INFORMATION SHEET

PROJECT TITLE Brownstone Project TYPE OF SUBMITTAL Pre Prelim.

ZONE ATLAS PAGE NO. J-15-00 CITY ADDRESS _____

LEGAL DESCRIPTION 5.374 Acres in NE¼ of NE¼ Sec. 6 T. 10N., R. 3E.

ENGINEERING FIRM William Matotan & Assoc. CONTACT Rod Peterson

ADDRESS 230 Truman St. N.E., Alb. NM PHONE 265-8467

OWNER Brownstone Group CONTACT Richard Rushing

ADDRESS 3130 Southwest Freeway Suite 204, Houston, Texas PHONE 713-520-7272

ARCHITECT _____ CONTACT Richard Rushing

ADDRESS _____ PHONE _____

SURVEYOR William Matotan & Assoc. CONTACT Rod Peterson

ADDRESS _____ PHONE _____

CONTRACTOR _____ CONTACT _____

ADDRESS _____ PHONE _____

DATE SUBMITTED 23 Sept. 1983

BY William Matotan & Associates, Inc.

Use this Information Sheet when submitting the following:

Drainage report or plan, conceptual grading and drainage plan, engineer's certification plan, erosion plan and grading plan. Provide the information applicable to your submittal.

INFORMATION SHEET

PROJECT TITLE CASA SANDIA APARTMENTS TYPE OF SUBMITTAL ~~Drainage Report~~

ZONE ATLAS PAGE NO. J-15 D17 CITY ADDRESS 1642 Indian School Road, N. E.

LEGAL DESCRIPTION Brownstone Tract in the NE 1/4, NE 1/4, Sec. 16, T. 10N., R. 3E., ~~N.M.P.M.~~

ENGINEERING FIRM William Matotan & Assoc., Inc. CONTACT William I. Matotan

ADDRESS 230 Truman St.,N.E.,Alb,N.M. 87108 PHONE (505) 265-8467

OWNER Brownstone Group CONTACT Gale Hunsinger

ADDRESS 230 Truman St.,N.E.,Alb.,N.M. 87108 PHONE (505) 266-7955

ARCHITECT Miguel Trujillo & Assoc. CONTACT Miguel Trujillo

ADDRESS 8210 La Mirada Rd.,N.E.,Alb. ~~N.M. 87109~~ PHONE (505) 298-7543

SURVEYOR William Matotan & Assoc., Inc. CONTACT William I. Matotan

ADDRESS 230 Truman St.,N.E.,Alb.,N.M. ~~87108~~ PHONE (505) 265-8467

CONTRACTOR _____ CONTACT _____

ADDRESS _____ PHONE _____

PRE-DESIGN MEETING:

X YES
___ NO
X COPY OF CONFERENCE RECAP SHEET PROVIDED

PLEASE CHECK TYPE OF APPROVAL EXPECTED WITH THIS SUBMITTAL:

___ SKETCH PLAT APPROVAL
___ PRELIMINARY PLAT APPROVAL
___ SITE DEVELOPMENT PLAN APPROVAL
___ FINAL PLAT APPROVAL
X BUILDING PERMIT APPROVAL
___ CERTIFICATE OF OCCUPANCY APPROVAL
___ ROUGH GRADING PERMIT APPROVAL
___ GRADING/PAVING PERMIT APPROVAL
X OTHER DRAINAGE REPORT (SPECIFY)

RECEIVED
APR 02 1984
HYDROLOGY SECTION

DATE SUBMITTED: March 30, 1984

BY: WILLIAM MATOTAN & ASSOCIATES, INC.

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION

HYDROLOGY SECTION PROJ. NO. J15 DATE: 9/23/83

PLANNING DIVISION NO.

CONFERENCE RECAP

SUBJECT: Brownstone Apts (224 units) located South of Indian School West of North Diversion Channel

ATTENDANCE:	WHO	REPRESENTING
	John Armstrong	City
	Rod Peterson	McKenna & Assoc.

FINDINGS:

(1) Drainage Report Appropriate
(2) Free discharge directly to storm drain if it can be shown that system is adequate
(3) Summary Plat to eliminate lots.

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: [signature]
TITLE: C.E./Hydrology
DATE: 9/23/83

SIGNED: Rodney E. Peterson
TITLE: Vice President
DATE: 9/23/83

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

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

April 10, 1984

Mr. William I. Matotan
230 Truman Street NE
Albuquerque, NM 87108

REF: CASA SANDIA APARTMENTS DRAINAGE REPORT (J15-D17)

Dear Mr. Matotan:

These are my comments on the above mentioned report as received 4/2/84:

1. Free discharge from the site has not been justified:

   a) Water leaving the site will not be picked up by inlet #3 (capacity 3.5 cfs per report) and will cross University Boulevard.

      i) Pre-design conference recap did not allow flows to be discharged into street. Discharge directly to storm drain only was allowed, but only if the system downstream was adequate.

   b) The report shows that the existing storm drain is not capable of conveying the existing flows, with the Casa Sandia Apartments site developed, let alone the fully developed watershed.

      i) Hydrograph analysis, with developed watershed, may justify free discharge but only if discharge from Casa Sandia can be shown to "beat the peak" and will not increase overland flow at the sag curve in Indian School.

      ii) The report does not mention an easement for overland flow at the sag curve. If there is an existing easement and the existing improvements in the easement are capable of conveying the excess flows from

the fully developed watershed, without encroachment or damage to private property, then free discharge can be justified.

c) In general, it appears that justification for free discharge will be difficult or impossible to show, due to conditions downstream, and in lieu of that, ponding with controlled discharge will be required.

If you have any questions on the above, please feel free to call me at 766-7644.

Thank you,

John Armstrong
Civil Engineer/Hydrology

JA:mrk

cc: Brownstone Group

the fully developed watershed, without encroachment or damage to private property, then free discharge can be justified.

c) In general, it appears that justification for free discharge will be difficult or impossible to show, due to conditions downstream, and in lieu of that, ponding with controlled discharge will be required.

If you have any questions on the above, please feel free to call me at 766-7644.

Thank you,

John Armstrong
Civil Engineer/Hydrology

JA:mrk

cc: Brownstone Group

WILLIAM MATOTAN & ASSOCIATES
ENGINEERS
230 Truman Street, N.E. Albuquerque, N.M. 87108
RODNEY E. PETERSON
Vice President
(505) 265-8467

Prelim.

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project Brownstone Apts. Sheet 1 of 2
Subject: Drainage Study Job No. 720
Comp. by DEP Date 12/20/83 Chk'd _____ Date _____

I. EXISTING CONDITIONS (Undeveloped)

A. Existing Runoff Volumes (5.388 Acres)

$V_{100} = 0.3 \times \frac{2.2}{12} \times 5.388 \times 43,560 = 12,910$ cu.ft.

$V_{10} = 0.3 \times \frac{0.98}{12} \times 5.388 \times 43,560 = 5,750$ cu.ft.

(Where $V = CRA$, V in cubic feet
C = Coefficient of Imperviousness
R = 6 hour rainfall depth in feet)

B. Existing Discharge Conditions (5.388 Acres)

Rainfall intensity $I = (6\text{-hr rain}) 6.84\, t_c^{-0.51}$

$I_{100} = 2.2 \times 6.84 \times 10^{-0.51} = 4.65$ ✓

$I_{10} = 4.65 \times .657 = 3.06$ ✓

$Q_{100} = 0.3 \times 4.65 \times 5.388 = 7.51$ cfs

$Q_{10} = 0.3 \times 3.06 \times 5.388 = 4.95$ cfs

(Where $Q = CIA$, Q in cubic feet per second
C = Coefficient of Imperviousness
I = Rainfall intensity
A = Area in Acres)

WILLIAM MATOTAN & ASSOCIATES
ENGINEERS

230 Truman Street, N.E. Albuquerque, N.M. 87108

RODNEY E. PETERSON
Vice President

(505) 265-8467

Prelim

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project Brownstone Apts. Sheet 2 of 2
Subject: Drainage Study Job No. 720
Comp. by REP Date 13 Sept 83 Chk'd _____ Date _____

II. DEVELOPED CONDITIONS

A. Developed Runoff Volumes (5.388 Acres)

$V_{100} = 0.8 \times \frac{2.2}{12} \times 5.388 \times 43{,}560 = 34{,}423$ cu.ft.

$V_{10} = 0.8 \times \frac{0.98}{12} \times 5.388 \times 43{,}560 = 15{,}334$ cu.ft.

B. Developed Discharge Conditions

$I_{100} = 4.65$ $I_{10} = 3.06$ (See sheet 1)

$Q_{100} = 0.8 \times 4.65 \times 5.388 = 20.0$ cfs

$Q_{10} = 0.8 \times 3.06 \times 5.388 = 13.19$ cfs

III INCREASED DEVELOPED FLOW CONDITIONS

V_{100} Developed = 34,423 cu.ft.
V_{100} Undevel. = 12,910 cu.ft.
Diff. = 21,513 cu.ft.

V_{10} Devel. = 15,334 cu.ft.
V_{10} Undev. = 5,750 cu.ft.
Diff = 9,584 cu.ft.

Q_{100} Devel. = 20.0 cfs
Q_{100} Undev. = 7.5
Diff = 12.5 cfs

Q_{10} Devel. = 13.2 cfs
Q_{10} Undev. = 5.0
Diff. = 8.2 cfs

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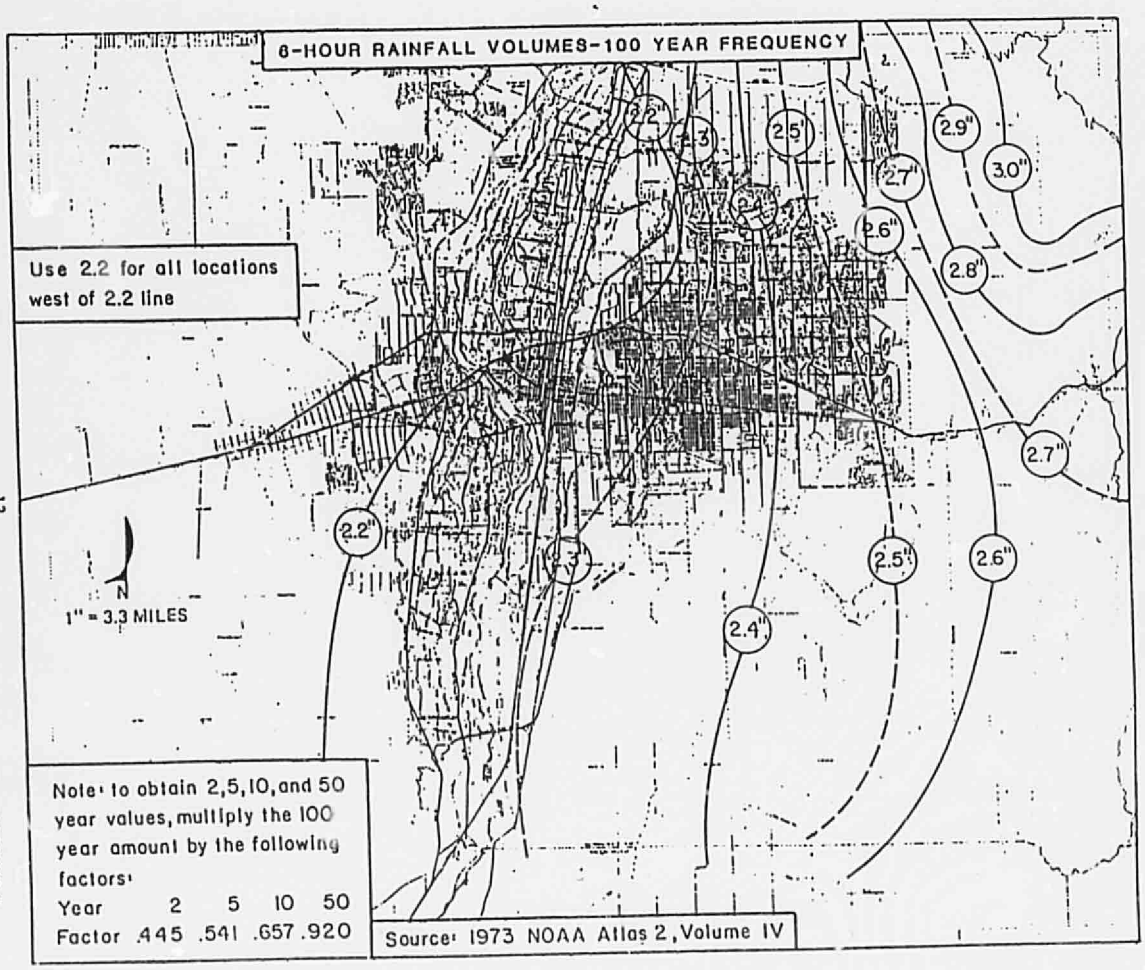
230 Truman Street, N.E. Albuquerque, N.M. 87108

