HYDROLOGY L8/D2 1 PLAN

L8/D2

1 Plan

Pending

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

May 15, 1979

L8-D2

Mr. Neal Godwin
Godwin Engineering Corp.
3820 Academy Parkway North N.E.
Albuquerque, New Mexico 87109

Re: Plaza Monte Vista Mobile Home Park

Dear Mr. Godwin:

I have reviewed the drainage report and of the site plan for the referenced project and I am in agreement with the proposal submitted. As verbally indicated, a drainage easement needs to be dedicated to allow the owners to the west to collect their runoff and discharge through the property. I also recommend that a rundown be provided to convey the surface flow to the ponding area. Safety provisions will have to be provided around the pond and a protected small diameter pipe should be installed to allow the drainage of the ponding area in a 24 hour time period.

Very truly yours,

Richard S. Heller

Richard S. Heller
City Engineer

RSH/fs

cc - Bruno Conegliano
Rich Leonard
Drainage File
Reading file

DRAINAGE REPORT

FOR

PLAZA MONTE VISTA MOBILE HOME PARK
ALBUQUERQUE, NEW MEXICO

RECEIVED
MAY 07 1979
CITY ENGINEERS

PREPARED BY:

Godwin Engineering Corporation
5/1/79 2202

REGISTERED PROFESSIONAL ENGINEER
STATE OF NEW MEXICO
3820
NEAL F. GODWIN

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STATE OF NEW MEXICO
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DRAINAGE REPORT FOR PLAZA MONTE VISTA MOBILE HOME PARK, ALBUQUERQUE, NEW MEXICO

INTRODUCTION

Plaza Monte Vista is a mobile home park approved by the City of Albuquerque Planning Commission on April 19, 1979, Case Number Z-79-30. The Park is located immediately west of 102nd Street, between Central Avenue S.W. and Sunset Gardens Road, S.W. The park contains 8.8720 acres (See exhibit "A" attached).

The mobile home park will contain 90 single-wide rental spaces, 2 overnight rental spaces, an owner's space, and a park/ponding area. Access is to be from 102nd Street, with all internal streets privately owned (See exhibit "B" attached).

PURPOSE AND SCOPE

The purpose of the report is to set forth the computations and factors related to the proposed plan for drainage management. The plan will incorporate on-site retention of excess drainage generated by development of the project in accordance with AMAFCA Resolution 1972-2. This plan has been prepared in accordance with the guidelines set forth in "Standard Requirements for Drainage Plans" as promulgated by the Office of the Assistant City Engineer, Hydrology, of the City of Albuquerque, New Mexico.

DRAINAGE MANAGEMENT PLAN

Since the improvements to be placed in the project will increase the drainage run-off over that which occurs naturally from the site, some on-site retention is mandatory in order to comply with AMAFCA Resolution 1972-2. The volume of drainage retention so required is calculated as follows:

92 Typical Mobile Home Spaces

Gross Area = 2937.7 sq ft

Area at C = 0.90 = 1,988.8 sq ft

Area at C = 0.40 = 948.9 sq ft

Composite C = 0.74

Using 2.4 inches as total rainfall, the pond volume required = (0.74-0.4) 2937.7 (0.2) 92 = 18,378 cubic ft

Paved Streets

Total area = 87,142 sq ft

Pond volume required = (0.9-0.4) 87,142 (0.2) = 8,714 cubic ft

Owner's Residence

Composte C = 0.75

Total Area = 12,560 sq ft

Pond volume required = (0.75-0.4) 12,560 (0.2) =879 cubic ft

TOTAL ON-SITE RETENTION REQUIRED = 27,971 CUBIC FEET

POND VOLUME PROVIDED = 28,000 CUBIC FEET

(See exhibit "B" for routing of drainage within project)

The retention pond is to be 2.00 feet in depth. Side slopes are to be 3:1. The top area of the pond is 15,800 sq ft, its bottom area is 12,200 sq ft, providing a volume of 28,000 cubic ft.

The top of pond elevation is designed at 5229.5. A berm is required along the east property line adjacent to 102nd Street. Its maximum height is 3.0 ft. The elevation of the top of the berm is 5230.0.

A 4 inch lo-flow drainpipe has been provided for positive final drainage of the pond. Under an average head of 1 ft, the pipe will discharge slightly less than 0.5 cubic ft per second, so that a full pond would be drained through such pipe in approximately 24 hours. Sizing of the ponds over spill structure requires a study of the contributing areas to determine the rate of in-flow occuring at the time when the pond reaches its capacity.

