HYDROLOGY K18/D2 1 PLAN

K18/D2

1 Plan

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NO.: K18-D2 DATE: 10/20/86

PLANNING DIVISION NOS: EPC: _____ DRB: _____

SUBJECT: Encino House

STREET ADDRESS (IF KNOWN): _____

SUBDIVISION NAME: _____

APPROVAL REQUESTED:

____	PRELIMINARY PLAT	____	FINAL PLAT
____	SITE DEVELOPMENT PLAN	____	BUILDING PERMIT
X	OTHER Pond Elimination	____	ROUGH GRADING

	WHO	REPRESENTING
ATTENDANCE:	Rex Allender	Encino House
	Fred J. Aguirre	City

FINDINGS:

Per our meeting we have investigated the possibility of eliminating the retention pond within the subject site and are amenable to its elimination with the following conditions:

The submittal of a revised drainage plan by a N.M. Registered Engineer for that portion of the site that affects the pond to be eliminated. This plan should provide existing grades and the proposed grades needed to discharge the storm runoff into ~~the~~ Public R/W. Before your engineer puts pen to paper it is recommended that he contacts this office for a pre-design meeting to identify specific ~~drg~~ drainage plan requirements.

Note: Free discharge is warranted since the public drainage that have been constructed upstream and downstream of this site.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED:	Fred Aguirre	SIGNED:	Rex Allender
TITLE:		TITLE:	Encino House
DATE:	10/20/86	DATE:	10-20-86

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE October 14, 1986 REF. NO._____

TO: Fred Aguirre

FROM: Rick Duran, Drainage Inspector

SUBJECT: ENCINO HOUSE EAST

In response to your request pertaining to the elimination of the retention pond at Encino House East Retirement Center I made a field inspection on October 10, 1986 and hereby offer my recommendation.

I am of the opinion that an updated drainage report for the site be done to address how flows which are currently entering the retention pond will be handled. Also, the increase in volume would warrant an updated study to determine if downstream conditions can handle the additional run-off.

If I can be of any further assistance or can answer any questions, please notify me.

RLD/cl

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

drainage file

July 29, 1977

Mr. Fred Burns
MacCornack & Burns
1721 Girard Blvd., NE
Albuquerque, New Mexico 87106

RE: DRAINAGE STUDY FOR ENCINO HOUSE EAST.

Dear Mr. Burns:

I have reviewed the drainage report as amended by the addendum dated August 25, 1977, regarding the Encino House East, and it is approved.

Very truly yours,

Bruno Conegliano

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/kr

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

drainage file

July 11, 1977

Mr. Fred Burns
MacCornack and Burns
1721 Girard Blvd., NE
Albuquerque, New Mexico 87106

Dear Mr. Burns:

I have reviewed the study for the drainage of the Encino House East, and I find that it does not answer the most relevant question; namely, the amount of water flowing into Valencia Drive from the east then west along Highland Avenue.

The storm which fell on Albuquerque this past Friday, July 8, 1977, was not a 100-year storm but as it is evident from the debris and silt left on the pavement, the water was flowing above the top of the curb both along Valencia Drive and along Highland Avenue.

Due to the considerations above, I need to obtain an estimate of the flow presently coming down Highland Avenue and a proposed method of handling such flow through the development. In addition, grading information in the form of proposed contour configurations must be provided.

Regarding the closed basin, the drainage report does not furnish information on cross sections, dimensions, and elevations.

Very truly yours,

Bruno Conegliano

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/kr

cc - V. M. Kimmick
Drainage File

ADDENDUM TO
STORM DRAINAGE STUDY

Relative to Development of
Lots 8 through 11 and 19 through 24
Blocks 52 and 62
Amended Plat of Tijeras Place Addition
for
ENCINO HOUSE EAST
ELDERLY AND HANDICAPPED HOUSING FACILITIES

July 25, 1977

HIGHLAND AVENUE FLOW

The flow in Valencia Drive results, for the most part, from a ditch that empties across the sidewalk and curb approximately 60 feet East on Valencia from the Highland intersection. Since this flow has essentially a zero velocity component in the direction of Valencia Drive, a backwater surcharge condition takes place until the energy gradient is adequate for flow equilibrium at the point of intersection of the flow paths.

This increased energy gradient allows the majority of the flow entering Valencia to spill into Highland Avenue across a poorly defined control section in the vicinity of the P. I. of the Northwest curb return of the Valencia-Highland intersection due to the greater conveyance of Highland Avenue, even though an adverse slope condition along Valencia is in evidence.

So as not to interfere with present local drainage patterns, the driveway proposed for the development that is to be located in the present Highland Avenue right-of-way should maintain a conveyance equal to or greater than the present roadway.

CONCLUSIONS: As long as the grades on the construction drawings yield the section shown in the accompanying calculations, there should be no

significant change in the drainage patterns relative to the flow in Highland Avenue.

