUCTURES

Existing Bridges and Culverts

The South Domingo Baca Arroyo now has bridges at Ventura St., Barstow St. and Wyoming Blvd. The Louisiana and San Pedro Blvd. bridges will be constructed in the near future. Interstate 25 (I-25), Paseo del Norte (PDN) and Jefferson St. all have 4-8 ft. tall X 10 ft. wide concrete box culverts to convey the South Domingo Baca Arroyo flows under each of these streets.

The capacities of all existing culverts from I-25 to Jefferson St. were computed using both the uniform flow (Manning's Equation) and culvert flow (inlet control) methods. The capacities of bridges along the South Domingo Baca Arroyo east of I-25 were computed for uniform flow conditions only, because they are all within concrete lined channel sections.

As also discussed elsewhere, all of the flow rates presented in this report do not make any allowance for sediment volumes (bulking) added to the flow volumes. This condition should be considered when detailed studies are conducted. Generally the flow volumes will increase from 7 to 20 percent as a result of sediment in the flow.

Culvert Capacities Assuming Uniform Flow

Table 6-1 is a summary of the capacity of each existing crossing structure assuming uniform flow and subtracting the required freeboard to the soffit or low chord based on City of Albuquerque DPM criteria for supercritical flow in trapezoidal channels. The uniform flow assumption implies that improved channels must be in place upstream of the structures. Table 6-1 also includes the computed 100-yr. peak discharges for existing and future development conditions at these structures.

The Ventura St. Bridge

The Ventura St. Bridge has adequate capacity under existing conditions. However, it may require improvement under future conditions if the freeboard requirement is held. Otherwise, the future condition peak flows could pass below the low chord with reduction of the required freeboard depth.

Barstow St. Bridge.

The Barstow St. Bridge has excess capacity under both existing and future conditions.

Wyoming Blvd. Bridge

The results on Table 6-1 indicate that the Wyoming Blvd. Bridge is inadequate under existing conditions if freeboard requirements are held. However, the peak discharge could pass below the low chord with reduction of the required freeboard depth. This bridge is inadequate (relative to required freeboard) for future development conditions.

Louisiana Blvd. Bridge

The Louisiana Blvd. Bridge has adequate capacity under both existing and future conditions.

San Pedro Blvd. Bridge

This bridge is currently in design and the capacity should be based on the 100-year peak discharge in this Drainage Management Plan.

I-25, Paseo del Norte and Jefferson St. Box Culverts

The flow capacities of the I-25, Paseo del Norte and Jefferson St. CBCs were also computed assuming they operated under uniform flow. The results on Table 6-1 indicate that under existing conditions all culverts have adequate capacity assuming uniform flow. However, under future conditions, Option H6-1 discharges exceed the capacity if the freeboard requirement is held. However, under Option G2/J, peak discharges are less than the capacity of the box culverts considering freeboard except for

Jefferson St. where some encroachment into the freeboard will occur.

Culvert Capacities Assuming Culvert Flow with Inlet Control

The North and South Branches of the North Domingo Baca Arroyo at I-25 have numerous culverts at I-25 and also west of I-25 through several road crossings within Coronado Mobile Home Park. The capacities of these crossings were also computed as culvert flow with inlet control. Figure 6-1 shows the locations of these culverts with a table listing the capacity of each culvert along with the 100-year peak discharges for existing and future conditions.

The results from Figure 6-1 indicate that with the future improvements in Options H6-1 and G2/J (assuming future development conditions) that both sets of culverts are adequate. However, the 100-yr peak discharges for future development conditions with no upstream improvements at structures 1 and 2 are 1140 cfs and 2210 cfs, respectively. Therefore, both sets of culverts (structures 1 and 2) for the North and South Branches under I-25 are very inadequate unless upstream improvements are constructed. Structures 1-7 all have severe capacity limitations relative to future development conditions (and some with existing development conditions) 100-yr. peak discharges unless upstream improvements are constructed.

It is important to note that the 4 - 4 ft. tall x 9 ft. wide box culverts (Structure 2) under I-25 which convey the South Branch of the North Domingo Baca Arroyo as well as the outfall channel and culverts through Coronado Mobile Home Park have more capacity than the North Branch culverts under I-25 and through the same area.

Under existing conditions Structures 3, 5 and 6 within Coronado Mobile Home Park are inadequate. All culverts within Coronado Mobile Home Park are inadequate under future conditions (Structures 3, 4, 5, 6 and 7). At present, Structure 5 on the North Branch is almost completely silted to the soffit and has minimal flow capacity.