RODNEY E. PETERSON
Vice President

(505) 265-8467

4-82



13

PLATE 22.2 D-1

22.2

STORM RUNOFF FROM PROJECT SITE

Pages A-1 thru A-9

Add-1 9a, April 29, 84

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230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project Brownstone Casa Sandia Sheet 1 of 1
Q_{10} & Q_{100} VOLUME H, I, J. Job No. 720
By S.A.H. Chk'd ✓ Date 25 Apr. 84

D.A. - "H" Indian School R.O.W. (N.W. Prop. cor to N.W. Driveway)

$C = 0.25$
$I = 3.05$
$A = 0.1901$
$Q_{10} = 0.14$ cfs

$C = 0.25$
$I = 4.65$
$A = 0.1901$
$Q_{100} = 1.22$ cfs

D.A. - "I" Indian School R.O.W. (N.W. Driveway to S.W. Driveway)

$C = 0.25$
$I = 3.05$
$A = 0.2420$
$Q_{10} = 0.18$ cfs

$C = 0.25$
$I = 4.65$
$A = 0.2420$
$Q_{100} = 0.28$ cfs

D.A. - "J" Indian School R.O.W. (S.W. Driveway to S.W. Prop. line)

$C = 0.25$
$I = 3.05$
$A = 0.2010$
$Q_{10} = 0.15$ cfs

$C = 0.25$
$I = 4.65$
$A = 0.2010$
$Q_{100} = 0.23$ cfs

Note: Areas "H", "I" & "J" to be sodded & landscaped.

STORM RUNOFF CONTRIBUTING
TO
EXISTING STORM SEWER SYSTEM NO. 129

Pages A-10 thru A-13

Revised 29 April 84

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ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet 1 of 4
Drainage Study Job No. 720
By DEP Chk'd ✓ Date 12 Mar. 84

SUMMARY OF STORM RUNOFF CONTRIBUTING TO EXISTING STORM SEWER SYSTEM NO. 129

Drainage Area	Developed Conditions	
	Q_{10}	Q_{100}
#1	27	41
#2	60	91
#3	14	22
#4	8	12
TOTALS* (cfs)	109	166

* Rounded to 1 cfs unit.

For developed conditions: Revised 29 Apr. 84

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Project CASA SANDIA APTS. Sheet 2 of 4
Subject: Drainage Study Job No. 720
Comp. by REP Date 12 Mar. 84 Chk'd ✓ Date 12 Mar.

Existing Storm Sewer System in Project Vicinity
Contributing Drainage Areas and Composite "C" Factors

Drainage Area	Area in Acres (By Planimeter 1"=200' Topo Map)	Composite "C" Factor (100% developed)
#1	13.61	0.65
#2	32.78	0.60
#3	7.80	0.60
#4	3.21	0.82

Total Area = 57.40 Acres

For developed conditions: Revised 29 Apr. 84

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Project CASA SANDIA AT 3. Sheet 3 of 4
Subject: Drainage Study Job No. 720
Comp. by REP Date 12 Mar 84 Chk'd V Date 12 Mar.

Existing Storm Sewer System

Time of Concentration of Contributing Drainage Areas, where $T_c = (0.0078)\left(\frac{L^{0.77}}{S^{0.385}}\right)$

D.A. #1, $L = 1100'$ $S = \frac{5116 - 5076}{1100'} = 0.0364'/ft.$

$$T_c = (0.0078)\left(\frac{1100^{0.77}}{0.0364^{0.385}}\right) = 6.1 \text{ Min.}$$

D.A. #2, $L = 2100'$ $S = \frac{5130 - 5074}{2100} = 0.0267'/ft.$

$$T_c = (0.0078)\left(\frac{2100^{0.77}}{0.0267^{0.385}}\right) = 10.09 \text{ Min.}$$

D.A. #3, $L = 950'$ $S = \frac{5104 - 5067}{950} = 0.0389'/ft.$

$$T_c = (0.0078)\left(\frac{950^{0.77}}{0.0389^{0.385}}\right) = 5.3 \text{ Min.}$$

D.A. #4, $L = 700'$ $S = \frac{5069 - 5063}{700'} = 0.0086'/ft.$

$$T_c = (0.0078)\left(\frac{700^{0.77}}{0.0086^{0.385}}\right) = 7.5 \text{ Min.}$$

Note: T_c of 10 minutes used for computing Rainfall intensity "I", all drainage areas. Calculated T_c's used to compare inflow hydrographs to storm sewer system.

Revised 28 Apr. 84

4

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Project CASA SANDIA APTS. Sheet 4 of 4
Subject: Drainage Study Job No. 720
Comp. by RSP Date 12 Mar. 84 Chk'd ✓ Date 12 Mar.

PEAK RUNOFF for Drainage Areas Contributing to Existing Storm Sewer System on Indian School Road (System No. 129)

D.A. #1, Developed Condition

$Q_{10} = (0.65)(3.05)(13.61) = 27$ cfs

$Q_{100} = (0.65)(4.65)(13.61) = 41$ cfs

D.A. #2, Developed Condition

$Q_{10} = (0.60)(3.05)(32.78) = 60$ cfs

$Q_{100} = (0.60)(4.65)(32.78) = 91$ cfs

D.A. #3, Developed Condition

$Q_{10} = (0.60)(3.05)(7.80) = 14$ cfs

$Q_{100} = (0.60)(4.65)(7.80) = 22$ cfs

D.A. #4, Developed Condition

$Q_{10} = (0.82)(3.05)(3.21) = 8$ cfs

$Q_{100} = (0.82)(4.65)(3.21) = 12$ cfs

Total Runoff $Q_{10} = 109$ cfs

Total Runoff $Q_{100} = 166$ cfs

For developed conditions: Revised 28 Apr. 84

STREET FLOW CAPACITY

Pages A-31 thru A-34
Revised 28 Apr. 84

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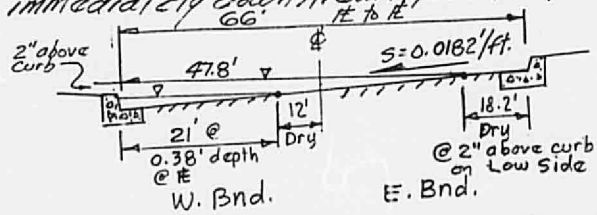
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet ____ of ____
Drainage Study Job No. 220
By REP Chk'd ✓ Date 23 Mar. 84

Street Capacity - Indian School Road, 66' ℄ to ℄ w/continuous left turn lane.

@ Critical cross section on West side of intersection, Indian School Rd. & University Blvd., immediately downstream from inlets #5 & #6



1. Capacity with one lane dry, westbound, and 3 lanes dry Eastbound, max. depth of flow 0.38' @ west curb.

$Q = AV$ and $V = \frac{1.486}{0.015} \cdot R^{2/3} \cdot S^{1/2}$

$A = 3.99$ ☐ $wp = 21.4'$ $R = \frac{3.99}{21.4} = 0.1864$, $R^{2/3} = 0.3245$

$S = 0.004$, $S^{1/2} = 0.0632$

$V = \frac{1.486}{0.015} \times 0.3245 \times 0.0632 = 2.03$ fps

$Q = 3.99 \times 2.03 = \underline{8.1 \text{ cfs}}$

Runoff contributing to this street cross section = Area #1 (See page A-13)

$Q_{10} = 15$ cfs $Q_{100} = 23$ cfs

Capacity of inlets #3, 4, 5 and 6 immediately upstream from this section = 48.5 cfs (see p. A-14)

Capacity of 30" RCP storm sewer @ above inlets = 49 cfs (see p. A-29)

∴ Storm sewer capacity 49 cfs and inlet capacity 48.5 cfs > Q_{10} 15 cfs and $Q_{100} = 23$ cfs and street flow criteria not exceeded.

For Developed Condition: Revised 28 Apr. REP

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ENGINEERS
230 Truman Street, N.E. – Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet ___ of ___
Drainage Study Job No. 720
By REP Chk'd ✓ Date 23 Mar. 1984

Street Capacity – University Blvd., 66' ℄ to ℄ w/ 22' raised median:

@ Critical cross section, approximately 300' South of intersection with Indian School Road, sag vertical curve and inlets #1 and #2; Drainage Area #2 outfall.

From page A-13, total runoff contributing to this section: $Q_{10} = 60$ cfs $Q_{100} = 91$ cfs

From page A-14, total inlet capacity = 53 cfs

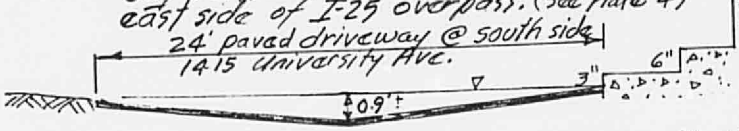
From page A-29, storm sewer capacity, = 36 cfs

∴ @ Q_{10}, 24 cfs in excess of storm sewer capacity flowing full, gravity flow.

and

@ Q_{100}, 55 cfs in excess of storm sewer capacity flowing full, gravity flow.

@ Q_{100}, street overflow is to the west via an asphalt paved, inverted crown, driveway on the south side of office building @ 1415 University Ave., to storm sewer inlets #7 and #8 at the sag vertical curve on Indian School Road, east side of I-25 overpass. (See Plate 4)



Capacity of driveway: $Q = AV$ $V = \frac{1.486}{0.015} \cdot R^{2/3} \cdot S^{1/2}$

$A = 10.8\ \square'$ $R = \frac{10.8}{24} = 0.45$ $R^{2/3} = 0.58$

$S = 0.015$ $S^{1/2} = 0.12$ $V = (99)(0.58\ (0.12) = 6.9$ fps

$Q = (10.8)(6.9) = 74$ cfs $>$ Q_{100} 55 cfs overflow

OK

For Developed Condition: Revised 28 Apr. 84

For Developed Conditions: Revised 28 Apr. 84

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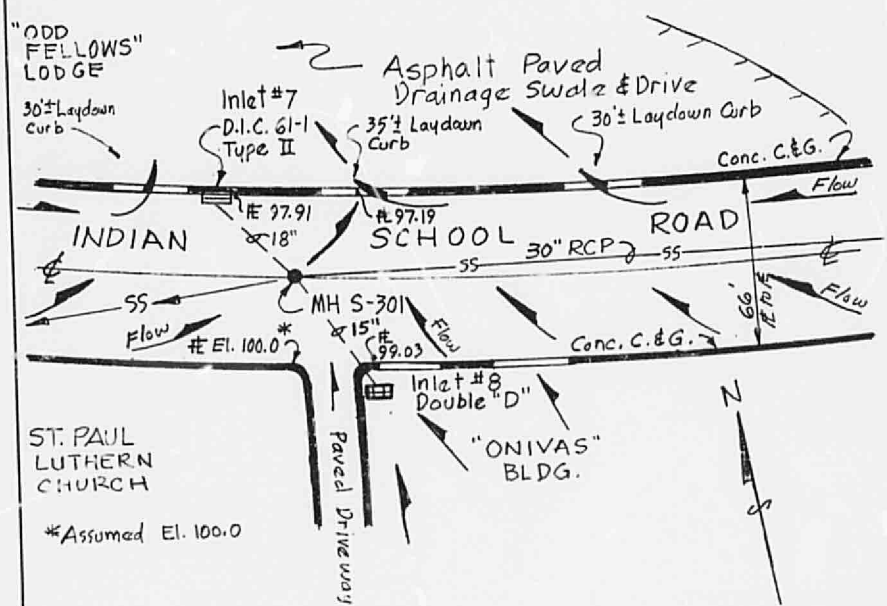
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet ____ of ____
Subject: Drainage Study Job No. 720
Comp. by REP Date 23 Mar. 84 Chk'd ✓ Date 23 Mar.