The contributing area to the pond is made up of two parts:

1. An off-site area upstream from the park.
2. The mobile home park itself (See exhibit "C" attached).

<u>OFF-SITE AREAS</u>

A = 10.2 acres

L = 850 feet

H = 30 feet

s = 3.5%

Tc = 21 minutes (See exhibit "D)

C = 0.42

Off-site routing throubh mobile home park:

L - 355 feet

H - 8 feet

s - 2.3%

Tc - 6.0 minutes

Total Tc for off-site area - 6.0 + 21 - 27.0 minutes

I = 3.1 inches per hour (See exhibit "E)

MOBILE HOME PARK

A = 8.87 acres

L = 900 feet

H = 8 feet

s = 1.1%

Tc = 27 minutes (See exhibit "D")

I = 3.1 inches per hour (See exhibit "E")

Composite C for combined areas

Composite C for off-site area and mobile home park combined:

$$C = \frac{0.76\ (8.87 + 0.42\ (10.2)}{8.87 + 10.2} = 0.58$$

Using the rational formula to compute the peak in-flow rate to the pond:

Q = ACI = (8.87 + 10.2) 0.58 (3.1) = 34.3 cubic feet/second

Therefore in the time interval of Tc = 27 minutes the volume of water contributed to the pond equals ((½ (34.3) 27 (60))) - ((0.5 (27) 60)) = 27,378 cubic feet.

Therefore, the pond will be almost full at TC = 27 minutes and the overspill structure should be sized to release the peak in-flow of 34.3 cubic feet/second.

It is desireable to reduce the depth of the spilling water as much as possible and thereby reduce its flowing velocity to a minimum so as to minimize its erosion potential.

Thus, a sharp crested rectangular weir two feet in height is proposed. The crest would be supressed into the top of the berm at elevation 5229.5, which is the designed high water level of the pond. Wing walls would be provided

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The unusually high discharge capacity necessary in the pond over spill structure is caused by the fact that the off-site area must be routed through the pond. This circumstance is corroborated as follows:

Natural discharge at over spill point:

A = 8.69 acres

C = 0.42

L = 1,210 feet

H = 40 feet

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Q = 8.69 (0.42) 3.5 = 12.8 cubic ft/second

However, some 600 feet downstream from the pond discharge point within the same arroyo, approximately 95% of the natural site and off-site discharge is brought together. This flow amounts to:

A = 22.3 acres

C = 0.42

L = 1,810 feet

H = 59 feet

s = 3.3%

Tc = 30 minutes

I = 2.8 inches/hr

Q = 22.3 (0.42) 2.8 = 26.2 cubic ft/second

In comparison, by taking the off-site area and the mobile home park individually routed entirely through the pond results in the following:

Off-site Contribution

A = 10.2 acres

C = 0.42

L = 850 feet

H = 30 feet

s = 3.5%

Tc = 21 minutes

I = 3.7 inches/hour

Q = 10.2 (0.42) 3.7 = 15.9 cubic feet/second

Mobile Home Park Contribution

A = 8.87 acres

C = 0.40

L = 900 feet

H = 8 feet

s = 1.1%

Tc = 27 minutes

i = 3.1 inches/hour

Q = 8.87 (0.40) 3.1 - 11.0 cubic feet/second

Therefore the total flow resulting from changing only the routing is Q = 15.9 + 11.0 = 26.9 cubic feet/second which corresponds closely to the computations of the natural flow (with natural routing) at a point 600 feet downstream from the pond.

The effect that routing the off-site area through the pond has on the function of the pond is that within the time period Tc= 27 minutes the flow of

15.9 cubic feet/second which arises off-site will produce 12,000 cubic feet, or almost one-half the total volume of the pond.

The developed park, with paved streets (considered by itself) has a Tc = 10.3 minutes, resulting in I = 4.75 inches/hour. Hence, the peak discharge arising from the developed park itself is Q = 8.87(0.74) 4.75 = 31.2 cubic feet/second.

The large volume of the pond, coupled with the relatively short Tc(for the developed park by itself) would result in a substantial peak shaving effect on the out-flow Q from the park so that the discharge Q from the pond would be no greater or less than that which occurs naturally.

DOWNSTREAM ROUTING

Once the discharge leaves the pond, it flows eastward within a broad bottomed arroyo. A short distance before it reaches the west side of 98th Street, it fans out over a width of 100 to 200 feet. At 98th Street the natural flow is interrupted and is diverted southward along the west side of 98th Street. It is carried in a bar ditch, part of which is graded for a distance of approximately 2300 feet where it enters a substantial arroyo which crosses under 98th Street at that point.

There are at least seven 24 inch concrete pipes under 98th Street, some of which are silted and covered up on the upstream end. There is evidence of substantial flow and some erosion in this arroyo in the vicinity of 98th Street. There is also some evidence that the arroyo has spilled over 98th Street on recent occasions.

It is understood that the City of Albuquerque plans channelization and structural improvements in this arroyo near 98th Street and downstream to carry the flow from that point through a series of drainage management facilities to its

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GODWIN
ENGINEERING
CORPORATION

Professional Consultants

3820 ACADEMY PARKWAY, NORTH • ALBUQUERQUE, NEW MEXICO 87109 • PHONE (505) 345-8371

DITCH ALONG WEST SIDE OF 98 TH.