Within the I-25/Paseo del Norte interchange, Structures 12, 14 and 16 do not have the required capacities for the existing or future conditions. Consequently, flooding of I-25 may occur, although a detailed analysis of this area was beyond the scope of this plan.

The South Domingo Baca Arroyo box culverts under I-25 and Paseo del Norte (Structures 10, 9 and 8) have adequate capacity under existing conditions. Although under future conditions the culverts will be inadequate. However, the upstream reach to Structure 10 will be concrete lined and uniform flow conditions will allow greater culvert flow possible. Based on the potential capacity problems at Structures 9 and 10, improvements (channel lining) is also recommended between these structures, so that additional flow capacity can be provided. Therefore with uniform flow structures 10, 9 and 8 will have adequate capacity for future development 100-yr. flows.

The Jefferson St. box culverts are inadequate under existing and future conditions. However, with a recommended concrete channel upstream, the culverts will have capacity assuming uniform flow.

6.3 CROSS-SECTION LOCATIONS, WATER SURFACE PROFILES AND OTHER HYDRAULIC DATA

The U.S. Army Corps of Engineers HEC-2 program was used to model hydraulics of those major tributary and main arroyos of the North and South Domingo Baca Arroyos with floodplains shown on the FEMA maps and located west of the existing North and South Domingo Baca Arroyo Dams. The cross-sections were generally located every 200 feet along the arroyo and also just upstream and downstream of roads crossing the arroyo, and on the road center lines. Digitized cross-section data was developed from the aerial photography taken in March 1990 by Koogle and Pouls Engineering. The additional required information for bridges and culverts were either field surveyed by Resource Technology, Inc. or obtained from as-builts.

The roughness coefficients or Manning's "n" values were assumed as follows:

DESCRIPTION	MANNING'S
Channel with shrubs and bushes	0.030
Overbanks	0.035
Overbanks in mobile home park	0.060
Channel with small grasses and bushes	0.025
Excavated channel (mobile home park)	0.024
Excavated channels (no vegetation)	0.021
Streets (asphalt)	0.020
Corrugated metal pipes	0.033
Concrete box culverts	0.015
Rip-rap	0.040

The existing condition peak discharges as computed in this study were used in the HEC-2 model. The arroyo reaches which were modeled with the HEC-2 program are shown on Figure 6-2. The bridges and box culverts were all modeled with the "Normal Bridge Method" available in HEC-2.

The arroyos in the study area have slopes which generally vary from about 2 to 4 percent with an average of about 2.5 percent. Because of the steep slopes, the arroyos were modeled assuming the supercritical flow regime. The model results indicated that the flow depth at nearly all cross-sections was at critical depth or only slightly less than critical depth. As a check, the arroyos were also modeled under the subcritical flow regime; the results indicate that the flow depth would be supercritical at nearly all cross-sections.

However, supercritical flows in natural channels are generally not sustainable and numerous hydraulic jumps, standing waves and related hydraulic transient phenomena are expected. These flow profile disturbances occur because of several reasons including:

1. Highly variable cross-section shapes within short distances.

2. Highly variable vegetation types, densities and locations across each cross-section.

3. Debris which is being transported by the flow or catches on vegetation and causes local disturbances in the flow.

4. Antidunes which are continually forming and moving along the arroyo bed.

5. Low Froude Numbers (generally from 1 to 1.7) resulting in undular hydraulic jumps which consist of a series of waves that do not dissipate easily and extend the length of the jump.

Two other significant factors which must be considered include:

A. The HEC-2 program is a one dimensional fixed bed hydraulic analysis procedure. However, as previously described, the arroyo beds are not fixed (they are continually changing shape and form) and the flow is usually not one dimensional.

B. These arroyos are flowing across alluvial depositional areas which may be treated as alluvial fans. According to the FEMA guidelines for alluvial fan flow analysis, the depth of flooding is the energy grade or computed depth of flow plus the velocity head .

Consequently, the computed supercritical flow depths only have meaning in a hydraulic sense; in practice, the specific energy (depth & velocity head) is used to determine depth of flooding.

Plots of the computed flow depths for the study arroyos are included in Supplement 4. These figures also show the approximate water surface elevation as shown on the current FEMA mapping of these arroyos. Full HEC-2 input data and output files are included in Supplement 4.