MacCORNACK & BURNS, Consulting Engineers

Fred Burns

Fred Burns, PE

bb

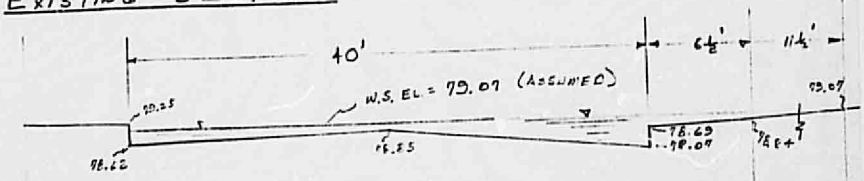
Job ENCINO HOUSE EAST — Sheet No. 1 of 1

Subject HIGHLAND AVE. DRAINAGE — Job No. W05-100-01

Client WENDELL - VARSA — By GARNANO Date 7/25/77

MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

EXISTING SECTION:



$$A = \frac{(.45+.22)}{2}\times 20 + \left(\frac{.22+1.00}{2}\right)20 + \frac{(.38+.23)}{2}\times 6\tfrac{1}{2} + \frac{(.23)}{2}\times 11\tfrac{1}{2}$$

$= 22.205$ SQ. FT.

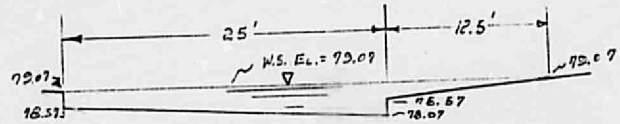
$$W.P. = .45 + (.23^2+20^2)^{1/2} + (.78^2+20^2)^{1/2} + .62 + (.15^2+6\tfrac{1}{2}^2)^{1/2} + (.23^2+11\tfrac{1}{2}^2)^{1/2}$$

$= 59.08056$ FT.

$R = A/W.P. = .37578$

CONVEYANCE $= Z S^{1/2} = A R^{2/3} S^{\frac{1}{2}} = \underline{11.563}\ S^{1/2}$

PROPOSED SECTION:



$$A = \frac{(.5+1.00)}{2}\times 25 + \frac{(.5)}{2}\times 12.5 = 21.875$$

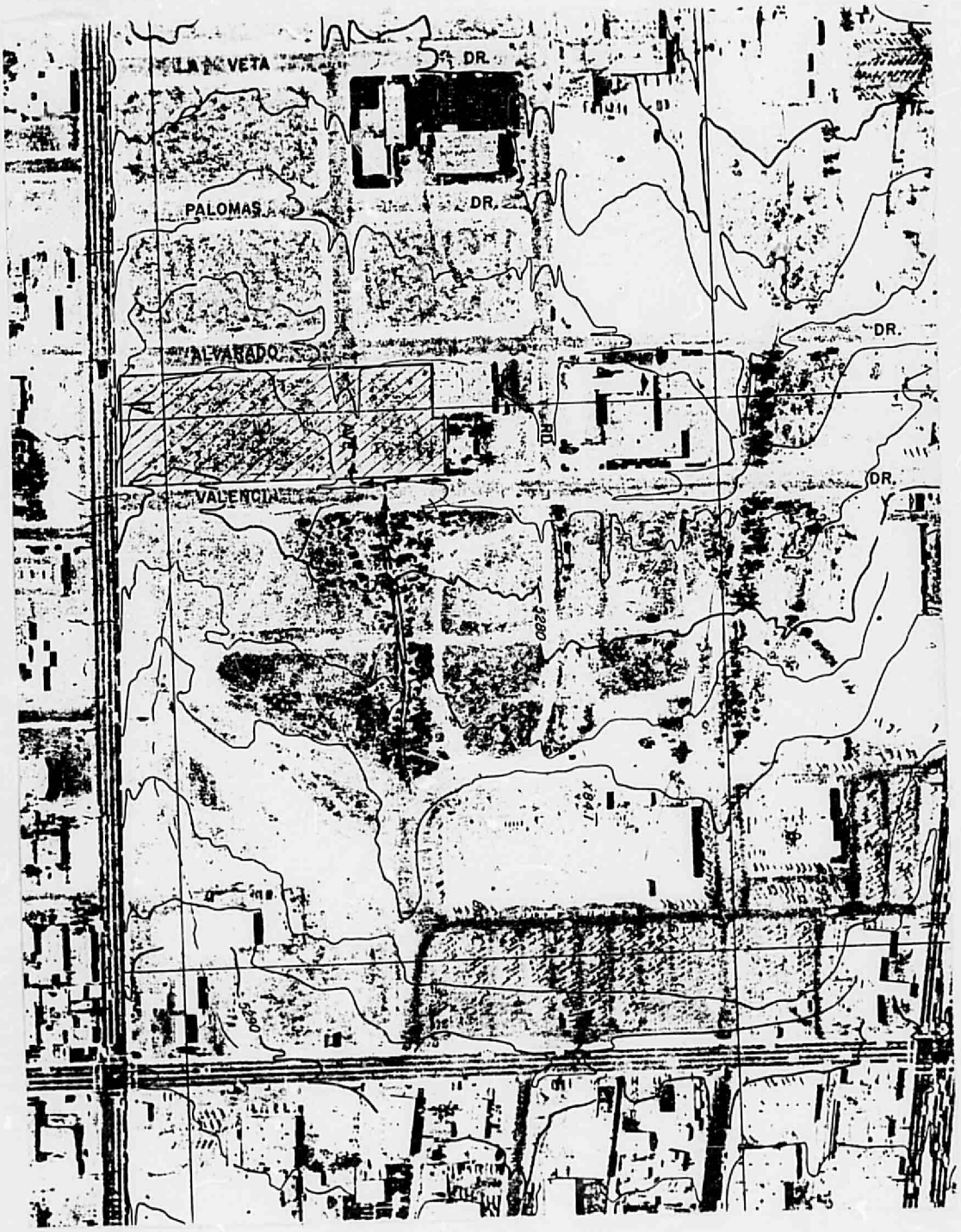
$$WP = .5 + (.5^2+25^2)^{1/2} + .5 + (.5^2+12\tfrac{1}{2}^2)^{1/2} = 38.515$$