WEST SIDE OF 98 TH. AT CULVERT ENTRANCE

ENTRANCE TO CULVERTS UNDER 98 TH.

CULVERT OUTLET-EAST SIDE 98 TH.

natural discharge into the Rio Grande River.

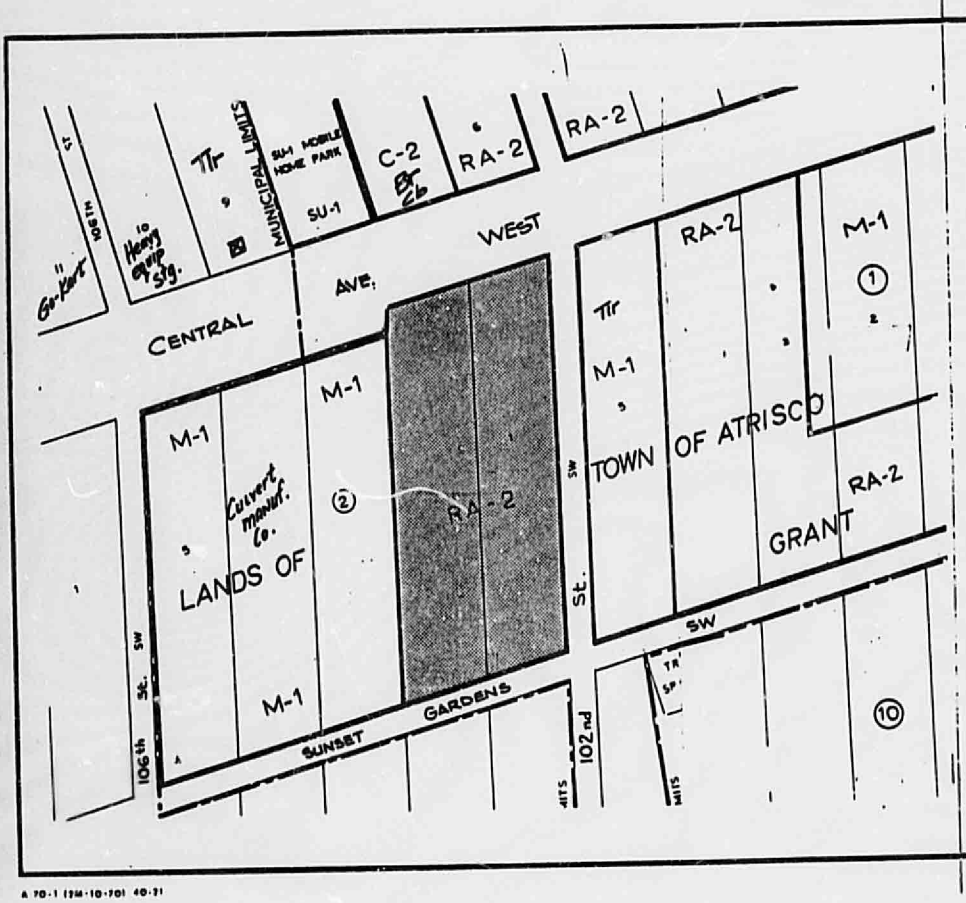
CONCLUSIONS AND RECOMMENDATIONS

As observed in the foregoing discussion, the development of this mobile home park may increase the rate of flow somewhat for a short distance in the natural channel downstream from the park during a storm event of 100 year frequency. However, such increase is caused by the necessity of ponding unregulated flow from the upstream off-site area which prevents the drainage management facilities provided in the mobile home park from functioning to their own best benefit.

At such time as the upland area is developed and has its own drainage management facilities, the early fill up of the pond in this project should be relieved. It is to be noted that this park is proposed for development over a phased 2 - 3 year period, by which time some development in the upland area may be initiated.

It is therefore recommended as follows:

1. That the foregoing analysis and drainage management plan be approved and adopted.
2. That the developed and off-site drainage be routed through the mobile home park and its pond in order to provide some regulation to down stream flow and minimize silt transport as much as possible.
3. That any upstream development be required to have its own ponding and/or drainage management facilities which will effectively alter the coincidence of concentration times of this project with that of the upstream area, thereby reducing the downstream discharge to a level more in agreement with that which occurs naturally.