STREET FLOW DISCHARGE ON INDIAN SCHOOL RD. 600'± WEST OF UNIVERSITY BLVD.



Scale: 1" = 50'±

From page A-13, Total runoff contributing to storm sewer system at MH S-301, D.A. #1, 2, 3 and 4: Q_{10} = 109 cfs Q_{100} = 166 cfs
From page A-29, capacity of 30" storm sewer downstream from MH S-301 = 71 cfs (flowing full, gravity flow)
∴ 71 cfs < Q_{10} peak flow by 38 cfs ∴ Q_{10} 38 cfs street flow
and 71 cfs < Q_{100} peak flow by 95 cfs ∴ Q_{100} 95 cfs street flow
All street flow within D.A. #1, 2, 3, 4 in excess of storm sewer capacity, drains into this sag vertical curve and thence flows north through the three curb cuts into the historic drainageway (old Indian School Road paved roadway) thence westerly through I-25 drainage structures into historic Campus Draw drainage way on the west side of Interstate Route-25. Note that gutter flowline on low side of street @ Inlet #7 is 0.1' higher than the gutter flowline at the low point of the sag.

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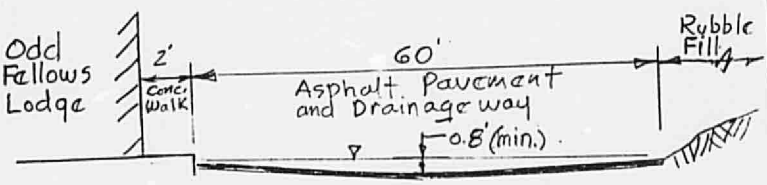
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS Sheet ___ of ___
Drainage Study Job No. 720
By REP Chk'd ✓ Date 23 Mar. 84

CAPACITY OF HISTORIC DRAINAGEWAY (old Indian School Road paved roadway) North of Existing Indian School Road @ East side of I-25.



Critical Cross Section @ North Side of Lodge Bldg.
Not to Scale

$Q = AV \quad V = \frac{1.486}{0.015} \cdot R^{2/3} S^{1/2}$

$A = \frac{(0.8)(60')}{2} = 24\#$ $\quad WP = 60' \quad R = \frac{24}{60} = 0.40 \quad R^{2/3} = 0.54$

$S = 0.0370'/ft. \quad S^{1/2} = 0.1924 \quad V = (99)(0.54)(0.1924) = 10.3 fps$

$Q = (24)(10.3) = 247 cfs$ > Q_{10} 38 cfs and Q_{100} 95 cfs Street flows from drainage areas #1, 2, 3 and 4, in excess of storm sewer capacity.

Note: This drainageway is the only outlet from the sag vertical curve on Indian School Road at the east side of the I-25 overpass and drains all street flows in Drainage Areas #1, 2, 3 and 4 that are in excess of the storm sewer capacity.

For Developed Conditions: Revised 28 Apr. 84

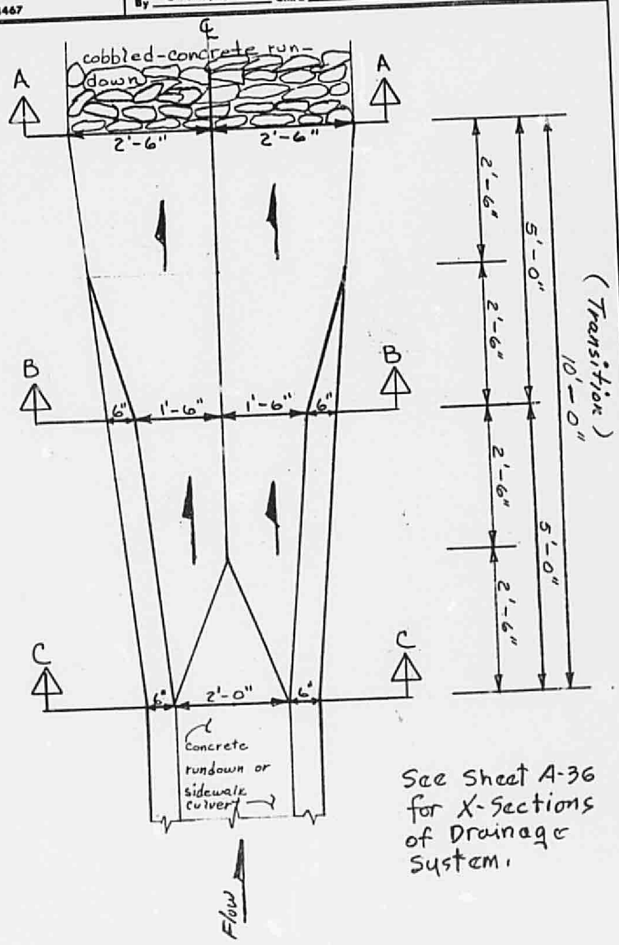
ON-SITE DRAINAGE STRUCTURE CAPACITIES

Pages A-35 thru A-39

Added 29Apr. 84

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project Brownstone Casa Sandia Apt. Sheet 2 of 2
Transition Cobble - Concrete Job No. 720
By S.A.M. Chk'd ✓ Date 4-26-89



See Sheet A-36 for X-Sections of Drainage System.

PLAN OF DRAINAGE SYSTEM
DOWNSTREAM FROM A.P. "A-B"
N.T.S.

A-35

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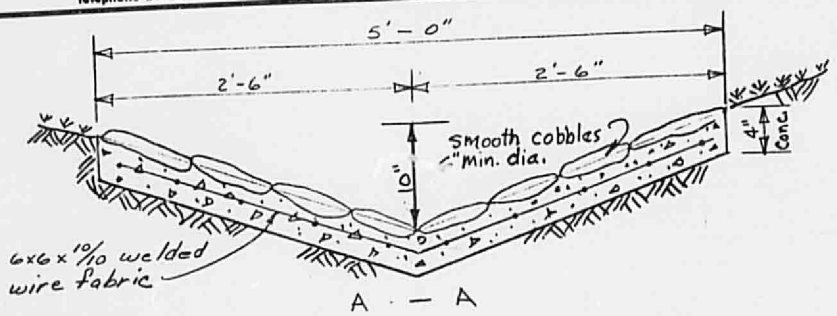
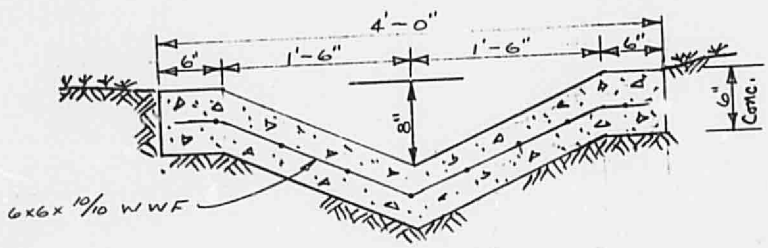
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

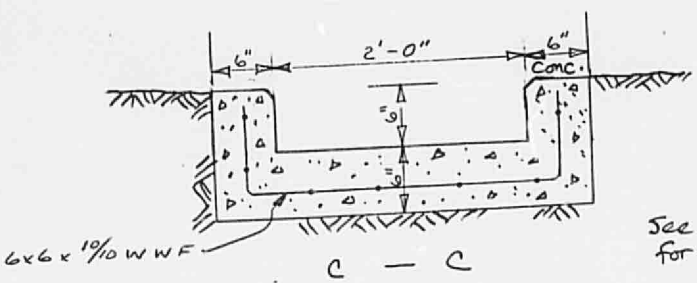
Project Brownstone Casa Sandia Apt. Sheet 1 of 2
Transition Cobble - Concrete Job No. 720
By S.A.M. Chk'd ✓ Date 4-25-84



A — A



B — B



C — C

See sheet A-35 for Plan.

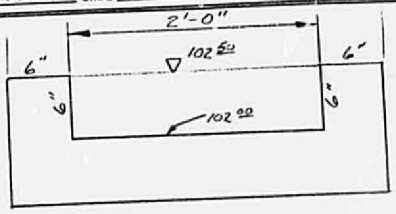
TYPICAL SECTIONS of DRAINAGE DITCH TRANSITIONS

N.T.S.

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project BRAMPTON TOWNE CASA SANDIA APT. Sheet 1 of 2
Capacity - Contribution Job No. 720
By S.A.M. Chk'd ✓ Date Apr. 25 '84

A.P. "A"-"B" Concrete rundown @ North driveway:



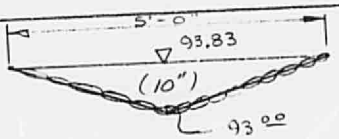
▽ 102.50

A = 1.00 □'
w/p = 3.00'
R = 0.3333 $R^{2/3}$ = 0.4790'
S_{AV} = 0.0140 $S^{1/2}$ = 0.1183'
f = 99.0667 (n = 0.015)
V = 5.6137 fps
Q = 5.61 cfs (capacity)

100 yr. Volumes contributed to A.P. "A"-"B"
D.A. "A" = 0.51 cfs
D.A. "B" = 3.79 cfs
Indian School R.O.W. = 0.22 cfs
(4.52 cfs) contribution

✓ OK Q_{100} < Cap. of Rundown

A.P. "E"-"F" Cobbled concrete swale



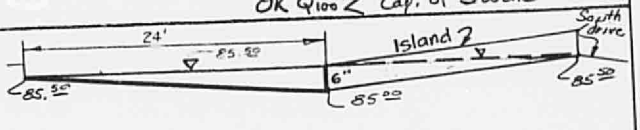
▽ 93.83

A = 2.0833 □'
w/p = 5.2704'
R = 0.3953 $R^{2/3}$ = 0.5369
S = 0.0286 $S^{1/2}$ = 0.1691
f = 37.1500 (n = 0.040)
V = 3.3731 fps
Q = 7.02 cfs (capacity)

100yr Volumes contributed to A.P. "E"-"F"
A.P. "A"-"B" = 4.52 cfs
D.A. "F" = 0.43 cfs
D.A. "E" = 1.87 cfs
6.82 cfs (contribution)

✓ OK Q_{100} < Cap. of Swale

A.P. "C" Parking access
▽ 85.50 Bldg. 1



A = 6.00 □'
w/p = 24.5052
R = 0.2448 $R^{2/3}$ = 0.3895
S_{AV} = 0.008 $S^{1/2}$ = 0.0894
f = 99.0667 (n = 0.015)
V = 3.4513
Q = 20.7077 cfs (capacity)

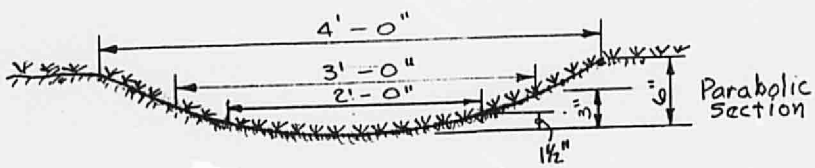
100yr Volumes contributed to A.P. "C"
AP "E-F" = 6.82 cfs
Indian School R.O.W. = 0.28 cfs
D.A. "C" = 9.44 cfs
16.54 cfs (contribution)

✓ OK Q_{100} < Cap. of Paved Section

A-37

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project Brownstone Casa Sandia Sheet 1 of 1
Parabolic Ditch Section Job No. 720
By S.A.M. Chk'd ✓ Date 28Apr. 87



TYPICAL SECTION
of
SODDED DRAINAGE SWALE
NTS

Note: Depths of flow will not exceed 2" for Q_{100} & Max. Velocity will not exceed 2 fps

Sodded swale to convey small volume "nuisance" flows through the landscaped portions of Drainage Areas "G", "H", "I", and "J."