$R = .56796$

CONVEYANCE $= A R^{2/3} S^{1/2} = \underline{15.002}\ S^{1/2}$

GREATER THAN EXISTING **OK**

THIS MICROIMAGE IS THE BEST POSSIBLE
REPRODUCTION DUE TO THE POOR QUALITY
OF THE ORIGINAL DOCUMENT



STORM DRAINAGE STUDY
RELATIVE TO DEVELOPMENT OF
LOTS 8 THROUGH 11 AND 19 THROUGH 24,
BLOCK 52 AND BLOCK 62
AMENDED PLAT OF TIJERAS PLACE ADDITION
FOR ENCINO HOUSE EAST
ELDERLY AND HANDICAPPED HOUSING FACILITIES

JUNE, 1977

MacCORNACK & BURNS
CONSULTING ENGINEERS, INC.
1721 GIRARD BLVD., N.E.
ALBUQUERQUE, NEW MEXICO 87106

A DIVISION OF BOYLE ENGINEERING CORPORATION

MacCornack & Burns
consulting engineers, inc.
1721 Girard Boulevard, N.E.
Albuquerque, New Mexico 87106
a division of Boyle Engineering Corporation
505 / 266-7789

June 15, 1977

WENDELL-VARSA & ASSOCIATES LTD.
903 Rio Grande Boulevard N.W.
Albuquerque, NM 87104

Drainage Report: Encino House East

Transmitted herewith is the report of studies conducted by this firm relative to storm runoff drainage considerations relative to the proposed development of the subject project.

The criteria and methods of analysis conform to standards of the Albuquerque Metropolitan Arroyo Flood Control Authority, and the City of Albuquerque, New Mexico.

We will be happy to answer any questions you may have about the conclusions and recommendations of this report.

MacCORNACK AND BURNS, Consulting Engineers

Fred Burns

Fred Burns, PE

JFB:bb
Encl.

STORM DRAINAGE STUDY

RELATIVE TO DEVELOPMENT OF

LOTS 8 THROUGH 11 AND 19 THROUGH 24,

BLOCK 52 AND BLOCK 62

AMENDED PLAT OF TIJERAS PLACE ADDITION

FOR ENCINO HOUSE EAST

ELDERLY AND HANDICAPPED HOUSING FACILITIES

JUNE, 1977

MacCORNACK AND BURNS
Consulting Engineers
a Division of BOYLE ENGINEERING CORPORATION
1721 Girard Boulevard N.E.
Albuquerque, New Mexico 87106

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STORM DRAINAGE STUDY
RELATIVE TO DEVELOPMENT OF
LOTS 8 THROUGH 11 AND 19 THROUGH 24,
BLOCK 52 and BLOCK 62
AMENDED PLAT OF TIJERAS PLACE ADDITION
FOR ENCINO HOUSE EAST
ELDERLY AND HANDICAPPED HOUSING FACILITIES
ALBUQUERQUE, NEW MEXICO

1. PURPOSE: This report is to present such data as is relative to the estimation of the quantity and proposed means of proper handling of storm runoff drainage with respect to the development of Lots 8 through 11, and Lots 19 through 24, Block 52 and Block 62, Tijeras Place Addition, as well as the abandoned right-of-way of Highland Avenue for Encino House East, Elderly and Handicapped Housing Facilities, Albuquerque, New Mexico.

2. SCOPE: This report is to establish criteria and means of construction such that the development of the proposed facility will be protected from storm runoff and, further, will not create increased flooding potential for contiguous properties.