A 70-1 (2M-10-70) 40-21

EXHIBIT "A"

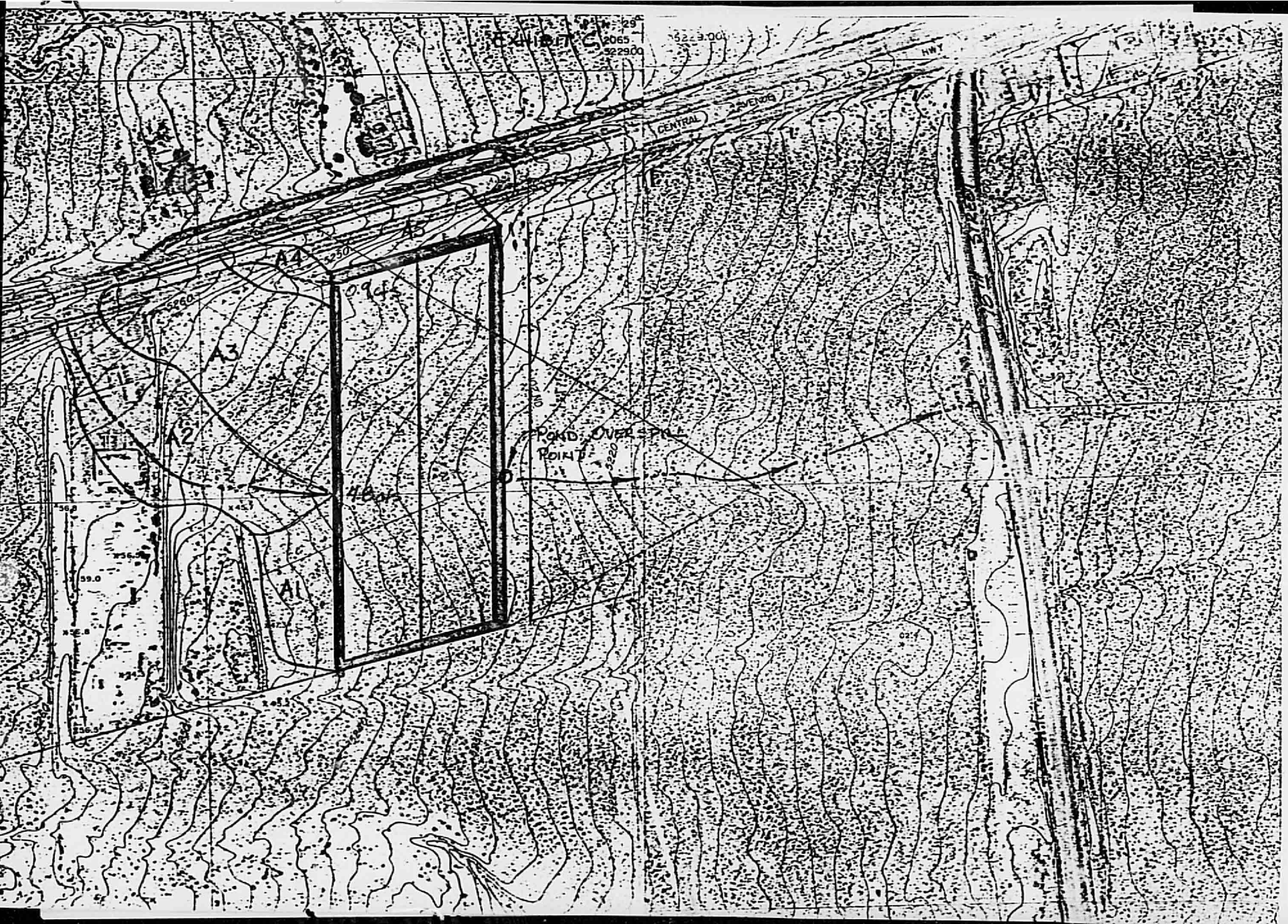


EXHIBIT C
CENTRAL
AVENUE
HWY
A1
A2
A3
A4
A5
0.9cfs
4.6cfs
POND OVER-FLOW POINT
5250
5260
5220

EXHIBIT "D"

DRAINAGE — RUNOFF — 1

FIG. A. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 2 YEARS.

FIG. B. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 10 YEARS.

FIG. C. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 50 YEARS.

FIG. D. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 5 YEARS.

FIG. E. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 25 YEARS.

FIG. F. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 100 YEARS.

COMPUTATION OF i IN RATIONAL FORMULA.

EXAMPLE: Assume expectancy period = 5 years, see Fig. D, assume locality, find 1 hour intensity = 1.75 in. per hour.