See Plate-7 of Drainage Report for location of sodded drainage swales.

WILLIAM MATOTAN & ASSOCIATES, INC. ENGINEERS 230 Truman Street, N.E. – Albuquerque, N.M. 87108 Telephone 265-8467	Project Sandstone Casa Sandia Apt. Capacity – Contribution	Sheet 2 of 2
	By SAM Chk'd ✓	Job No. 720
		Date Apr. 25 '84

A.P. "D" Double "D" Inlet in sump condition $Q = CLH^{3/2}$

one foot available curb height for ponding

$C = 3.0$
$L = (2.1250' + 6.5') = 8.6250'$
$H = 1.00'$ $H^{3/2} = 1.00$

$Q = (3.0)(8.6250)(1.00) = 25.8750$ cfs capacity

100yr. Volumes contributed to A.P. "D"

A.P. "C"	=	16.54 cfs
D.A. "D"	=	1.55 cfs

18.09 cfs ≅ (H of 9.5")

✓ OK Q_{100} < Double "D" Inlet Cap.

A.P. "G"
18" RCP Connecter Pipe Capacity

$A = 1.7671$
$w/p = 4.7124$
$R = 0.3750$ $R^{2/3} = 0.5183$
$S = 0.0310$ $S^{1/2} = 0.1761$
$f = 114.0000$ $(n = 0.013)$
$V = 10.4032$ fps
$Q = 18.3835$ cfs (capacity)

100yr. Volumes contributed to A.P. "G"

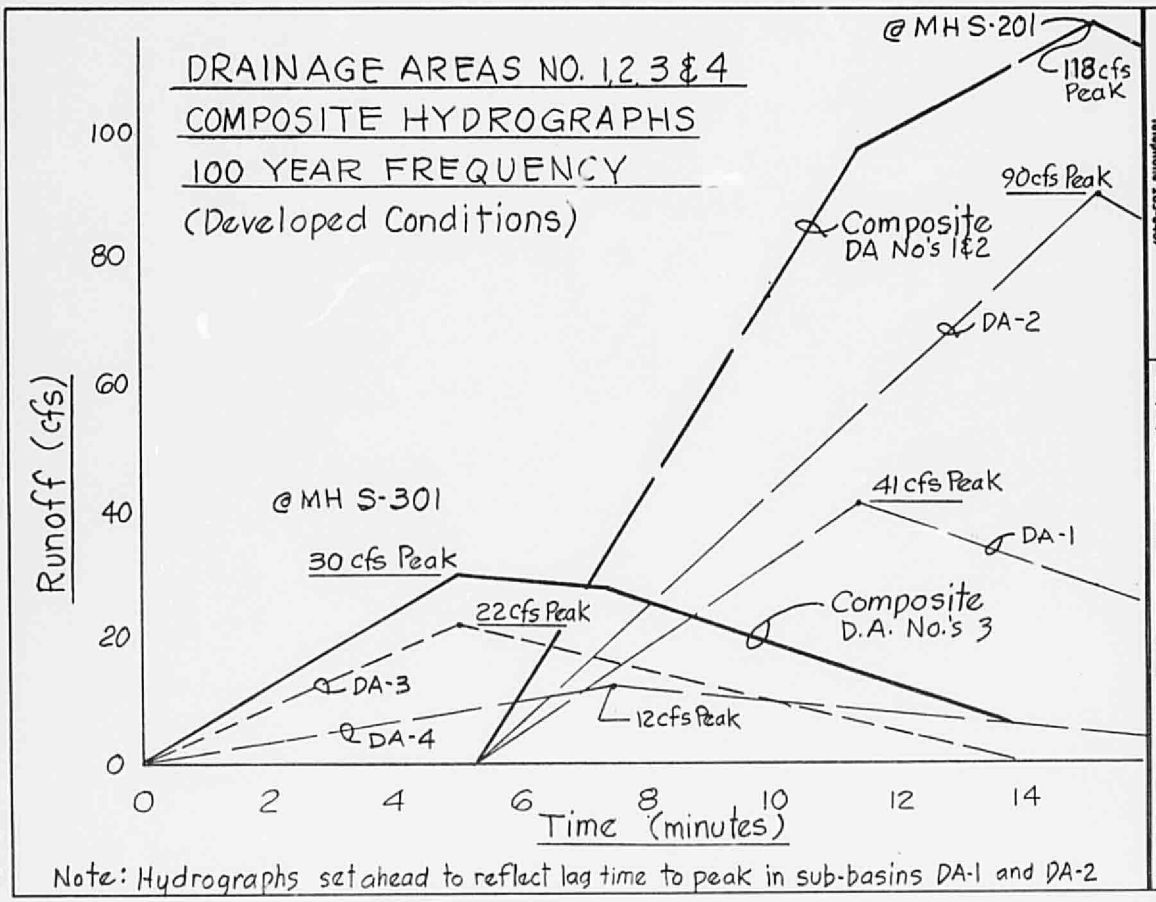
A.P. "D"	=	18.09 cfs
Indian School R.O.W.	=	0.23 cfs
D.A. "G"	=	0.04 cfs
(Contribution)		18.36 cfs

✓ OK $Q_{100} \cong$ 18" RCP Capacity

COMPOSITE HYDROGRAPHS
DRAINAGE AREAS 1, 2, 3 AND 4

Pages A-40 and A-41

Added 29 Apr. 84



Note: Hydrographs set ahead to reflect lag time to peak in sub-basins DA-1 and DA-2

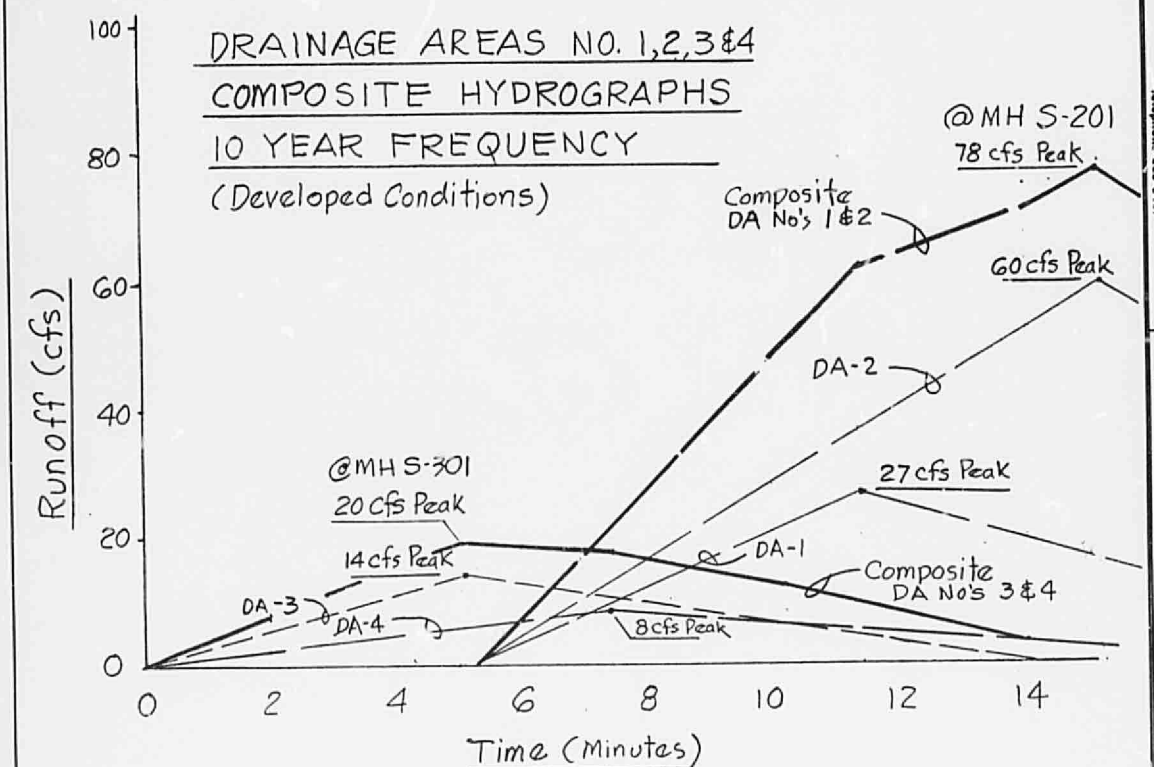
WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
330 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet 2 of 2
Subject: Drainage Study Job No. 720
Comp. by REP Date Apr. 26 '84 Chk'd ✓ Date 26 Apr. 84

WILLIAM MATOIAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone: 265-8447

Project CASA SANDIA APTS. Sheet 1 of 2
Subject: Drainage Study Job No. 720
Comp. by REP Date Apr. 26 84 Chk'd ✓ Date 29 Apr 84

DRAINAGE AREAS NO. 1,2,3 & 4
COMPOSITE HYDROGRAPHS
10 YEAR FREQUENCY
(Developed Conditions)



Note: Hydrographs set ahead to reflect lag time to peak in sub-basins DA-1 and DA-2.

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION

HYDROLOGY SECTION PROJ. NO. J15 DATE: 9/23/83

PLANNING DIVISION NO. _____

CONFERENCE RECAP

SUBJECT: Brown stone Apts (224 units) located South of Indian School West of North Diversion Channel

ATTENDANCE:	WHO	REPRESENTING
	John Armstrong	City
	Rod Peterson	Martolan & Assoc.

FINDINGS:

(1) Drainage Report Appropriate
(2) Free discharge directly to storm drain if it can be shown that System is adequate
(3) Summary Plat to eliminate lots.

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: _____
TITLE: CE / Hydrology
DATE: 9/23/83

SIGNED: Rodney E. Peterson
TITLE: Vice President
DATE: 9/23/83

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

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

May 14, 1984

Mr. William Matotan, P.E.
William Matotan & Associates
230 Truman NE
Albuquerque, NM 87108

REF: CASA SANDIA DRAINAGE REPORT (J15-D17)

Dear Mr. Matotan:

The above mentioned report is hereby approved. Please be sure that copies of the latest plan, along with approved copies of "Drainage Facilities Within City Right-of-Way" documents, are attached to the permit sets prior to submittal to Hydrology for final sign-off.

If you have any questions on the above, please feel free to call me at 766-7644.

Thank you,

John Armstrong
Civil Engineer/Hydrology

JA:mrk

cc: Gale Hunsinger, Brownstone Group
Gregg Olson

INFORMATION SHEET

PROJECT TITLE Casa Sandia Apartments TYPE OF SUBMITTAL Supplement to Original Report

ZONE ATLAS PAGE NO. J-15 CITY ADDRESS 1642 Indian School NE J-15-D17

LEGAL DESCRIPTION Brownstone Tract in the NE¼ NE¼, Sec. 16, T.10N, R.3E.

ENGINEERING FIRM William Mafetan & Assoc. Inc. CONTACT William I. Mafetan

ADDRESS 230 Truman St. N.E. 87108 PHONE (505) 265-8467

OWNER Brownstone Group CONTACT Gale Hunsinger

ADDRESS 230 Truman St. NE, Alb NM 87108 PHONE (505) 266-7955

ARCHITECT Miguel Trujillo & Assoc. CONTACT Miguel Trujillo

ADDRESS 8210 La Mirada NE. Alb N.M. 87109 PHONE (505) 298-7543

SURVEYOR William Mafetan & Assoc CONTACT William I. Mafetan

ADDRESS Same as above PHONE 265-8467

CONTRACTOR _____ CONTACT _____

ADDRESS _____ PHONE _____

PRE-DESIGN MEETING:

X YES
___ NO
___ COPY OF CONFERENCE RECAP SHEET PROVIDED

PLEASE CHECK TYPE OF APPROVAL EXPECTED WITH THIS SUBMITTAL:

___ SKETCH PLAT APPROVAL
___ PRELIMINARY PLAT APPROVAL
___ SITE DEVELOPMENT PLAN APPROVAL
___ FINAL PLAT APPROVAL
X BUILDING PERMIT APPROVAL
___ CERTIFICATE OF OCCUPANCY APPROVAL
___ ROUGH GRADING PERMIT APPROVAL
___ GRADING/PAVING PERMIT APPROVAL
X OTHER Supplement to Drainage Report (SPECIFY)

APR 30 1984
HYDROLOGY SECTION

DATE SUBMITTED: April 30, 1984

BY: William Mafetan & Assoc, Inc.