6.4 IMPACT OF URBANIZATION ON CHANNEL STABILITY

As may be expected, urbanization increases the impervious area (streets, roofs, etc.) and the runoff volume and peak discharge rate above the undeveloped condition. Urbanization also provides improved flow paths in terms of streets, storm sewers and concrete channels which reduce the time for runoff to reach collection points, thus further increasing flow rates. In addition, the available sediment supply to arroyos is reduced. Therefore urbanization can also lead to increased channel erosion. Designs for all drainage structures must consider this fact and provide for energy dissipation, erosion protection and consideration to downstream areas. Particular concerns include potential increases in floodplain areas or possible redirection of the arroyo as a result of increased runoff and associated erosion problems.

6.5 FLOW AND SEDIMENT LOAD IMPACTS ON THE NORTH DIVERSION CHANNEL

Sediment Load Impacts

As shown on Tables 4-4 through 4-8, the runoff volumes and peak flow rates will increase in the future but sediment inflow from the watershed to the channel will be reduced due to development. This will cause increased erosion within the arroyos. Unless appropriate measures to stabilize the channel are implemented this sediment will be transported to the North Diversion Channel.

However, a significant portion of the sediment load that reaches Washington Street could be deposited in the wide channel section which begins about 1100 feet west of Washington Street and extends to the inlet to the North Diversion Channel. This reach was designed as a sedimentation basin because the flow velocity decreases from approximately 18 feet per second to 9 feet per second in this reach. The short term solution is to remove the sediment from the sediment detention basin which will provide adequate sediment trap capacity for incoming high sediment laden flows under existing conditions.

However, as the watershed becomes fully urbanized, sediment loads will significantly decrease and erosion in this reach may be of greater concern. Therefore, the long term solution may be to confine and line the channel with either concrete or soil- cement from Washington Street to the concrete inlet structure at the North Diversion Channel.

The 1100-foot arroyo reach west from Washington Street to the wide sedimentation basin is deeply incised and is currently causing maintenance problems. Consequently this reach is also recommended for lining with soil cement or possibly concrete.

Flow Impacts

The peak discharge rate at the Domingo Baca Arroyo outfall to the North Diversion Channel will increase from 4,640 cfs for the existing condition to 7,050 cfs for the future condition with Paseo del Norte flows being diverted to the South Domingo Baca Arroyo and a detention dam on the North Domingo Baca Arroyo near

Louisiana Blvd.(Option E/J or G2/J); or to 9,710 cfs for the future condition with all flows being diverted to the South Domingo Baca Arroyo (Option H6-1).

The design capacity of the Domingo Baca Arroyo Inlet to the North Diversion Channel is 7800 cfs. The inlet is a concrete trapezoidal channel approximately 960 feet in length east of the North Diversion Channel. Therefore, diverting all flows to the South Domingo Baca Arroyo (9,710 cfs) will exceed the inlet capacity. Consequently, if Option H6-1 was selected, additional cost would be involved to increase the capacity of the inlet structure. The inlet structure would require structural improvement which may entail concrete walls approximately one and one-half feet tall for a length of 960 feet on the north top of inlet channel and 790 feet on the south top of inlet channel.

In addition, the increased flow (9,710 cfs) would cause wave problems and freeboard deficiency in the North Diversion Channel from the Domingo Baca Inlet to the Rio Grande. The following improvements to the North Diversion Channel were recommended by AMAFCA for Option H6-1..

1. A four-foot tall wall 150 feet long located on the North Diversion Channel top of westside channel across from the Domingo Baca Inlet to control wave run-up from the large inflow from Domingo Baca Arroyo.

2. A one-foot tall wall located on the North Diversion Channel westside top of channel from Station 154 + 21 to Station 72 + 50.

3. A one-foot tall wall located on the North Diversion Channel eastside top of channel for approximately one-third of the distance required for the westside or about 2,700 feet.

The existing capacity of the Jefferson St. box culverts under uniform flow conditions is 6,120 cfs (or 3500 cfs with inlet control culvert capacity) compared to 9,710 cfs (Option H6-1); this would also lead to considerable expense to increase the number of box culverts to convey the additional flow.

Therefore, the North Diversion Channel will receive an additional 2,410 cfs over existing conditions with the proposed dam or 5,070 cfs without the dam. An existing study by the U.S. Army Corps of Engineers has shown that the capacity of the North Diversion Channel is less than the standard project storm event and close to the 100-year storm event due to increased discharges to the channel as a result of more urbanization than originally anticipated, concrete channel lining (less peak discharge attenuation or reduction) of many arroyos which outfall to the North Diversion Channel, and revised hydrology based on better data. The increased Domingo Baca Arroyo flows are one component of this overall impact on the North Diversion Channel.