FIG. G-INTENSITY EXPECTATION FOR ONE-HOUR RAINFALL.*

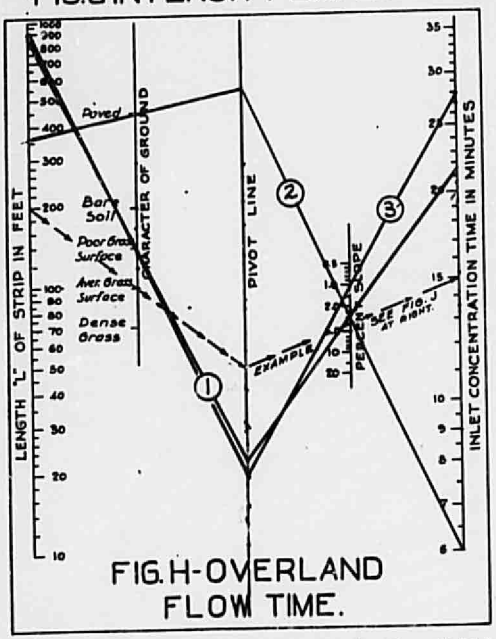


FIG. H-OVERLAND FLOW TIME.

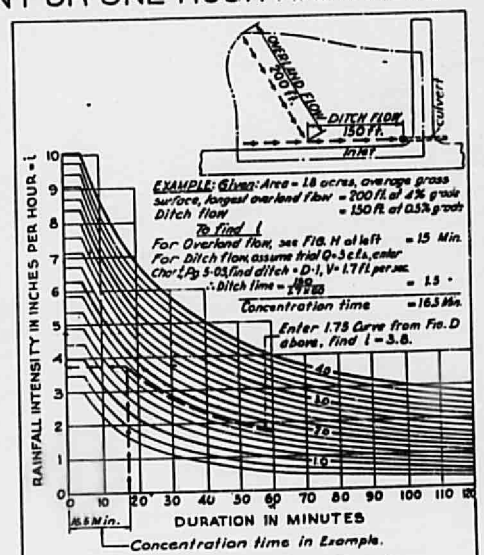
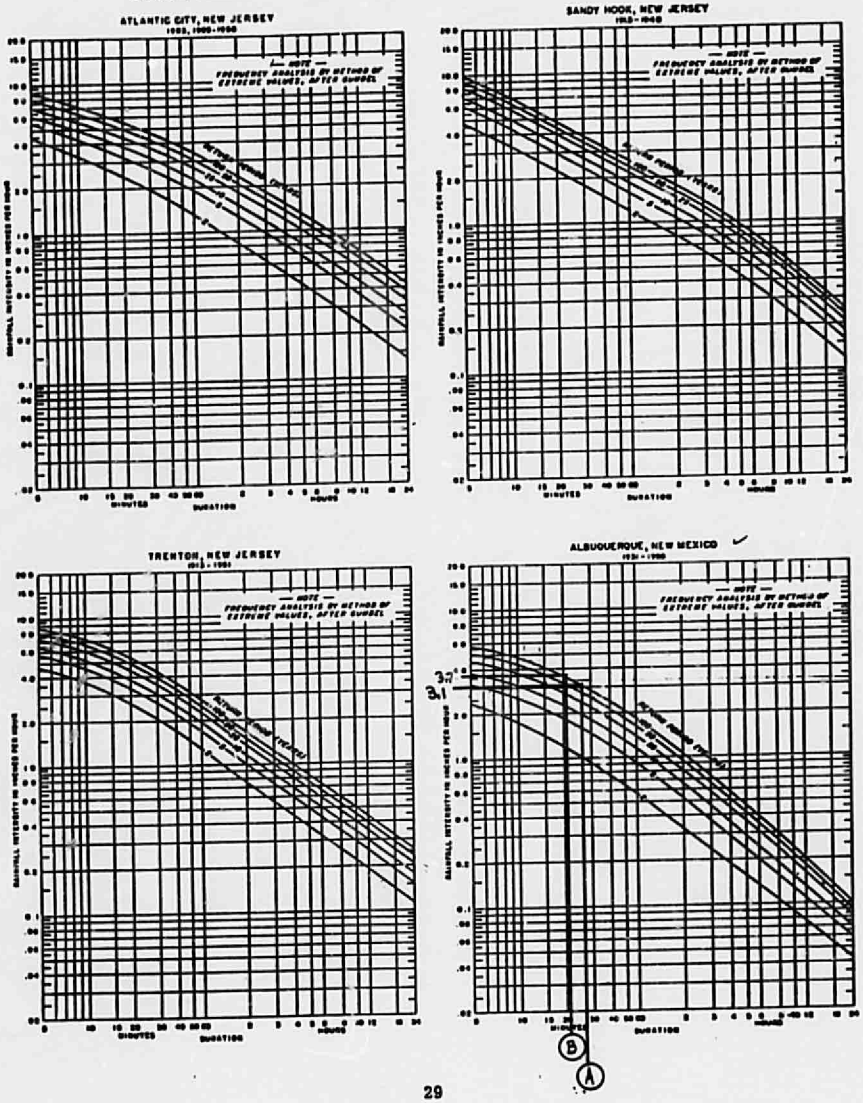


FIG. J-VALUES OF i
RAINFALL INTENSITY-DURATION†

*Reproduced from Miscellaneous Publication No. 204, U.S. Dept. of Agriculture, by David L. Yarnell.
†Adopted from Engineering Manual of the War Department, Pg. [illegible] Chap. I, Dec. '45

EXHIBIT "E"

RAINFALL INTENSITY-DURATION-FREQUENCY CURVES



HYDROLOGY L8/D2 1 PLAN

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REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
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ENTRANCE TO CULVERTS UNDER 98 TH.