WILLIAM MATOTAN & ASSOCIATES INC • ENGINEERS

230 Truman Street, N.E. Albuquerque, New Mexico 87108 Phone (505) 265-8467

April 30, 1984

Mr. John Armstrong
City of Albuquerque
Design Hydrology Section
123 Central Ave. NW
Albuquerque, New Mexico 87102

Re: CASA SANDIA DRAINAGE REPORT (J15-D17)
City of Albuquerque Review Comments by letter of April 10, 1984

Dear Mr. Armstrong:

Subsequent to receipt of your review comments, we have revised the grading and drainage plan for subject project to handle all flows on-site and to discharge those flows from the site by direct connection to the existing storm sewer system. The previously submitted drainage report is hereby supplemented with the attached revised report documents:

1. Plate 5 - Existing 30" storm sewer and contributing drainage areas. (Revised to show "Developed Condition" runoff for the entire drainage basin, drainage areas 1, 2, 3 and 4.)

2. Plate 7 - Grading Plan, Developed Condition. (Revised to show on-site handling of all runoff, including "nuisance" flows and conveyance of all site runoff directly to existing storm sewer system with no discharge into the street.)

3. Appendix Page 9a. (Added to show drainage areas contributing to "nuisance" flows within the Indian School Road Right of Way; Areas "H", "I", and "J").

4. Appendix Pages A-10 thru A-13. (Revised to show runoff from all drainage basin areas under fully developed conditions).

5. Appendix Pages A-31 thru A-34. (Revised to analyze overland, street and storm sewer flows under developed conditions.

6. Appendix Pages A-35 thru A-39. (Added to show details, capacities and velocities of proposed site drainage facilities).

7. Appendix Pages A-40 and A-41. (Added to show "Composite Hydrographs" for drainage areas 1, 2, 3 and 4.)

As shown on Plate-7, all flows will be conveyed by on-site surface conveyance to a "double-D" inlet at the downstream corner of Drainage Area "D". Total 100-year runoff to this proposed inlet will be about 18 cfs (see page A-39). Conveyance of flows to this inlet, including all "nuisance" flows will be accomplished by the various swales and structures shown on pages A-35 thru A-39 and Plate-7. The "Double-D" inlet will be connected to existing storm sewer inlet #3 by an 18-inch diameter connector pipe (capacity 18.4 cfs). Existing inlet #3 has an 18-inch diameter connector pipe (capacity 30 cfs, page A-23) to existing M.H. #S-201.

A "Single-D", area drain, will be located between the "Double-D" inlet and existing inlet #3 to intercept about 0.3 cfs, 100-year runoff, from drainage areas "G" and "J".

Hydrograph analysis of drainage areas #1 thru #4 show that the combined peak flows for areas #3 and #4, 30 cfs for 100-year event, will pass through M.H. #S-301, at the sag on Indian School Road, about five minutes before the combined peak for drainage areas #1 and #2, 118 cfs for 100-year event, reaches M.H. #S-201, about 700 feet upstream at the intersection of University Blvd. and Indian School Road.

Inasmuch as the capacity of the existing 30-inch storm sewer on the downstream side of M.H #S-201 is 48 cfs (gravity flow, pipe full) 70 cfs of the 118 cfs peak flow will flow overland to inlets #7 and #8 at M.H. #S-301. The 30-inch outlet pipe from M.H. #S-301 has a capacity of 60 cfs, gravity flow-pipe full, therefore 12 cfs of the 70 cfs can enter the storm sewer leaving 58 cfs to flow overland to the north of Indian School Road via the historic drainageway between Indian School Road and Interstate Route 25 (I-25.)

Review of "Drainage Report for Netherwood Apartments" (J-15-D20) dated March 13, 1984, and "Response to City Review Comments," dated April 10, 1984, for that report, confirms recognition of the historic drainageway and describes provision for surface conveyance of 81 cfs overland flow from the sag on Indian School Road to the I-25 drainage structure which conveys flow from this drainage under I-25.

As quoted from the section "Flood Plain Information" of that report:

"As indicated in the February 1, 1984, conference notes, this flood plain cannot be shifted onto adjacent property. Computations contained in Appendix 2 have been made to insure that 81 cfs overland flow can be conveyed safely between the northern boundary of the Oddfellows Building and the apartment units. These computations indicate that the flow depth is less than 0.5 feet. Finished floor elevations in the apartment units have been set at least one-foot above the anticipated flow depth. It should also be noted that to insure that runoff follows its historic path, the grades along the property line match closely with existing ground."

The consultant response, dated April 10, 1984, to City review comments, includes the following eference to the existing drainage structure at I-25 and available ponding upstream from that structure, within the I-25 right-of-way:

"The invert elevation of the 30" RCP is approximately 5029.0. To avoid damage to the retaining wall, ponding must not occur higher than the 5032.0 contour. I have estimated that approximately 45,000 cu. ft. of storage is provided between the 5030.0 and 5032.0 contour. Utilizing the 100-year runoff hydrograph (see enclosed), and the fact that a 30" RCP can convey 31 cfs with a head of 1.75 feet, (0.5 feet above top of the pipe), approximately 50,000 cu. ft. of storage is required. In my opinion, this provides a reasonable match."

The Grading/Drainage Plan, dated April 9, 1984, submitted with the above drainage report, shows that the historic drainageway between the sag on Indian School Road and the I-25 right-of-way line will not be blocked by permanent structures, but will be conveyed along that drainageway by means of an inverted crown pavement section from Indian School Road to a rip-rap rundown, 15-feet in width and 1-foot depth at the I-25 right-of-way.

We have recently conducted a detailed field survey of the conditions existing within the I-25 right-of-way and confirm that the inlet flowline elevation of the 30" RCP is 5028.71; the top of shoulder pavement elevation, 17 feet west of the culvert inlet, is 5035.2; roadway embankment elevation, 15 feet east of the edge of pavement, is 5032.7; low elevation

of ponding area, 10 feet east and 20 feet north of the culvert inlet is 5028.1; and approximately 45,000 cu. feet of ponding exists within the I.25 right-of-way below elevation 5032.

Based on the above analysis and for the following summarized reasons, it is recommended that the revised grading and drainage plan for the Casa Sandia Project be approved to allow direct discharge into the existing storm sewer system without requirements for on-site ponding:

1. Increase to basin flows will not result in encroachment or potential damage to private property.

2. Proposed facilities within the downstream historic drainageway are being designed on the basis of 81 cfs overland flow for the 100-year event. Our studies indicate a more probable overland runoff peak of about 58 cfs for that event, about 30% less.

3. Ponding capacity exists with the I-25 right-of-way, at the 30" pipe to contain the 100-year overland flow from the sag on Indian School Road, in excess of the storm sewer capacity. Water surface of the ponding would be 15 feet or more from the edge of the highway shoulder pavement and about 2.5' below the shoulder elevation. Total volume of the 100-year ponding would be discharged through the 30" culvert in less than 2 hours.

4. The fully developed Casa Sandia Project will increase flows to the drainage basin by only 8.7 cfs, about 5% of the fully developed basin flows for the 100-year event.

5. Rough grading of the site received approval based on no site ponding and rough grading construction has been completed.

6. Due to extreme grade differential across the site, on-site ponding is extremely difficult, would require extensive retaining walls, would probably require a signigicant reduction in the number of apartment and would make the economic viability of the project doubtful.

April 30, 1984

Your timely review of our original drainage report is deeply appreciated and we look forward to your response to our revised plan in order that a building permit can be issued for the project at the earliest possible date.

Very truly yours,

WILLIAM MATOTAN & ASSOCIATES, INC.

William I. Matotan

William I. Matotan, P.E. & L.S.
President

WIM:jal

Enclosures

cc w/enc.:
Mr. Richard Rushing, Project Coordinator, Brownstone Group
Mr. Gale Hunsinger, Project Superintendent, Brownstone Group
Job File 720

DRAINAGE REPORT

FOR

CASA SANDIA APARTMENTS (J15-D17)
AN APARTMENT COMPLEX IN THE
CITY OF ALBUQUERQUE, NEW MEXICO

MARCH, 1984

WILLIAM MATOTAN AND ASSOC., INC.
ENGINEERS
ALBUQUERQUE, NEW MEXICO

DRAINAGE REPORT

FOR

CASA SANDIA APARTMENTS (J15-D17)
AN APARTMENT COMPLEX IN THE
CITY OF ALBUQUERQUE, NEW MEXICO

MARCH, 1984

WILLIAM MATOTAN AND ASSOC., INC.
ENGINEERS
ALBUQUERQUE, NEW MEXICO

DRAINAGE REPORT

FOR

CASA SANDIA APARTMENTS

PREPARED FOR:

THE BROWNSTONE GROUP

3130 SOUTHWEST FREEWAY, SUITE 204

HOUSTON, TEXAS 77098

MARCH 1984

PREPARED BY:

WILLIAM MATOTAN & ASSOCIATES, INC.

230 TRUMAN STREET, N. E.

ALBUQUERQUE, NEW MEXICO 87108

William I. Matotan

WILLIAM I. MATOTAN
N.M. P.E. NO. 1593

DRAINAGE REPORT
FOR
CASA SANDIA APARTMENTS

INDEX

APPENDIX

PLATES

DRAINAGE REPORT
FOR
CASA SANDIA APARTMENTS

I. GENERAL

This report presents a comprehensive analysis of the drainage control, flood control and erosion control constraints on and impacts resulting from the planned construction of a 218-unit apartment complex within the limits of the City of Albuquerque, New Mexico.

Plans for the proposed development have been prepared in accordance with criteria and guidelines established by the City of Albuquerque, New Mexico State Highway Department and Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA).

A. Site Description and Location.

The site is triangular in shape and contains 5.4361 acres. It is bounded on the south by the existing Citadel Apartment complex (at the intersection of University Boulevard, N. E., and Indian School Road, N. E.), on the westerly side by Indian School Road, N. E., and on the easterly side by the AMAFCA North Diversion Channel. The site is identified on zone atlas map J-15-Z. (See Vicinity Map, Plate 1.)

The site slopes generally from east to west with a maximum difference in elevation across the site of about 30 feet from the southeast corner (at the AMAFCA North

A. Site Description and Location (continued).

Diversion Channel) to the southwest corner at Indian School Road. Slopes vary from about 4% to 6%.

Soil classes for the site are designated as "BKD", Bluepoint Series and "Cu", Cut and Fill land, in the SCS soils report, sheet 31, for Bernalillo County. (Plate 2.) Soil cover is sparse with an estimated 10% cover of native weeds and grasses.

Current flood hazard boundary maps do not indicate flooding on or adjacent to the site due to a 100-year frequency rainfall event. (Plate 3.)

B. Zoning.

By action of the Environmental Planning Commission on October 20, 1983, zoning of the site was changed from C-3 to R-3. Findings of the Commission were as follows:

1. The requested R-3 zoning is appropriate to and compatible with surrounding zoning.

2. The reported R-3 zoning is more appropriate to the site than C-3 zoning.

C. Methods of Analysis.

In general, criteria outlined in Sections 22.2 and 22.3 of the City of Albuquerque Development Process Manual (DPM) was used to evaluate existing and developed

C. Methods of Analysis (continued).

runoff for the project site.

Specifically:

1. Six-hour rainfall volumes from Plate 22.2 D-1.

2. Rainfall intensities from Plate 22.2 D-2.

3. Peak Flowrate Computations by Rational Formula, Section 22.2, page 17.

4. Inlet capacities by weir formula, Section 22.3, page 17 and grate capacities from Plates 22.3 D-5 and 22.3 D-6.

5. Concrete connector pipe flow from Plate 22.3 D-8.

6. "C" Factors to be used with Rational Formula from Handbook of Applied Hydrology, by Chow.