3. LOCATION: The land area under study in this report is a parcel located within the City of Albuquerque in the S.W. 1/4 of Section 24, TSP. 10N, R3E, N.M.P.M. bounded to the east by Valencia Drive S.E., to the south by Zuni Road S.E., to the west by Alvarado Drive S.E., and to the north by a line from a point on the easterly right-of-way of Alvarado Drive S.E. 155 feet north along the right-of-way from the intersection with the centerline of Highland Avenue S.E.,

extending north 89°43'39" east 100.05', thence north 0°13'00" west 25.00', thence north 89°43'39" east 100.05' to a point on the westerly right-of-way of Valencia Drive S.E. that lies 180' north along the right-of-way from the centerline intersection with Highland Avenue S.E.

4. EXISTING DRAINAGE CONDITIONS

A. General: The property under study is presently unimproved with the exception of the Highland Avenue right-of-way which is to be abandoned. The property drains for the most part in a westerly direction to Alvarado Drive, except for very small amounts that drain to Zuni, Valencia and the adjacent lots.

B. Topography: The parcel is located on an alluvial slope of the Sandia Mountains in the lower middle reaches of a fairly extensive basin comprising the majority of the City's Southeast Heights, characterized as not having any main arroyo in the vicinity of the site. The approximate elevation of the highest point on the site is 5280.9± M.S.L. from which the land slopes in a westerly direction at an average of 1.1%.

The area is sparsely vegetated and is for the most part bare soil, consisting of slightly silty to very silty sands, with pockets of clay, gravel and cobbles in evidence. There are no notable geologic features unusual to the area.

C. Drainage Areas: The two streets adjacent to the site with significant contributing drainage areas are Zuni Road (294.6 Ac.) and Valencia Drive (85.6 Ac.) as shown in Figure 3. Both areas consist of principally residential development with significant portions consisting of commercial tracts, all of which are for the most part fully developed. Drainage in both areas consists mainly of street drainage with some storm sewerage in evidence on Zuni Road well east of the site that can be ignored for the purposes of this study.

Future development in both areas should not result in any significant change to the present off-site drainage conditions.

5. PROPOSED DRAINAGE PLANS:

A. Criteria:

(1) General: Resolution No. 1972-2, Albuquerque Metropolitan Arroyo Flood Control Authority.

(2) Project Storm: 100-year Intensity; frequency duration as shown on the Curve of Figure 1, "1963 Master Plan of Drainage for the City of Albuquerque and Environs", as prepared by Gordon Herkenhoff and Associates, Inc., Consulting Engineers.

B. Flood Protection: Drainage areas contributing to street flows adjacent to the site are based on a field reconnaissance of the areas and flows calculated by the Rational Method as it applies to urban runoff phenomena with runoff coefficients based on fully developed

residential (conservative) as recommended in the Herkenhoff Master Plan referenced above, except in those areas where it was felt that the runoff so calculated would not be realistic, in which cases the engineers' estimate (generally higher) was used.

Off-site drainage calculations are included in Exhibit "B" of the Appendix.

C. Site Drainage: The proposed development includes construction of buildings and parking lots which will increase site runoff. To comply with AMAFCA Resolution No. 72-2, that portion of the peak runoff in excess of that encountered under existing conditions will be detained and be allowed to evaporate and percolate on the site.

On-site drainage calculations are included in Exhibit "A" of the Appendix, and reference the enclosure.

6. CONCLUSIONS AND RECOMMENDATIONS: On the basis of the study of this report, the following recommendations are proposed:

A. Provide site grading such that the increased peak runoff from parking and building areas is retained and allowed to percolate and evaporate on the site as outlined in Exhibit "A", and the enclosure of the Appendix.

B. Provide site grading such that finished grades for the structures are above maximum water surface elevations as outlined in Exhibit "B" of the Appendix, or provide berms along property boundaries conforming to the above-mentioned elevations so as to preclude the flood flows

intrusion of the site.

Provided the above listed recommendations are implemented prior to or concurrent with the development of the Parcel for the Encino House East, Elderly and Handicapped Housing Facilities, it is concluded that the proposed development will not create flood hazard to surrounding properties, nor will the structures themselves be in danger of flooding.

Respectfully submitted:

MacCORNACK AND BURNS

Fred Burns

Fred Burns, PE
New Mexico Registration #4000

APPENDIX

Job: ENCINO HOUSE EAST — Sheet No. 1 of ___
Subject: ON SITE DRAINAGE — Job No. W05-100-01
Client: WENDELL – VARSA & ASSOC. — By GARNAND Date 6/3/97
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

EXHIBIT "A"

EXISTING:

$$Q = ACI$$

AREA		RUNOFF COEF.		WEIGHTED AREA	COMMENTS
2.40 Ac	x	.35	=	.84	BARE SOIL
.05 Ac	x	1.00	=	.05	CONC. SIDEWALKS
.18 Ac	x	.95	=	.17	ASPH. PVMT.
2.63 Ac.				1.06	= AC

$I = 189^{*}/(T_c+25)$ — * SEE FIG. 1

$T_c = 11^{**}$ min — ** SEE FIG. 2 — 203' @ 1.1% BARE SOIL

$I = 5.25$ '/HR

Q = PEAK RUNOFF = 1.06 x 5.25
= 5.57 C.F.S.