TABLE 6-1

SOUTH DOMINGO BACA ARROYO EXISTING BRIDGE / BOX CULVERT SUMMARY ASSUMING UNIFORM FLOW

LOCATION	BRIDGE (B) OR CONCRETE BOX CULVERTS (CBC)	CAPACITY at low chord or soffit (cfs)	CAPACITY (subtracting required channel freeboard) (cfs) (c)	100-YR - HYDROLOGIC RESULTS EXISTING CONDITION (cfs)	FUTURE CONDITION OPTION H6-1 (cfs) (d)	FUTURE CONDITION OPTION G2/J (cfs) (d)	COMMENT
Ventura	B	5110	1780	1150	2430	2430	May require future improvement to sustain freeboard
Barstow	B	10830	4970	1510	2860	2860	
Wyoming	B	3800	1700	2100	3460	3460	Inadequate relative freeboard, may require future improvement
Louisiana	B	11910	4870	2360	3790	3790	
San Pedro	B	(a)	(a)	2680	4280	4280(b)	
I-25	CBC (4 @ 8'H x 10'W)	10850	6950	2840	8150	5450	Inadequate with Option H6-1 relative to freeboard (e)
Paseo del Norte	CBC (4 @ 8'H x 10'W)	10450	6120	3340	8690	5980	Inadequate with Option H6-1 relative to freeboard (e)
Jefferson	CBC (4 @ 8'H x 10'W)	10450	6120	4360	9760	7080	Inadequate with Option H6-1 relative to freeboard (e)

(a) Currently in design.
(b) At San Pedro, without Paseo del Norte Diversion.
(c) Computed assuming uniform flow and subtracting required freeboard; each bridge will require additional analysis as necessary
(d) Options described in Section 6.
(e) Assumed inadequate because channel freeboard is violated; futher analysis is required.

NOTE: Freeboard equation applied is from the City of Albuquerque Development Process Manual for supercritical flow in trapezodial channels.

TABLE

SUMMARY OF I-25, PASEO DEL NORTE AND CORONADO MOBILE HOME PARK CULVERTS
ASSUMING CULVERT FLOW

STRUCTURE NUMBER	QUANTITY AND DESCRIPTION	MAXIMUM FLOW DEPTH NO SEDIMENT (ft)	EXISTING AVAILABLE FLOW DEPTH INLET (ft)	EXISTING AVAILABLE FLOW DEPTH OUTLET (ft)	EXISTING MAXIMUM CAPACITY Assuming Culvert Flow (cfs) (a)	CAPACITY AT LOW CHORD OR SOFFIT Assuming Uniform Flow (cfs)	100-YR HYDROLOGIC RESULTS EXISTING CONDITION (cfs)	100-YR HYDROLOGIC RESULTS FUTURE CONDITION OPTION H6-1 (cfs) (b)	100-YR HYDROLOGIC RESULTS FUTURE CONDITION OPTION G2/J (cfs) (c)
1	8 - CMP'S 4'	4.00	4.00	4.00	600		630	650	420
2	4 - CBC'S 4'H X 9'W	4.00	4.00	4.00	1250		390	90	360
3	1 - CMP 5.67'H X 8.5'W	5.67	5.67	5.50	360		630	680	(e)
4	2 - CMP'S 5.67'H X 8'W	5.67	5.67	5.67	500		390	90	780(f)
5	1 - CMP 5.5'H X 8'W	5.50	5.00	1.70	200		630	670	(e)
6	2 - CMP'S 5.5'H X 8'W	5.50	3.70	3.70	300		390	90	900(f)
7	1 - CMP 5'H X 13'W	5.00	4.70	4.70	450		390	90	900(f)
8	4 - CBC'S 8'H X 10'W	8.00	5.97	6.50	3500	10450	3340	8690	5980
9	4 - CBC'S 8'H X 10'W	8.00	7.57	8.00	3600		2840	8150	5440
10	4 - CBC'S 8'H X 10'W	8.00	6.29	8.00*	3500	10850	2840	8150	5450
11	4 - CMP'S 4'	4.00	4.00	4.00	450		240	330	330
12	2 - CMP'S 4'	4.00	4.00	4.00	120		310	400	400
13	1 - CMP 4'	4.00	4.00	4.00	140		NC	NC	NC
14	2 - RCP'S 5'	5.00	5.00	5.00	350		490	620	620
15	2 - CMP/RCP' 5'	5.00	5.00	5.00	300		160	170	170
16	2 - RCP'S 5'	5.00	5.00	5.00	300		490	620	620
17	4- CBC's 8'H X 10'W	8.00	4.00	5.50	3500	10450	4360	9760	7080