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CONCLUSIONS AND RECOMMENDATIONS

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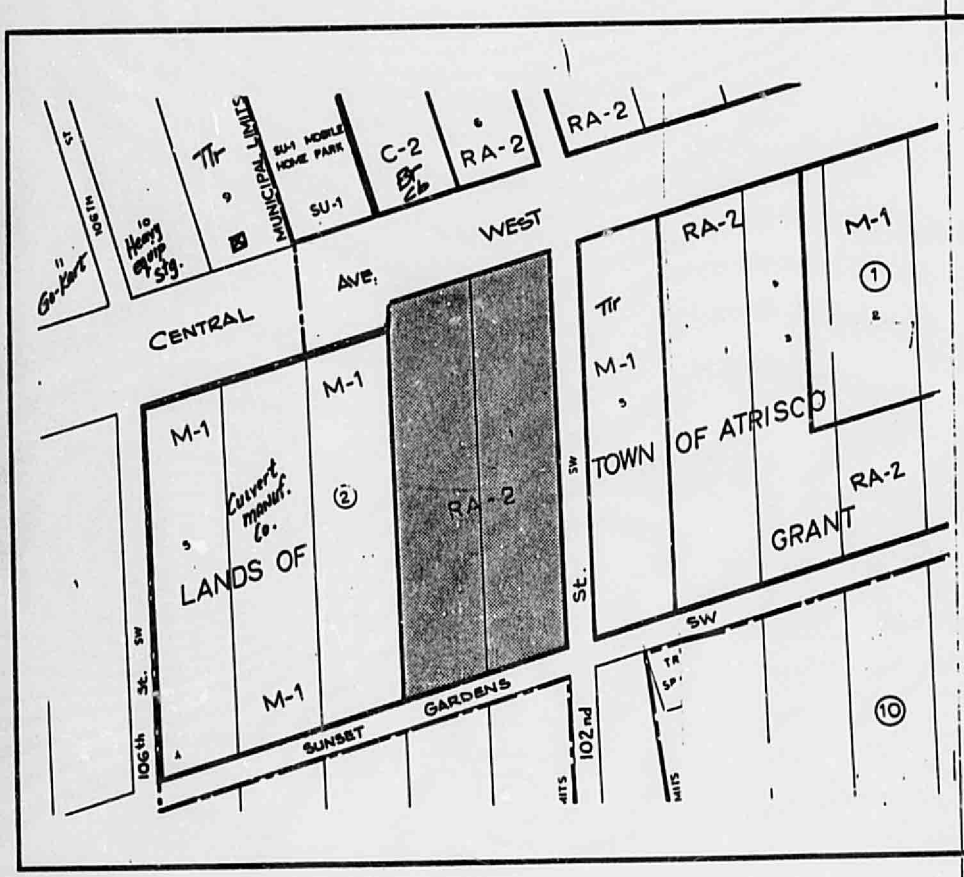


STUDY AREA

Approx. 8.87 Acre

Albuquerque • Bernalillo County
PLANNING DEPARTMENT

	By	Date	Checked	Scale: 1"=100'
Plat:	MT			Air Photo: L-8
Zoning:			"	Source: L-8
Land Use:			"	MRCOD: N/A

Description:

Lots 1 & 2, Block 2, Lands of Town of Atrisco Grant

Zone Change: RA-2 to SU-1 (Mobile Home Park

Applicant or Agent: Mr. & Mrs. Rob Turner

EPC Hearing: 4/19/79

CC BCC Hearing:

File Number: Z-79-30

A 70-1 (2M-10-70) 40-31

EXHIBIT "A"