PROPOSED:

AREA*		RUNOFF COEF.		WEIGHTED AREA	COMMENTS
.06	x	1.0	=	.060	CONCRETE SIDEWALKS
.67	x	.95	=	.637	ASPHALT
.44	x	.9	=	.396	ROOF AREA
.47	x	.3	=	.141	GRASS-LANDSCAPING
.26	x	0	=	0	CLOSED BASIN
2.63				1.234 = AC	

* SEE ENCLOSURE

Job: ENCINO HOUSE EAST
Subject: ON SITE DRAINAGE
Client:
Sheet No. 2 of
Job No. V05-100-01
By GARNAND Date 6/3/77

MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

$I = 189/(25 + t_c)$ SEE FIG. 1

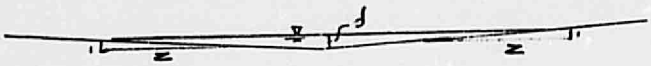
OVERLAND FLOW PATH (SEE ENCLOSURE)

30' ACROSS ROOF (APPROX. SAME TEXTURE AS BARE EARTH)
@ 2% → 4.6 MIN

43' ACROSS AVG. GRASS (14½' @ 7.07%; 11' @ 1% & 17½' @ 24%).
@ 3.556% (WEIGHTED) → 8.3 MIN

TOTAL OVERLAND FLOW TIME = 12.9 MIN

SWALE DRAINAGE CHANNEL CHARACTORISTICS



$Q = \frac{1.486}{n} a r^{2/3} S^{1/2}$ $a = d^2 z$ $r = zd/2(1+z^2)^{1/2}$
(DIRECT SOLUTION FOR d)

BASIN #I
SWALE SECTION BETWEEN BUILDINGS S = 1%
Z = 50 N = .020 S = 1%

ESTIMATE t_c = 16.9 MIN → I = 4.51 IN/HR.

BASIN DATA:

AREA	COEF.		WEIGHTED AREA
.11 Ac.	× .9 (ROOF)	→	.099
.07 Ac	× .3 (GRASS)	→	.021
.03 Ac	× 1.0 (CONC.)	→	.030
			.150 = AC

Q = ACI = .677 CFS
$V_i = Q/a$ = 1.085 FPS $V_0 = 0$ (INITIAL VELOCITY)
FLOW TIME = ℓ (CHANNEL LENGTH) / $V_{AVG.}$, $V_{AVG} = \frac{(V_i + V_0)}{2}$
= 59 FT. / $\left(\frac{1.085 \text{ FPS} + 0}{2}\right)$ / 60 SEC/MIN = 1.81 MIN

Job ENCINO HOUSE EAST Sheet No. 3 of ___
Subject ON SITE DRAINAGE Job No. N05-100-01
Client WENDELL - VARSA & ASSOC. By GARNANO Date 6/9/97
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

BASIN #II

SWALE SECTION THROUGH PARKING TO ALVARADO
SAME HYDRAULICS AS BASIN 1
S = 2% Z = 50 n = .015

t_c (ESTIMATED) = 16.9 → I = 4.51

BASIN DATA:

AREA		COEF.		WEIGHTED AREA
.03 ac.	×	1.0 (CONC.)	→	.030
.39	×	.95 (ASPH)	→	.371
.04	×	.90 (ROOF)	→	.036
.08	×	.36 (GRASS)	→	.024
.54 AC				.461
			+	.150 (BASIN 1)
				.611 = AC

Q = ACI = 2.76 CFS

V_1 = 2.021 FPS V_0 = 1.085 FPS (BASIN 1)

FLOW TIME = l / $V_{AVG.}$

$= 202' / \left(\frac{1.085 + 2.021}{2}\right) / 60 \frac{SEC}{MIN} = 2.17$ MIN

TOTAL TIME OF CONC. t_c = 12.90 (OVERLAND)
4.81 (BASIN 1)
2.17 (BASIN 2)
t_c = 16.88 MIN

APPROX. EQUAL TO ESTIMATED OK

PEAK ON SITE RUNOFF

Q = ACI = 1.234 × 4.51 = 5.57 CFS < 5.57 (EXISTING)

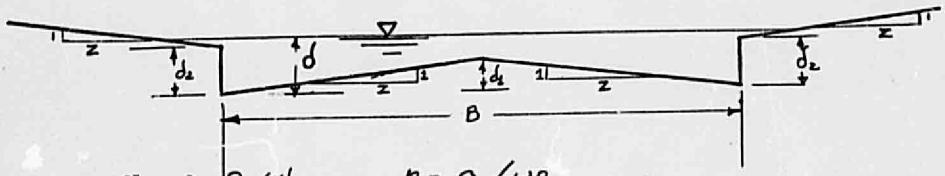
OK

Job ENCINO HOUSE EAST — Sheet No. 1 of ___
Subject OFF SITE DRAINAGE — Job No. W05-100-01
Client WENDELL - VARSA & ASSOC. — By GARNAND Date 6/9/77
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

EXHIBIT "B"