NC Not Computed.
(a) Computed based on culvert hydraulics - assuming open culvert.
(b) Diversions from North Domingo Baca Basin at Ventura, Wyoming and San Pedro to Paseo del Norte Channel, outfall to South Domingo Baca Arroyo west of San Pedro.
(c) Based on Option G2/J - Paseo del Norte Diversion to South Domingo Baca Arroyo west of San Pedro and a detention dam near Louisiana on the North Domingo Baca Arroyo.
(e) Recommend that these culverts be abandoned in future. Divert runoff from outfall of structure 1 to outfall of structure 2 in a concrete channel (recommended).
(f) Culverts must be replaced.
* Not surveyed.

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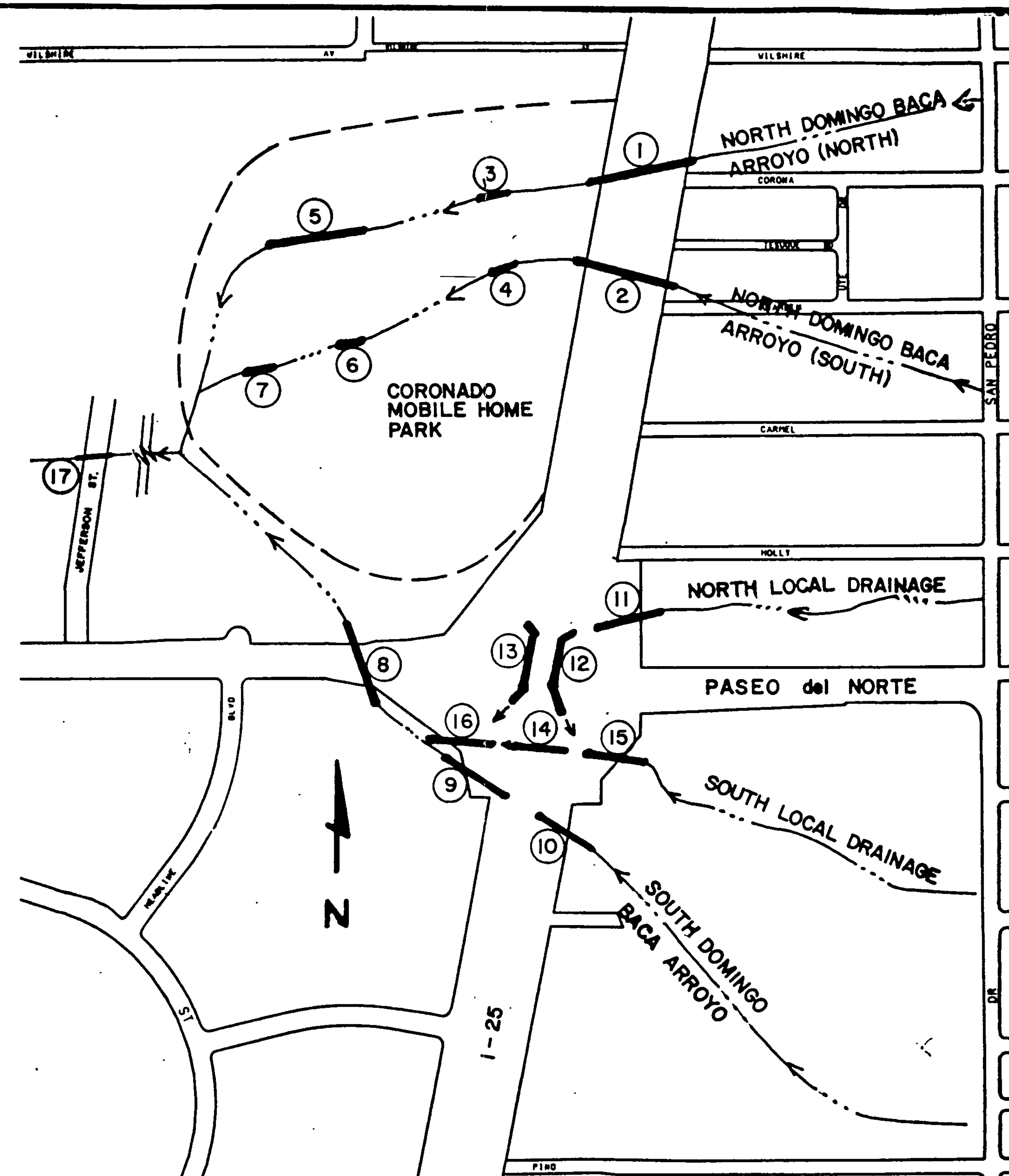