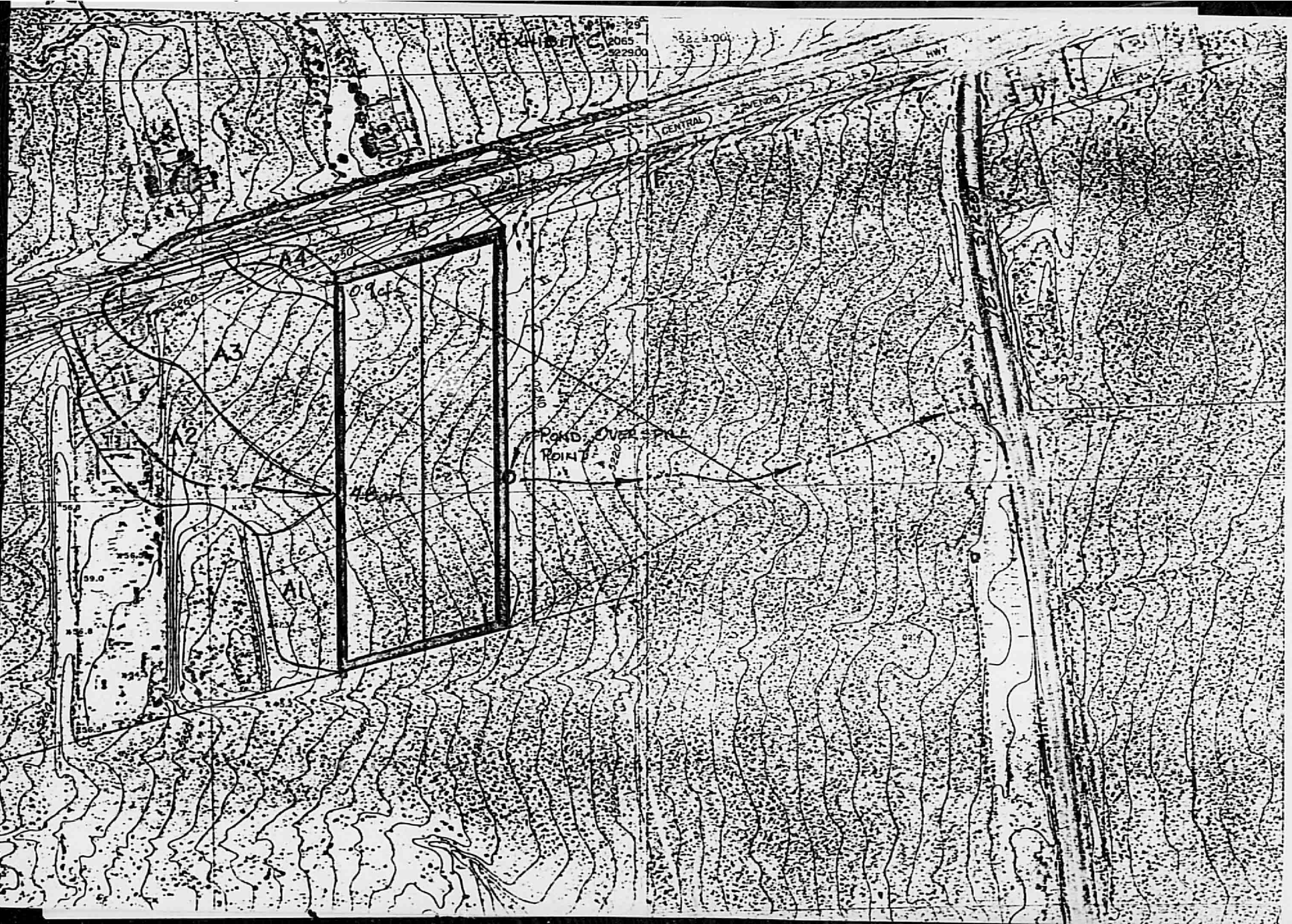


EXHIBIT C
CENTRAL
AVENUE
HWY
A1
A2
A3
A4
A5
0.9cfs
4.6cfs
POND OVERSPILL POINT

EXHIBIT "D"

DRAINAGE — RUNOFF — I

FIG. A. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 2 YEARS.

FIG. B. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 10 YEARS.

FIG. C. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 50 YEARS.

FIG. D. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 5 YEARS.

FIG. E. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 25 YEARS.

FIG. F. - ONE-HOUR RAINFALL, IN INCHES, TO BE EXPECTED ONCE IN 100 YEARS.

COMPUTATION OF i IN RATIONAL FORMULA.

EXAMPLE: Assume expectancy period = 5 years, See Fig. D, assume locality, find 1 hour intensity = 1.75 in. per hour.

FIG. G-INTENSITY EXPECTATION FOR ONE-HOUR RAINFALL.*

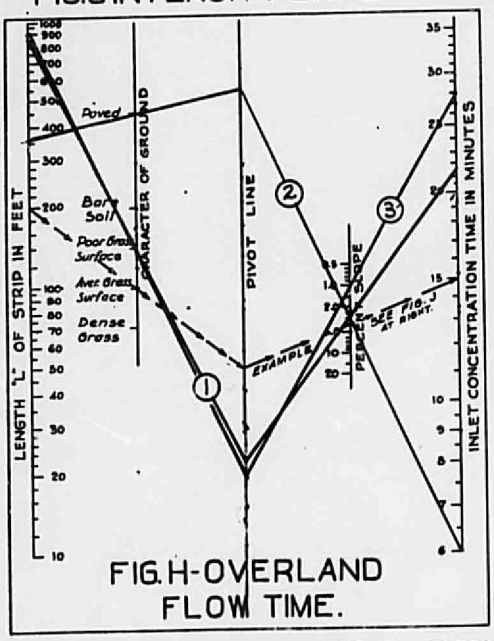


FIG. H-OVERLAND FLOW TIME.