STREET DRAINAGE CHANNEL CHARACTERISTICS

$$Q = ACI = \frac{1.486}{n} a r^{2/3} s^{1/2}$$



$Z = 2 \times B / d_1$ $\qquad r = a / w.p.$

$d \leq d_1$ $\quad a = d^2 \cdot Z$, $\quad w.p. = d \times (2 \times (1+Z^2)^{1/2} + 2)$
(DIRECT SOLUTION FOR d)

$d_1 \leq d \leq d_2$ $\quad a = B \times (d - d_1/2)$, $\quad w.p. = 2 \times (B^2/4 + d_1^2)^{1/2} + 2 \times d$
(TRIAL & ERROR SOLUTION FOR d)

$d \geq d_2$ $\quad a = B \times (d_2 - d_1) + (d + d_1 - d_2)^2 \times Z$
$w.p. = 2 \times d_2 + 2 \times (d + d_1 - d_2) \times (1+Z^2)^{1/2}$
(TRIAL & ERROR SOLUTION FOR d)

ZUNI Rd. FLOW (BASIN #I) SEE FIG. #3

O. OVERLAND FLOW: ESTIMATED 250' - BARE SOIL
@ 2% → 10.7 min + 600' - PAVEMENT
@ 1.5% → 8.5 → Tc (OVERLAND) = 19.2 min

ESTIMATED TOTAL Tc = 58.73 min

$I = 189/(25 + t_c) = 2.257$ "/HR CNTD. SHT. 2

VALENCIA DR. FLOW (BASIN #II) SEE FIG. #3

OVERLAND FLOW: ESTIMATED 150' - BARE SOIL
@ 2% → Tc (OVERLAND) = 8.7 min

ESTIMATE TOTAL Tc = 32.94 min
→ I = 3.262 "/HR. CONTD. SHT. 3

Job: ENCINO HOUSE EAST
Subject: OFF SITE DRAINAGE
Client: WENDELL-VARSA & ASSOC.
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM
Sheet No. 2 of
Job No. W05-100-01
By GARNAND Date 6/13/97

ZUNI RD. - BASIN I I = 2.257"/HR

Sub Basin #	ΔAREA (ACRES)	ΣAREA (ACRES)	C	Q (CFS)	d_1 (FT)	d_2 (FT)	B (FT)	S (%)	n	d (FT)	V (FPS)	$V_{AVG.}$ (FPS)	l (FT)	ΔTc (MIN)	ΣTc (MIN)
OVERLAND	-	-	-	-	-	-	-	-	-	-	0	-	-	19.2	19.2
#1	29.5	29.5	.45	29.97	.50	.67	33	1.4	.015	.46	4.31	2.15	1600	12.38	31.58
#2	43.9	73.4		74.56				1.0		.69	5.12	4.71	1150	4.07	35.65
#3	8.1	81.5		82.79				0.7		.77	4.69	4.90	700	2.38	38.03
#4	41.7	123.2		125.15				1.3		.81	6.52	5.61	970	2.88	40.91
#5	8.7	131.9		133.98				0.7		.96	5.15	5.84	700	2.00	42.91
#6	60.9	192.8		195.84			33	1.0		1.04	6.41	5.78	1,300	3.75	46.66
#7	13.4	206.2		209.46			65	1.1		.78	5.96	6.19	700	1.89	48.55
#8	28.7	234.9		238.61			48	1.1		.96	6.44	6.20	310	0.83	49.38
#9	27.8	262.7		266.85			48	1.0		1.01	6.33	6.39	1600	4.17	53.55
#10	31.9	294.6	.45	299.25	.50	.67	48	1.0	.015	1.06	6.53	6.43	2000	5.18	58.73

OK

ENERGY GRADIENT = (MAX WATER SURFACE ELEV. IN EDDIES)

$= d + V^2/2g$

$= 1.06 + (6.53^2/(2 \times 32.174))$

$= 1.72'$

MIN F.G. = 1.72 − .67 (CURB) = 1.05' ABOVE TOP OF CURB ON ZUNI TO PRECLUDE STRUCTURAL DAMAGE DURING THE 100YR FREQUENCY STORM

Job: ENCINO HOUSE EAST
Subject: OFF SITE DRAINAGE
Client: WENDELL - VARSA & ASSOC.
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM
Sheet No. 3 of
Job No. W05-100-01
By GARNAND Date 6/13/79