7. Time of Concentration, "Tc", from Section 22.2, page 3.

As-built construction drawings for New Mexico Project I-025-4 (29) 222 and Special Assessment District 166A, were utilized for analysis of the existing Indian School Road-University Boulevard storm sewer system.

C. Methods of Analysis (continued).

Volume I, Plate 2 of the Albuquerque Master Drainage Study, showing existing and proposed storm drainage facilities in the project vicinity, was reviewed and a portion thereof included as Plate 3 of this report.

Field investigations were conducted to confirm on-site and off-site runoff conditions and conditions of the existing downstream storm sewer system.

Plates 4 and 5 of this report show the existing off-site storm sewer system layout and contributing drainage areas. Plate 7 shows the existing and developed contours and site discharge analysis points.

II. ON-SITE CONDITIONS

A. Undeveloped Flows.

Historically, storm water runoff from the site and from lands to the east of the site was conveyed westerly, by natural minor arroyos into Campus Draw. Campus Draw being a major, south to north, drainageway through that part of the City. Subsequent construction of the AMAFCA North Diversion Channel diverted all upstream runoff from the site and construction of Indian School Road provided downstream interception of runoff from the site.

Runoff from the project site now discharges directly onto Indian School Road. Indian School Road being an asphalt paved arterial, 66 feet in width from flowline to flowline of gutters. (The existing layout plan and profile

A. Undeveloped Flows (continued).

of Indian School Road, along the downstream (westerly) side of the site is shown on Plate 6.)

About 50 feet downstream from the southwest corner of the site, street flow from Indian School Road enters the intersection of Indian School Road and University Boulevard. Street runoff is intercepted by storm sewer inlets at each corner of that intersection.

The storm drain inlets in that intersection have been numbered 3, 4, 5 and 6 for purposes of this report and are shown, together with details of the entire storm drain system, on Plates 5 and 6 of this report.

Undeveloped site runoff peaks are as follows:

10-year frequency:	Q = 6.27 cfs
100-year frequency:	Q = 9.58 cfs

Areas contributing to the above runoff are:

1. Project site = 5.4361 acres
2. Off-site = 0.4573 acres

The off-site area contribution is from a strip of undeveloped land, about 25 feet wide, east of the project, lying between the east property line and the west side of the AMAFCA North Diversion Channel.

Computations of the undeveloped runoff are included in the Appendix of the report, pages A-1 through A-9.

B. Developed Flows.

The developed site will consist of seven separate drainage areas. Drainage area designations and boundaries are shown on the "Grading Plan - Developed Condition", Plate 6 of this report.

A summary of the developed drainage areas and respective peak runoff is shown on pages A-1 and A-1a of the Appendix. Computations of developed peak runoff are included in the Appendix, pages A-2 through A-9.

Total developed runoff peaks are as follows:

10-year frequency: Q = 11.57 cfs
100-year frequency: Q = 17.63 cfs

Areas contributing to the above runoff are:

Project site = 5.4361 acres
Off-site = 0.4573 acres

It is proposed that the 0.45-acre, undeveloped, off-site area (land of AMAFCA) draining onto the project site, will be sodded with Kentucky Bluegrass and maintained by the project owner. Runoff from the off-site contributing area will be reduced from the undeveloped 100-year peak fow of 0.74 cfs to a developed 100-year peak flow of 0.42 cfs. The reduced runoff, after development, will result from the lesser "c" factor (runoff coefficient), estimated as 0.20 for the turfed condition, as opposed to a "c" factor estimated as 0.35 for the existing undeveloped "bare earth" condition.

B. Developed Flows (continued).

Site grading and landscape plans are presently being reviewed by both AMAFCA and the Albuquerque office of the Corps of Engineers. Tentative approval to sod the 0.45-acre AMAFCA strip, as part of this project, was given by AMAFCA prior to finalizing the landscape plan.

A summary of the total developed pervious and impervious acreage for each of the project drainage areas is shown on page A-1a of the Appendix. Pervious areas were considered to be those sodded and landscaped areas around the buildings and outside of parking areas, drives and sidewalks. A "c" factor of 0.20 was used in runoff computations for all pervious areas. Impervious areas were considered to be all paved drives and parking areas, concrete curbs and gutters, retaining walls, concrete walks, building roofs and roof overhangs. Various "c" factors, ranging between 0.82 and 0.90 were used in runoff computations for impervious areas.

As shown on Plate 7 of this report, developed runoff from Drainage Areas "B" through "E" will free discharge directly to Indian School Road at four locations labeled A.P. (analysis points) "B" through "E".

Drainage area "B" runoff will discharge at the north entrance drive, A.P. "B", at a 10-year peak rate of 2.48 cfs and a 100-year peak rate of 3.79 cfs.

Drainage area "C" runoff will discharge at the south entrance drive, A.P. "C", about 370 feet south of and downstream from A.P. "B", at a 10-year peak rate of 6.19 cfs and 100-year peak rate of 9.44 cfs.

B. Developed Flows (continued).

Drainage Area "D" will discharge into the Indian School Road Right-of-Way at A.P. "D", about 230 feet south of and downstream from the south entrance drive. Runoff from Area "D" will be conveyed to the street by a concrete-cobbled rundown, City of Albuquerque Standard Sidewalk Culvert and 2-foot wide curb opening. The 10-year peak discharge rate will be 1.02 cfs and 100-year peak rate 1.55 cfs.

Drainage Area "E" will discharge into the Indian School Road Right-of-Way at A.P. "E", about 220 feet south of and downstream from the north entrance drive. Runoff from Area "E" will be conveyed to the street in the same manner as described above for Area "D". The 10-year peak discharge rate will be 1.23 cfs and 100-year peak rate 1.87 cfs.

Runoff from drainage area "A", at the extreme north end of the site, will sheet flow into a sodded and landscaped area along Indian School Road at a 10-year peak rate of 0.34 cfs and 100-year peak rate of 0.51 cfs.

Runoff from drainage area "F" will sheet flow into a sodded and landscaped area, about 170 feet in length, between the north and south entrance drives, at a 10-year peak rate of 0.28 cfs and 100-year peak rate of 0.43 cfs.

Runoff from drainage area "G", at the southwest corner of the site, will sheet flow into a sodded and landscaped area along Indian School Road at a 10-year peak rate of 0.03 cfs and 100-year peak rate of 0.04 cfs.

B. Developed Flows (continued).

In summary, total developed peak flow rates discharging to Indian School Road and the existing storm sewer system are 5.3 cfs greater than the historic undeveloped rate for the 10-year runoff event and 8 cfs greater for the 100-year event.

C. Adequacy of Downstream Drainage System.

1. General

The existing downstream drainage system is shown on Plate 4, "Existing Storm Sewer System No. 129" and Plate 5, "Existing 30" Storm Sewer and Contributing Drainage Areas."

Four drainage areas have been identified as contributing to the system. Boundaries of the four areas together with acreages and peak runoff rates for the 10-year and 100-year frequency rainfall are shown on Plate 5.

Area runoff computations are shown on Appendix pages A-10 through A-13, storm sewer capacity computations on pages A-14 through A-30 and street flow capacity computations on pages A-31 through A-34.

"Developed condition" flows from the project site contribute to Drainage Area 1 and have been used in all downstream drainage analysis computations.

2. Existing Storm Sewer System

The original storm sewer system on Indian

2. Existing Storm Sewer System (continued)

School Road was constructed during the 1960's, concurrent with the re-alignment and construction of Indian School Road under New Mexico Project I-025-4 (29) 222. It consisted of about 1280' of 30-inch-diameter reinforced concrete pipe main, four manholes and two combination drop inlets. The 30-inch-diameter main extended from a "free outlet" at the upstream end of three 120-inch-diameter culvert pipes (draining from southeast to northwest under I-25) easterly to the intersection of Indian School Road and University Boulevard where it terminated at a manhole on the west side of the intersection (City M.H. #S-201). One combination drop inlet, D.I.C. 61-1, Type II (numbered inlet #4 in this report) was installed in the northeast curb return of that intersection, on Indian School Road, and the second drop inlet, D.I.C. 61-1, Type II, (numbered inlet #7 in this report), was installed in the north curb of Indian School Road, at a sag curve, about 600 feet west of University Boulevard.

In 1970, the 30-inch-diameter main was extended about 330 feet to the south on University Boulevard, concurrent with the construction of University Boulevard, under City Paving District No. 166A, and terminated at a manhole, (no City manhole number, numbered "Sta. H25 for this report) in a sag vertical curve. Three combination inlets, double "C" type, (inlets numbered 3, 5 and 6 in this report), were constructed in the intersection of Indian School Road and University Boulevard, one each at the southeast, southwest and northwest corners of the intersection. Two drop inlets, one a combination type 2-double "C", (inlet number 2, this report), installed in the low point of the west curb and one grated type, single "C", (inlet number 1, this report) installed in the gutter of a

2. Existing Storm Sewer System (continued)

driveway on the east side of University Boulevard, both about 250 feet south of Indian School Road.

One additional drop inlet, a grated type double "D", (inlet number 8, this report) was found during a field investigation, behind the curb, on the south side of Indian School Road, north of the entrance drive to the St. Paul Lutheran Church. No plans could be found for this inlet.

It was noted during the field investigation for this report that inlet #7 flowline, in the sag vertical curve and low side of the super-elevated roadway (bottom of east approach to the Indian School Road bridge over I-25), is about 8 inches higher in elevation than the low portion of the roadway sag. The existing drainage outlet for that portion of Indian School Road consists of three curb cuts, one about 30' long, immediately upstream, to the west of the inlet and two curb cuts, about 35' long and 30' long, upstream, to the east of the inlet. (See sketch on Appendix page A-33). All 100-year frequency street flows, in excess of the storm sewer capacity, from drainage areas #1, #3 and #4, (including all of Indian School Road, between I-25 and the AMAFCA North Diversion Channel), together with street overflow from the sag south of Indian School Road on University Boulevard (drainage area #2) discharges to the north and west through those curb cuts.

Overflow from drainage area #2, at the street sag on University Boulevard, flows west in an asphalt paved, inverted crown driveway, along the south side of an office building at 1415 University Boulevard, N. E., thence across Indian School Road through the curb

2. Existing Storm Sewer System (continued)

cuts mentioned above.

It is estimated that for the 10-year event, about 8 cfs from drainage area #2 would discharge to Indian School Road via the above-described route and for the 100-year event, about 31 cfs would be discharged. Capacity of the inverted crown driveway is estimated at 74 cfs or 43 cfs greater than the estimated 100-year peak flow rate (Appendix page A-32).

The only existing surface discharge point from the downstream end of drainage area #2 is the one described above, which appears to be a historic drainageway for surface runoff in this area. The Master Drainage Plan for the City of Albuquerque shows a proposed future 36-inch diameter storm sewer line, with the upstream end intercepting drainage area #2 flows at the sag point in University Boulevard, described above, and conveying that runoff west along the present surface flow route to Indian School Road, thence along the south side of Indian School Road to a point of discharge at the inlet to three 120-inch-diameter existing culverts under I-25 at "Campus Draw."

It should be noted that none of the storm water runoff from the Casa Sandia Apartment project will contribute to Drainage Area #2 or to the proposed future storm sewer.

The total area contributing to the Indian School Road drainage system, between the AMAFCA North Diversion Channel and Interstate Route-25 (including the Casa Sandia project site as part of Drainage Area #1)

2. Existing Storm Sewer System (continued)

is about 57.4 acres (Appendix page A-11).

Estimated peak storm runoff from the above area: (Appendix page A-10).

10-year frequency =	91 cfs
100-year frequency =	138 cfs

Total estimated storm sewer system inlet capacity is estimated to be 138 cfs (assuming the inlet connector pipe capacity governs when it is less than inlet grate capacity.) (Appendix page A-14).