SUMMARY OF I-25, PASEO DEL NORTE AND CORONADO MOBILE HOME PARK CULVERTS

FIGURE 6 -1


DOMINGO BACA ARROYO
NORTH BRANCH
NORTH DOMINGO BACA ARROYO
SOUTH BRANCH NORTH DOMINGO BACA ARROYO
NORTH DOMINGO BACA
ARROYO TRIBUTARY
SOUTH
DOMINGO BACA ARROYO
LA CUEVA
TRIBUTARY ARROYO
LA CUEVA
HIGH
SCHOOL
NORTH
DOMINGO BACA
DAM
SOUTH
DOMINGO BACA
DAM
NORTH DOMINGO BACA
ARROYO WATERSHED
SOUTH DOMINGO BACA
ARROYO WATERSHED
MODESTO AVE
EAGLE ROCK AVE
OAKLAND AVE
A. AVEDA BLVD
SIGNAL AVE
WILSHIRE AVE
CORONA AVE
ANAHEIM AVE
CARMEL AVE
PALOMAS AVE
SAN BERNARDINO DR
RANCHITOS RD
PINO AVE
SAN FRANCISCO DR
CORONADO AVE
SAN RAFAEL AVE
WASHINGTON ST
SAN MATEO BLVD
SAN PEDRO DR
LOUISIANA BLVD
WYOMING BLVD
BARSTOW ST
VENTURA ST
HOLBROOK ST
EUBANK BLVD
BROWNING ST
LOWELL ST
TENNYSON ST
LEGEND
ARROYO NAME DESIGNATION
CORRESPONDING TO HEC-2 MODELS
A1 NORTH BRANCH NORTH DOMINGO BACA ARROYO
A2 DOMINGO BACA ARROYO
B SOUTH BRANCH NORTH DOMINGO BACA ARROYO
C NORTH DOMINGO BACA ARROYO TRIBUTARY
D SOUTH BRANCH NORTH DOMINGO BACA ARROYO
E SOUTH DOMINGO BACA ARROYO
MASTER DRAINAGE PLAN
NORTH AND SOUTH
DOMINGO BACA ARROYOS
EXISTING ARROYOS
MODELED WITH HEC-2
ALBUQUERQUE METROPOLITAN ARROYO
FLOOD CONTROL AUTHORITY
Resource Technology, Inc.
1991
FIGURE
6-2

8.0 RECOMMENDED DRAINAGE IMPROVEMENTS

8.1 RECOMMENDED OPTION

Option H6-1 is the most expensive and creates major problems west of I-25. Options E/J and G2/J are similar in cost, however Option E/J has several problems as previously discussed. Therefore Option G2/J is the recommended drainage option for the Paseo del Norte Corridor and the North and South Domingo Baca Arroyos.

Please refer to Figure 5-6 for the locations of the recommended drainage improvements described in the following sub-sections.

Paseo Del Norte Corridor

The recommended improvements for the Paseo del Norte include:

1. A 5-ft. diameter RCP storm sewer in Paseo del Norte and Lowell St. to divert runoff into South Domingo Baca reservoir.

2. 3.5-ft. to 4-ft. diameter RCP storm sewers in Paseo del Norte and north into the existing North Domingo Baca reservoir.

3. 3.5-ft. to 7-ft. diameter RCP storm sewers in Paseo del Norte from Eubank to San Pedro Blvds.

4. 8-ft. X 10-ft. concrete box culvert from the intersection of San Pedro Blvd. and Paseo del Norte to confluence with the South Domingo Baca Arroyo west of San Pedro Blvd.

North Domingo Baca Arroyo

The existing North Domingo Baca Arroyo Dam has adequate capacity under existing development conditions. However, under future development conditions including the proposed La Cueva Tributary Diversion, the storage volume must be increased as per the "ultimate storage" proposed by Wilson and Company (1980). The emergency spillway should also be expanded for the ultimate design condition.

Although not a part of this study area, the main and tributary arroyos between the existing North Domingo Baca Dam and Tramway Blvd. may remain in their existing state. However, if development in this area increases even at the 1 Du/ac density, bridges and grade control structures may be required. In addition, a Prudent Line analysis may also be advisable to help in guiding proper development of existing lots.