VALENCIA DR. - BASIN II $I = 3.262''/HR$

SUB-BASIN #	ΔAREA (ACRES)	ΣAREA (ACRES)	C	Q (CFS)	d_1 (Ft.)	d_2 (Ft.)	B (Ft.)	S (%)	n	d (Ft)	V (FPS)	$V_{AVG.}$ (FPS)	ℓ (Ft)	ΔTc (MIN)	ΣTc (MIN)
OVERLAND	-	-	-	-	-	-	-	-	-	-	0	-	-	8.7	8.7
# 1	9.6	9.6	.45	14.09	.5	.67	40	1.0	.015	0.34	3.00	1.50	1000	11.10	19.80
# 2	48.7	58.3	.45	85.58	.5	.67	40	0.8	.015	0.71	4.69	3.85	2000	8.66	28.46
# 3	15.6	73.9	.75	123.74	SWALE SECTIONS: Z = .50 SEE EXHIBIT "A" PAGE 2			0.8	.015	0.74	4.55	4.62	500	1.80	30.26
# 4	11.3	85.2	.35	136.64	Z = 5			0.8	.020	2.03	6.63	5.59	600	1.79	32.05
# 5	0.4	85.6	.84	137.74	.5	.67	44	0.6	.015	0.88	4.60	5.61	300	0.89	32.94

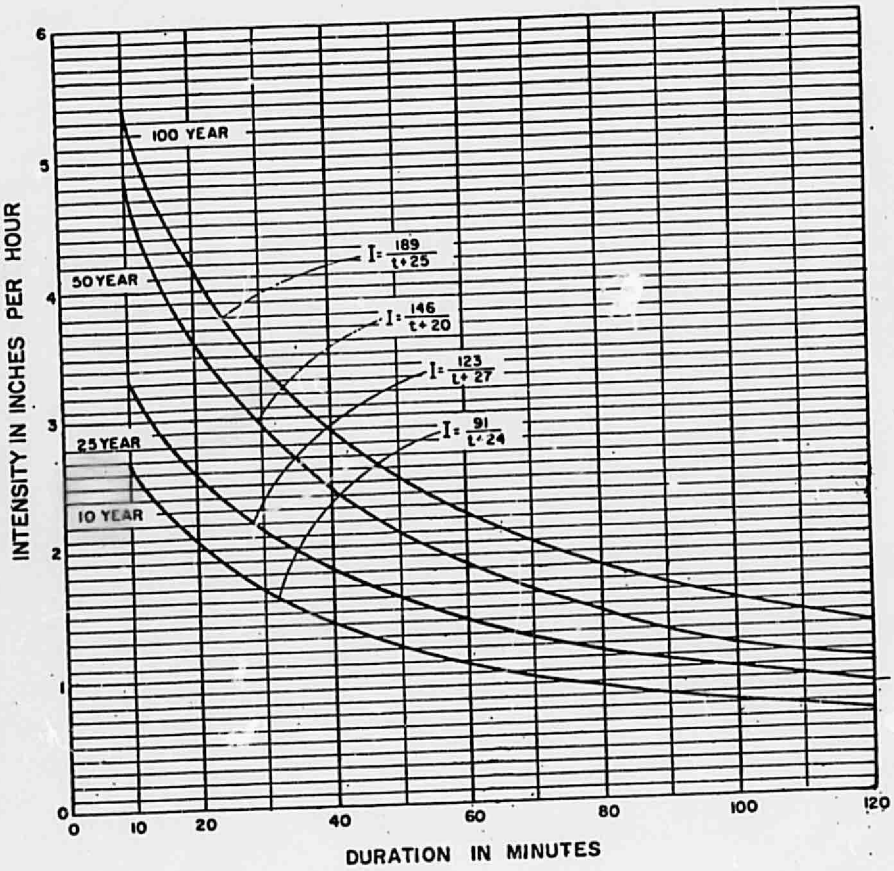
ENERGY GRADIENT = (MAX. WATER SURFACE ELEV. IN EDDIES)

$= d + V^2/2g$

$= .88 + 4.60^2/(2 \times 32.174)$

$= 1.21'$

MIN. F.G. = 1.21 - .67 (CURB) = .54' ABOVE TOP OF CURB ON VALENCIA TO PRECLUDE STRUCTURAL DAMAGE DURING THE 100YR. FREQUENCY STORM.



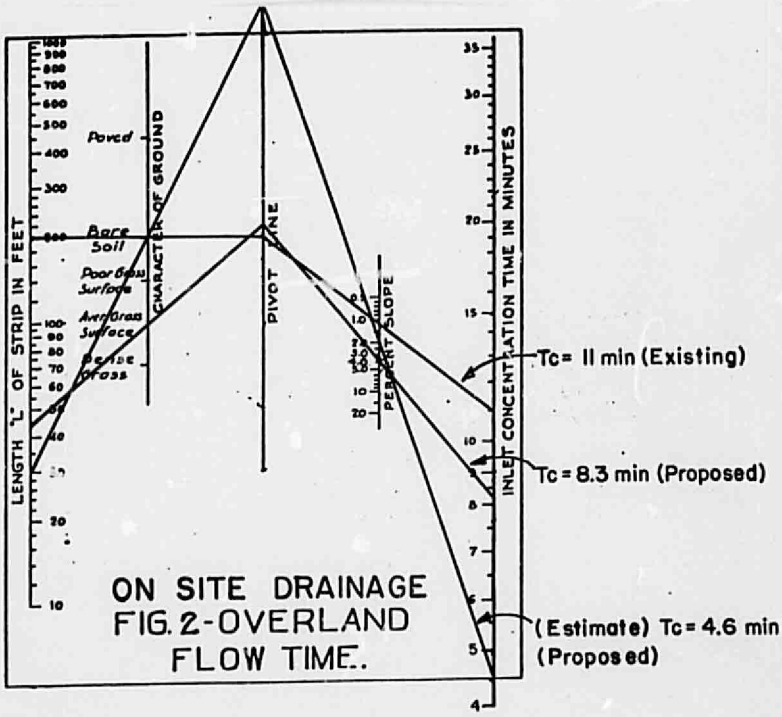
MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO
AND ENVIRONS