No inlet capacity has been allowed for the "throat" inlet at the curb. This capacity is considered to be equal to that lost by clogging of the grate during runoff periods.

Maximum capacity of the 30-inch storm sewer main, assuming pipe flowing full under gravity flow conditions is 71 cfs. (Appendix page A-29).

Maximum street flow would be the difference between the storm sewer capacity and peak storm runoff and is estimated to be 20 cfs for the 10-year frequency and 67 cfs for the 100-year frequency peak runoff.

The above peak street flow would occur at the previously-described sag on Indian School Road, about 600 feet west of University Boulevard. Flows discharge north through the three existing curb cuts into the historic drainageway (old Indian School paved roadway), thence westerly along the old roadway pavement to the I-25 drainage

2. Existing Storm Sewer System (continued)

structures that convey the runoff under the I-25 roadway into the historic Campus Draw drainageway on the west side of the interstate.

Capacity of the existing asphalt paved drainageway (old Indian School Road) is estimated to be 247 cfs, four times greater than the estimated 57 cfs peak flow for the 100-year frequency storm event. (Appendix page A-34).

3. Street Flow Capacity

Runoff from the project site contributes to Indian School Road flows only. Analysis of the capacity of Indian School Road indicates only two critical points for maintaining one dry driving lane in each direction during the 10-year peak runoff. One point being the section of Indian School Road west of the intersection with University Boulevard and immediately downstream from storm sewer inlets #5 and #6. (Appendix page A-31). At that point, the roadway has a continuous cross slope to the north curb and is at the downstream discharge for Drainage Area #1.

The street capacity is estimated to be 8.1 cfs when one dry driving lane exists in each direction. Under the above flow conditions, the entire east-bound half of the street (33 feet) would be dry and the inside 12-foot, west-bound driving lane would be dry. Depth of flow at the north curb would be 0.38' (4½ inches).

With flow two inches above the north (low)

3. Street Flow Capacity (continued)

curb, about 48 feet of the 66 feet total width would be wet and peak street flow would be about 75 cfs.

Capacity of storm sewer inlets #3, #4, #5 and #6, immediately upstream from this section is about 49 cfs. Estimated peak flows for drainage area #1, including developed flows from the Casa Sandia project, are 27 cfs for the 10-year and 41 cfs for the 100-year frequency. Street flow would be the difference between the peak drainage area flows and the flow capacity of the storm sewer system which would indicate zero street flow at the critical section. In other words, the storm sewer system immediately upstream from the critical section will handle all peak runoff from drainage area #1 for both the 10-year and the 100-year frequency events.

The second critical point for street flow on Indian School Road is about 600 feet west of the above-described point, at the sag vertical curve at the east approach to the bridge over I-25. This location has been discussed earlier relative to drainage north and west through three existing curb cuts in the north curb, thence along the historic drainageway in the paved roadway of old Indian School Road. It is important to note that the old Indian School Road drainageway is the only surface flow outlet from the sag vertical curve on Indian School Road and that it conveys all surface flows, that exceed the storm sewer capacity, from drainage areas #1, #2, #3 and #4. It is estimated that about 12 cfs would be flowing across the super-elevated street section at that point during the 10-year frequency event and that the maximum depth in the street would be about two inches. This depth would occur

3. Street Flow Capacity (continued)

during the first 10 to 15 minutes of the runoff event and would decrease rapidly thereafter as the storm intensity decreased.

For the 100-year peak flow, it is estimated that a peak flow of about 55 cfs would sheet flow across Indian School Road at a maximum depth of about four inches.

III. OFF-SITE CONDITIONS

A. General.

The only offsite area contributing runoff to the project site is a strip of undeveloped AMAFCA land about 25 feet wide and about 800 feet in length along the easterly side of the project. It consists of about 0.46 acres and contributes about 0.49 cfs peak flow during the 10-year event and about 0.74 cfs during the 100-year event.

Along the south boundary of the site, on the adjoining lands of the Citadel Apartment Complex, an asphalt-lined, inverted crown, drainage swale conveys runoff from that property westerly to Indian School Road.

Indian School Road borders the project site along the westerly side, for the entire length of the project and conveys the only runoff discharge from the project.

IV. EROSION CONTROL

A. Rough Grading

A "rough grading plan" was previously submitted to the City and approved for construction. That plan included construction of earth dikes along the tops of all embankment areas to prevent erosion of the embankments and to ensure that eroded material will not be drained onto the roadway of Indian School Road.

B. Construction Phase

During the construction phase, all embankments will be protected from erosion by means of ditches and dikes. Sand cover will be spread over bare earth where deemed necessary to prevent runoff and erosion and, if deemed necessary, temporary on-site ponding will be utilized.

C. Permanent Phase

All bare earth areas will be sodded and landscaped.

Where vertical grade changes greater than 18 inches occur, they will be retained by concrete retaining walls.

No slopes over three feet in height will be steeper than 3:1 and slopes less than three feet high will not be steeper than 2:1.

V. CONCLUSIONS

Detailed investigations and analysis of off-site conditions, existing storm sewers and street flow capacities, indicates that free discharge of storm runoff from the developed project site is feasible and will have only a minimal impact on existing downstream drainage facilities.

VI. RECOMMENDATIONS

It is recommended that the City of Albuquerque approve this drainage report and permit the free discharge of runoff from the project site into the adjacent City street and downstream storm sewer facility.

APPENDIX

STORM RUNOFF FROM PROJECT SITE

Pages A-1 thru A-9

WILLIAM MATOTAN & ASSOCIATES, INC. ENGINEERS 230 Truman Street, N.E. - Albuquerque, N.M. 87108 Telephone 265-8467	Project CASA SANDIA APTS. Sheet 1 of 9 Subject: Drainage Study Job No. 720 Comp. by REP Date 12 Mar 84 Chk'd ✓ Date 12 Mar. 84

SUMMARY OF STORM RUNOFF from PROJECT SITE

Drainage Area	Exist. Condition		Developed Condition	
	Q_{10}	Q_{100}	Q_{10}	Q_{100}
"A"	0.38 cfs	0.58 cfs	0.34 cfs	0.51 cfs
"B"	1.29	1.98	2.48	3.79
"C"	3.23	4.93	6.19	9.44
"D"	0.52	0.80	1.02	1.55
"E"	0.63	0.96	1.23	1.87
"F"	0.18	0.27	0.28	0.43
"G"	0.04	0.06	0.03	0.04
TOTALS (cfs)	6.27	9.58	11.57	17.63

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ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APARTMENTS Sheet ____ of ____
Drainage Study Job No. 720
By REP Chk'd ✓ Date Mar. 6, 1984

SUMMARY OF PROJECT DRAINAGE AREAS

Area Designation	Pervious (Acres)	Impervious (Acres)	Total Acres
"A" Off-site	0.1004	0	0.1004
On-site	0.1967	0.0618	0.2585
Sub-total	0.2971	0.0618	0.3589
"B" Off-site	0.182	0	0.182
On-site	0.1433	0.8918	1.0351
Sub-total	0.3253	0.8918	1.2171
"C" Off-site	0.1749	0	0.1749
On-site	0.6290	2.2251	2.8541
Sub-total	0.8039	2.2251	3.0290
"D" Off-site	0	0	0
On-site	0.1184	0.3730	0.4914
Sub-total	0.1184	0.3730	0.4914
"E" Off-site	0	0	0
On-site	0.1537	0.4390	0.5927
Sub-total	0.1537	0.4390	0.5927
"F" Off-site	0	0	0
On-site	0.0725	0.092	0.1645
Sub-total	0.0725	0092	0.1645
"G" Off-site	0	0	0
On-site	0.0392	0.0006	0.0398
Sub-total	0.0392	0.0006	0.0398
Sub-total, Off-site	0.4573	0	0.4573
Sub-total, On-site	1.3528	4.0833	5.4361
TOTAL	1.8101	4.0833	5.8934

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ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS Sheet 2 of 9
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Rainfall Volumes (from DPM, Vol. 2, Plate 22.2 D-1)

6-Hour Rainfall Volumes

100 Yr. Frequency = 2.2"
50 " " = (2.2")(0.92) = 2.02"
10 " " = (2.2")(0.657) = 1.44"
5 " " = (2.2")(0.544) = 1.19"
2 " " = (2.2")(0.445) = 0.98"

Rainfall Intensity

From DPM, Vol. 2, Plate 22.2 D-2

$I_{100} = (6\text{ hr. rainfall})(6.84)(t_c)^{-0.51}$

where I_{100} = Rainfall Intensity (Dimensionless), 100yr. fr.
t_c = Time of Concentration in Minutes

$I_{10} = (I_{100})(0.657)$

Drainage Area Runoff (Use Rational Formula)

$Q = CIA$

Q = Peak runoff in cubic feet per second (cfs)
C = Runoff Coefficient
I = Rainfall intensity in inches per hour for the design frequency and time of concentration
A = Drainage Area in acres

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ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

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Time of Concentration

From DPM, Vol. 2, Sec. 22.2, p. 3

$T_c = (0.0078)\left(\frac{L^{0.77}}{S^{0.385}}\right)$ where:

T_c = Time of Concentration in minutes

L = length of drainage basin, in feet

S = slope of drainage basin, in feet of rise per foot of length

D.A. "A", $L = 175'$ $S = \frac{11.5 - 6.5}{175} = 0.03'/ft.$

$T_c = (0.0078)\frac{175^{0.77}}{0.03^{0.385}} = 1.6$ Min. Use 10 Min

D.A. "B", $L = 415'$ $S = \frac{11.5 - 02.7}{415} = 0.02'/ft.$

$T_c = (0.0078)\frac{415^{0.77}}{0.02^{0.385}} = 3.6$ Min. Use 10 Min.

D.A. "C", $L = 900'$ $S = \frac{111.5 - 84.5}{900} = 0.03'/ft.$

$T_c = (0.0078)\frac{900^{0.77}}{0.03^{0.385}} = 5.6$ Min. Use 10 Min.

D.A. "D", $L = 230'$ $S = \frac{85.7 - 82.0}{230} = 0.02'/ft.$

$T_c = (0.0078)\frac{230^{0.77}}{0.02^{0.385}} = 2.3$ Min. Use 10 Min.

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Telephone 265-8467

Project CASA SANDIA APTS. Sheet 4 of 9
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Comp. by RDL Date 7 Mar 84 Chk'd ✓ Date 7 Mar.

Time of Concentration (Cont'd)

O.A. "E", $L = 265'$ $S = \frac{106.3 - 95}{265} = 0.04'/ft.$

$T_c = (0.0078)\frac{265^{0.77}}{0.04^{0.385}} = 2.6$ Min. Use 10 Min.

O.A. "F", $L = 110'$ $S = \frac{103.0 - 99}{110} = 0.04'/ft.$

$T_c = (0.0078)\frac{110^{0.77}}{0.04^{0.385}} = 1.0$ Min. Use 10 Min.

O.A. "G", $L = 75'$, $S = \frac{83.75 - 80.5}{75} = 0.04'/ft$

$T_c = (0.0078)\frac{75^{0.77}}{0.04^{0.385}} = 0.7$ Min. Use 10 Min.