A Prudent Line analysis is recommended as an interim solution between the North Domingo Baca Dam and Ventura St. The long term solution for this reach, if the projected development density should occur, is a storm sewer in Carmel Ave.

Under the current density (1 Du/ac) no public improvements (other than possibly defining the Prudent Line) are proposed or recommended and no funds can be committed at this time. Neither can any time schedule be developed to set up a bond program because of the uncertainty of higher density development ever occurring. If the higher density development occurs when public agencies are not prepared to fund the improvements, private interests may have to provide the financing in order to proceed with the intended development density. However, for purposes of this report the costs are allocated to public agencies.

It is important to note that full development at the existing density of 1 Du/ac could still cause cumulative drainage impacts on the arroyo. Each individual development alone has a minor impact but a whole series of these developments will result in longer duration and higher magnitude flows in the arroyo. These impacts can be mitigated by either protecting all structures from erosion and flooding or building detention ponds on a lot by lot or block by block basis or for each new development.

The following specific improvements are recommended.

1. A 3.5-ft. to 4-ft. diameter RCP storm sewer in Paseo del Norte to the existing North Domingo Baca reservoir. - Public cost.

2. A 4.5-ft. diameter RCP storm sewer in Carmel Ave. between Eubank Blvd. and Holbrook St.; or, a Prudent Line setback until the development density is high enough. - Public or Private cost.

3. 3.5-ft. to 6.5 ft. diameter RCP storm sewers in Holbrook St. to divert flows to the Carmel Ave. storm sewer; or, street flow only until the development density is high enough. - Private cost.

4. A 5.5-ft. diameter RCP storm sewer in Carmel Ave. between Holbrook and Ventura Streets; or, a Prudent Line setback until the development density is high enough. - Public or Private cost.

5. 4.0-ft. to 5.5-ft. diameter RCP storm sewer in Ventura St. to divert flows to the Carmel Ave. storm sewer; or, street flow only until the development density is high enough. - Private cost.

6. A 10-ft. bottom width 2H:1V side slopes soil cement (partial or full lining) or concrete channel along Carmel and Anaheim Avenues from Ventura St. to new reservoir at Louisiana Blvd. - Private cost.

7. 3.0-ft. to 4.5-ft. diameter RCP storm sewer in Barstow St. to divert flows to the Carmel/Anaheim Channel. - Private cost.

8. 6.0-ft. to 8-ft. diameter RCP storm sewer in Wyoming Blvd. to divert flows to the Carmel/Anaheim Channel. - Private cost.

9. A 10-ft. bottom width 2H:1V side slopes earthen/rip rap channel to divert flow from Holly Ave. to the new reservoir at Louisiana Blvd. - Public cost.

10. A new dam and reservoir at Louisiana Blvd. with a 200 ac.ft. volume. - Public cost.

11. 3.5-ft. to 4-ft. diameter RCP storm sewer in Anaheim Ave. from Louisiana Blvd. to I-25 for the dam outflows and local drainage below the dam. - Public cost.

12. 3.5-ft. to 4-ft. diameter RCP storm sewer in Corona Ave. from just east of San Pedro Blvd. to the I-25 culverts for the North Branch of the North Domingo Baca Arroyo. - Private cost.

13. A 10-ft. bottom width 2H:1V side slopes concrete channel to convey all runoff from I-25 across Coronado Mobile Home Park to the South Domingo Baca Arroyo. - Private cost.

Because of the existing severe culvert capacity problems, this plan recommends the following for the North Domingo Baca Arroyo at I-25 and the Coronado Mobile Home Park culverts. With reference to Figure 6-1 the outfall of the North Branch of the North Baca at I-25 (Structure 1) should be diverted to the outfall of the South Branch of the North Domingo Baca Arroyo at I-25 (Structure 2) in a concrete diversion channel. Therefore, Structures 3 and 5 within Coronado Mobile Home Park may be abandoned. Structures 4, 6 and 7 must be improved to accommodate the combined flows.

South Domingo Baca Arroyo

The existing South Domingo Baca Dam has adequate capacity for existing and future conditions. The arroyo upstream from the dam to Tramway Blvd. is well defined and somewhat incised and under AMAFCA's ownership. Furthermore, development density is expected to remain light in this area. Therefore, no improvements are recommended in this reach. However, if development density increases in this area, a Prudent Line analysis may be appropriate.