INTENSITY DURATION
FREQUENCY CURVES

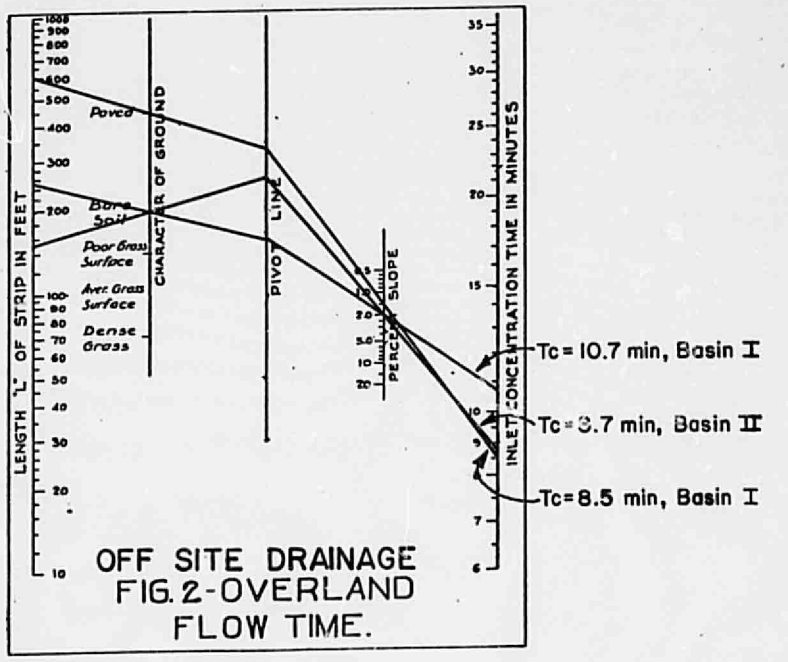
(ALBUQUERQUE AREA - 1961)

GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

FIG. 1



ON SITE DRAINAGE
FIG. 2-OVERLAND
FLOW TIME.



OFF SITE DRAINAGE
FIG. 2-OVERLAND
FLOW TIME.

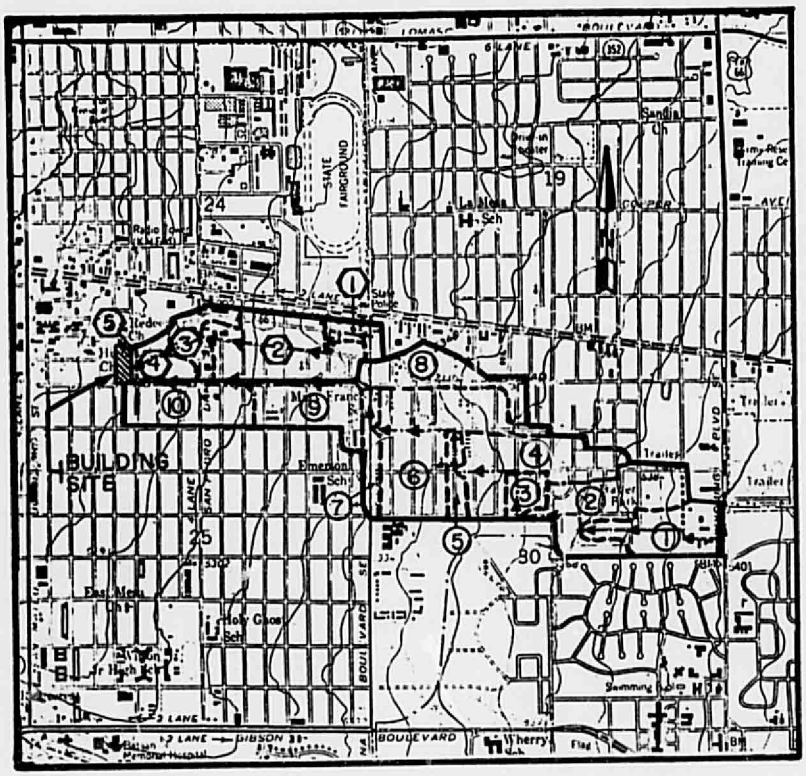


FIG. 3

BASIN AREAS:

BASIN I, COMPOSED OF SUBBASINS (1) → (10) = 294.6 Ac.

BASIN II, COMPOSED OF SUBBASINS ⟨1⟩ → ⟨5⟩ = 85.6 Ac.