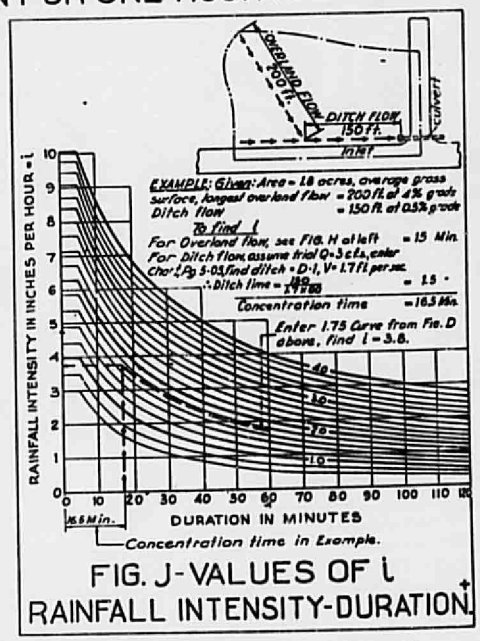
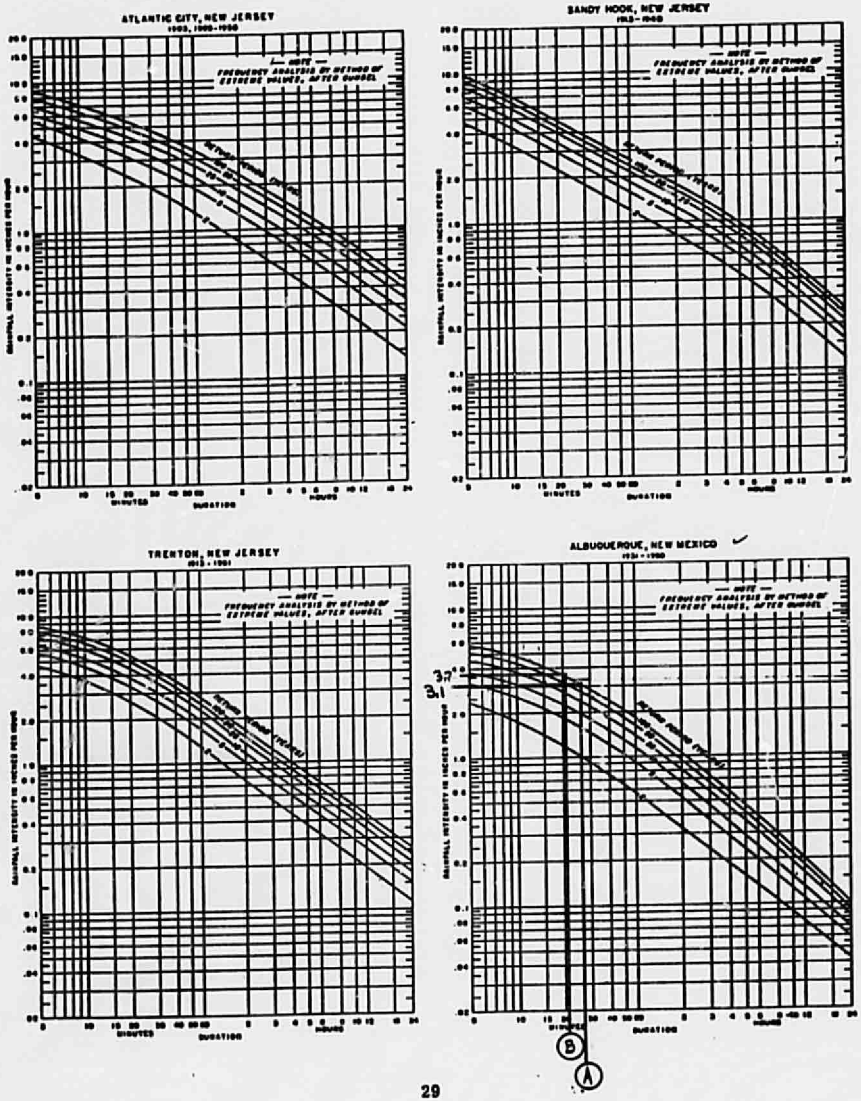


FIG. J-VALUES OF i
RAINFALL INTENSITY-DURATION.+

*Reproduced from Miscellaneous Publication No. 204, U.S. Dept. of Agriculture, by David L. Yarnell.
+Adopted from Engineering Manual of the War Department, Part XIII, Chap. I, Dec. '45.

EXHIBIT "E"

RAINFALL INTENSITY-DURATION-FREQUENCY CURVES