Between the South Domingo Baca Dam and Eubank, a Prudent Line analysis is recommended as an interim solution and a storm sewer as the long term solution if the development density should occur. Again, as described for the North Domingo Baca Arroyo, the cost distribution between public and private interest for the storm sewer will be dependent upon the timing of development, and the fiscal ability of the public agency at that time. Figure 5-6 illustrates the recommended storm sewers and channel improvements from the South Domingo Baca Dam to the North Diversion Channel.

The recommended improvements include:

1. A 4.5-ft. diameter RCP storm sewer in Lowell St. From San Francisco Ave. to the South Domingo Baca Reservoir. - Private cost.

2. A 5-ft. diameter RCP storm sewer in Paseo del Norte and Lowell St. to the South Domingo Baca Reservoir. - Public cost.

3. 4-ft. to 5-ft. diameter RCP storm sewer in Palomas Ave. and Eubank Blvd. - Public (or Private) cost.

4. A 5.5-ft. diameter RCP storm sewer in Ranchitos Rd. from just east of Browning St. to Eubank Blvd. - Private cost.

5. 4-ft. to 6.5-ft. diameter RCP storm sewer in Coronado Ave. between Lowell St. and Browning St., in San Francisco Rd. between Browning St. and Eubank Blvd., and in Eubank Blvd. - Private cost.

6. A 10-ft. bottom width 2H:1V side slopes concrete channel between Eubank Blvd. and Holbrook St. connecting to the existing channel at Holbrook St. - Private cost.

7. A 10-ft. bottom width 2H:IV side slopes concrete channel (under design/construction) from Wyoming Blvd. to I-25. - Public cost.

8. A 44-ft. bottom width rectangular concrete channel between I-25, west Frontage Road, and Paseo del Norte , box culverts. - Public cost.

9. A 20-ft. bottom width 2H:1V side slopes concrete channel from Paseo del Norte to Washington St. - Public cost.

10. Four 8 ft X 10 ft concrete box culverts at Washington St. - Public cost.

11. Soil cement lining of a portion of the reach from Washington St. to the inlet to the North Diversion Channel. - Public cost.

As described in the next sub-section improvements will be required at the Wyoming Blvd. bridge to increase capacity and additional lining may be required in the Holbrook St. to Wyoming Blvd. section that is currently lined. Lining of the Wyoming Blvd. to I-25 reach, currently under design/construction is also assumed.

8.2 OTHER RECOMMENDED IMPROVEMENTS

La Cueva/Signal Ave. Training Dike

As discussed previously, the La Cueva/Signal Ave. Training Dike located between Ventura St. and Barstow St. was overtopped by flood flows from La Cueva Arroyo from a thunderstorm in July 1991. Therefore, the elevation of this dike should be increased.

Pino Street and I-25 Berm

During field verification of the outer drainage basin boundaries, the boundary between the North Pino basin and the South Domingo Baca basin located at Pino Avenue and I-25 was found to be at a high point in the roadside ditch invert. Therefore to force the flows from Pino Avenue to stay within the North Pino Basin, a berm in the road side swale is recommended approximately 20 feet north of the Pino Avenue and I-25 intersection.

Coronado Mobile Home Park

The recommended improvements through Coronado Mobile Home Park include combining the North and South Branches of the North Domingo Baca Arroyo at their outfalls from I-25. This diversion will eliminate the need for the northern channel through the mobile home park.

In addition, the South Branch of North Domingo Baca Arroyo through the mobile home park should be concrete lined and the existing culverts replaced, as described in Sub-section 8.1 above.

South Domingo Baca Arroyo Bridges

The existing bridge at Wyoming Blvd. is severely undersized, and should either be improved or replaced. The Louisiana and San Pedro bridges are currently in design. A crossing structure is proposed at Washington in the Long Range Major Street Plan and is recommended here as 4 - 8 ft. tall X 10 ft. wide box culverts.

South Domingo Baca Arroyo Channel

The existing South Domingo Baca Arroyo concrete channel has limited capacity at several locations between Holbrook St. and Wyoming Blvd. The freeboard and superelevation requirements are violated for future development condition flows and in some locations the channel may be overtopped. A more detailed analysis should be completed to ascertain the exact locations and possible solutions for the inadequate sections.

Other proposed improvements specifically between I-25 and the North Diversion Channel are shown on Figure 5-6.

I-25 Interchange

Several of the culverts within the I-25 interchange are inadequate and flooding of the interchange may occur. However, the extent of flooding was not analyzed in this plan. Two short segments of the South Domingo Baca Arroyo are unlined between the existing box culverts. Due to the magnitude of flows and culvert entrance hydraulics, these short segments should be concrete lined to join the three sets of box culverts, as described in Sub-section 8.1 above.