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* "C" Factors (to be used in Rational Form Q = CIA)

Type of Drainage Area	Runoff Coefficient, "C"	
Lawns, sandy soil, steep	0.15 - 0.20	Use 0.20
Streets:		
Asphaltic	0.70 - 0.95	Use 0.82
Concrete	0.80 - 0.95	Use 0.90
Roofs	0.75 - 0.95	Use 0.85
Unimproved Areas	0.10 - 0.35	Use 0.35

* From "Handbook of Applied Hydrology" by Ven Te Chow, Professor of Hydraulic Engineering, University of Illinois; pub. McGraw-Hill Book Company

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ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet 6 of 9
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Project Site Drainage Areas and Developed Composite "C" Factors

Drainage Area	Area in Acres	Composite "C" Factor (Developed Condition)
"A"	Offsite = 0.1004 Onsite = 0.2585 Total 0.3589	0.31
"B"	Offsite = 0.182 Onsite = 1.0351 Total 1.2171	0.67
"C"	Offsite = 0.1749 Onsite = 2.8541 Total 3.0290	0.67
"D"	Offsite = 0 Onsite = 0.4914 Total 0.4914	0.68
"E"	Offsite = 0 Onsite = 0.5927 Total 0.5927	0.68
"F"	Offsite = 0 Onsite = 0.1645 Total 0.1645	0.56
"G"	Offsite = 0 Onsite = 0.0398 Total 0.0398	0.21

Total Area onsite = 5.4361
Total Area offsite = 0.4573

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ENGINEERS
230 Truman Street, N. E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS Sheet 7 of 9
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Rainfall Intensity

T_c = 10 Minutes all areas "A" through "G"

$\therefore I_{100} = (2.2)(6.84)(10)^{-0.51} = 4.65$

and $I_{10} = (4.65)(0.657) = 3.05$

Drainage Area Peak Runoff ($Q = CIA$)

D.A. "A" (Includes 0.10 Ac. offsite undeveloped area)

1. Exist. Condition ($C = 0.35$)

$Q_{100} = (0.35)(4.65)(0.3589) = 0.58$ cfs

$Q_{10} = (0.35)(3.05)(0.3589) = 0.38$ cfs

2. Developed Condition ($C = 0.31$)

$Q_{100} = (0.31)(4.65)(0.3589) = 0.51$ cfs

$Q_{10} = (0.31)(3.05)(0.3589) = 0.34$ cfs

D.A. "B" (includes 0.182 Ac. offsite undeveloped area)

1. Exist. Condition ($C = 0.35$)

$Q_{100} = (0.35)(4.65)(1.2171) = 1.98$ cfs

$Q_{10} = (0.35)(3.05)(1.2171) = 1.29$ cfs

2. Developed Condition ($C = 0.67$)

$Q_{100} = (0.67)(4.65)(1.2171) = 3.79$ cfs

$Q_{10} = (0.67)(3.05)(1.2171) = 2.48$ cfs

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Drainage Area Peak Runoff (Cont'd)

D.A. "C" (Includes 0.1749 acres offsite undeveloped area)

1. Exist. Condition (C = 0.35)

$Q_{100} = (0.35)(4.65)(3.029) = 4.93$ cfs

$Q_{10} = (0.35)(3.05)(3.029) = 3.23$ cfs

2. Developed Condition

$Q_{100} = (0.67)(4.65)(3.029) = 9.44$ cfs

$Q_{10} = (0.67)(3.05)(3.029) = 6.19$ cfs

D.A. "D" (No offsite flows contribute to this area)

1. Exist. Condition (C = 0.35)

$Q_{100} = (0.35)(4.65)(0.4914) = 0.80$ cfs

$Q_{10} = (0.35)(3.05)(0.4914) = 0.52$ cfs

2. Developed Condition (C = 0.68)

$Q_{100} = (0.68)(4.65)(0.4914) = 1.55$ cfs

$Q_{10} = (0.68)(3.05)(0.4914) = 1.02$ cfs

D.A. "E" (No offsite flows contribute to this area)

1. Exist. Condition (C = 0.35)

$Q_{100} = (0.35)(4.65)(0.5927) = 0.96$ cfs

$Q_{10} = (0.35)(3.05)(0.5927) = 0.63$ cfs

2. Developed Condition (C = 0.68)

$Q_{100} = (0.68)(4.65)(0.5927) = 1.87$ cfs

$Q_{10} = (0.68)(3.05)(0.5927) = 1.23$ cfs

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Drainage Area Peak Runoff (Cont'd)

D.A. "F" (No offsite flows contribute to this area)

1. Exist. Condition (C = 0.35)

$Q_{100} = (0.35)(4.65)(0.1645) = 0.27$ cfs

$Q_{10} = (0.35\ (3.05)(0.1645) = 0.18$ cfs

2. Developed Condition (C = 0.56)

$Q_{100} = (0.56)(4.65)(0.1645) = 0.43$ cfs

$Q_{10} = (0.56)(3.05)(0.1645) = 0.28$ cfs

D.A. "G" (No offsite flows contribute to this area)

1. Exist. Condition (C = 0.35)

$Q_{100} = (0.35)(4.65)(0.0398) = 0.06$ cfs

$Q_{10} = (0.35)(3.05)(0.0398) = 0.04$ cfs

2. Developed Condition (C = 0.21)

$Q_{100} = (0.21)(4.65)(0.0398) = 0.04$ cfs

$Q_{10} = (0.21)(3.05)(0.0398) = 0.03$ cfs

STORM RUNOFF CONTRIBUTING
TO
EXISTING STORM SEWER SYSTEM NO. 129

Pages A-10 thru A-13

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SUMMARY OF STORM RUNOFF CONTRIBUTING TO EXISTING STORM SEWER SYSTEM NO. 129

Drainage Area	Existing Conditions (except Casa Sandia Project site considered 100% developed)	
	Q_{10}	Q_{100}
#1	27	41
#2	44	67
#3	12	18
#4	8	12
TOTALS* (cfs)	91	138

* Rounded to 1 cfs unit.

WILLIAM MATOTAN & ASSOCIATES, INC.
ENGINEERS
230 Truman Street, N.E. - Albuquerque, N.M. 87108
Telephone 265-8467

Project CASA SANDIA APTS. Sheet 2 of 4
Subject: Drainage Study Job No. 720
Comp. by REP Date 12 Mar. 84 Chk'd ✓ Date 12 Mar.

Existing Storm Sewer System in Project Vicinity
Contributing Drainage Areas and Composite "C" Factors

Drainage Area	Area in Acres (By Planimeter 1"=200' Topo Map)	Composite "C" Factor
#1	13.61	0.65 *
#2	32.78	0.44
#3	7.80	0.48
#4	3.21	0.82

Total Area = 57.40 Acres

* CASA SANDIA APT. Project considered fully developed.

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Project CASA SALIDA APTS. Sheet 3 of 4
Subject: Drainage Study Job No. 720
Comp. by REP Date 12Mar84 Chk'd ✓ Date 12 Mar.

Existing Storm Sewer System

Time of Concentration of Contributing Drainage Areas, where $T_c = (0.0078)\left(\frac{L^{0.77}}{S^{0.385}}\right)$

D.A. #1, $L = 1100'$ $S = \frac{5116 - 5076}{1100'} = 0.0364'/ft.$

$T_c = (0.0078)\left(\frac{1100^{0.77}}{0.0364^{0.385}}\right) = 6.1$ Min. Use 10 Min.

D.A. #2, $L = 2100'$ $S = \frac{5130 - 5074}{2100} = 0.0267'/ft.$

$T_c = (0.0078)\left(\frac{2100^{0.77}}{0.0364^{0.385}}\right) = 10.09$ Min. Use 10 Min.

D.A. #3, $L = 950'$ $S = \frac{5104 - 5067}{950} = 0.0389'/ft.$

$T_c = (0.0078)\left(\frac{950^{0.77}}{0.0389^{0.385}}\right) = 5.3$ Min. Use 10 Min.

D.A. #4, $L = 700'$ $S = \frac{5069 - 5063}{700'} = 0.0086'/ft.$

$T_c = (0.0078)\left(\frac{700^{0.77}}{0.0086^{0.385}}\right) = 7.5$ Min. Use 10 Min.

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Project CASA SANDIA APTS. Sheet 4 of 4
Subject: Drainage Study Job No. 720
Comp. by REP Date 12 Mar 84 Chk'd ✓ Date 12 Mar.

PEAK RUN OFF for Drainage Areas Contributing to Existing Storm Sewer System on Indian School Road (System No. 129)

D.A. #1, Existing Condition (except project site considered 100% developed). Q = CIA

$Q_{10} = (0.65)(3.05)(13.61) = 26.98$ cfs

$Q_{100} = (0.65)(4.65)(13.61) = 41.14$ cfs

D.A. #2, Existing Conditions

$Q_{10} = (0.44)(3.05)(32.78) = 43.99$ cfs

$Q_{100} = (0.44)(4.65)(32.78) = 67.07$ cfs

D.A. #3, Existing Conditions

$Q_{10} = (0.48)(3.05)(7.80) = 11.42$ cfs

$Q_{100} = (0.48)(4.65)(7.80) = 17.41$ cfs

D.A. #4, Existing Conditions

$Q_{10} = (0.82)(3.05)(3.21) = 8.03$ cfs

$Q_{100} = (0.82)(4.65)(3.21) = 12.24$ cfs

Total Runoff $Q_{10} = 90.42$ cfs

Total Runoff $Q_{100} = 127.86$ cfs

CAPACITY
OF
EXISTING STORM SEWER SYSTEM NO. 129

Pages A-14 thru A-30

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Project CASA SANDIA Drainage Study | Sheet 1 of 15 | Job No. 720 | By REP | Chk'd ✓ | Date 21 Mar. 84

SUMMARY OF STORM SEWER INLET CAPACITIES

Inlet No.	Connector Pipe Capacity in cfs	Inlet Capacity in cfs	Use for Analysis - cfs
1	17	10	10
2	52	43	43
3	3	3.5	3.5
4	36	15	15
5	35	15	15
6	33	15	15
7	27	20	20
8	17	48	17

Total System Inlet Capacity = 138.5 cfs

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Project CASA SANDIA APTS. Sheet 2 of 15
Drainage Study Job No. 720
By REL Chk'd ✓ Date 21 Mar. 84

Existing Grated Inlet Capacities - In Sump Condition

Use inlet capacity analysis as outlined in Dept. of the Army Technical Manual TM 5-820-4, "Drainage and Erosion Control," pages 37-50

For Inlets in sag (sump) condition:

Capacity $Q = CLH^{3/2}$

where:

Q = Capacity in cfs

C = 3.0

L = gross perimeter of grated opening in feet (ignoring bars and omit side against curb for combination inlet)

H = depth of ponded water in feet

Inlet #1 = Single "D" (in driveway of Citadel Apts.)

Grate = 3'-4" x 2'

L = (3'-4")(2) + 2' + 2' = 10.87'

H = 0.44'

$Q = (3.0)(10.87)(0.44)^{3/2} = 9.5$ cfs Use 10 cfs

Note: Maximum available ponding at this inlet = 0.44' which is the crown height above the grate it. Above that depth flows are to the west into Inlet #2.

Inlet #2 = 2 Double "C" Inlets - (Combination curb inlet and grated gutter inlet)

Grate = 2 - 6'x10" x 2'

L = 2(6.83') + 2' + 2'

H = 0.87'

$Q = (3)(17.66)(0.87)^{3/2} = 42.99$ Use 43 cfs

Inlet #8 = Double "D" Inlet, grated inlet back of curb in sump.

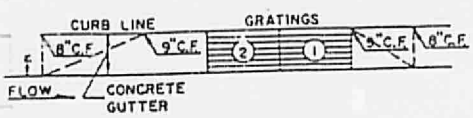
Grate = 6'-10" x 2'

L = 2(6.83') + 2' + 2' = 17.66'

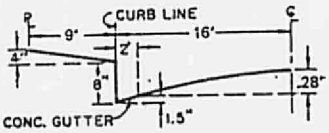
H = 0.87'

$Q = (3)(17.66')(0.87)^{3/2} = 42.99$ Use 43 cfs

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

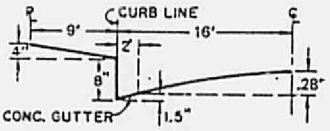
D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Inlet #3 = Gutter Flow
Double "C"
S = 0.0064
Q = 3.5 cfs

22.3

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN

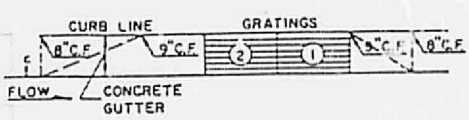


TYPICAL HALF STREET SECTION
(ABOVE BASIN)

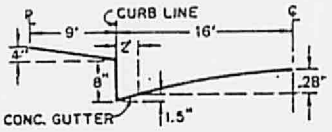
D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Inlet #4 = Gutter Flow
DIC 61-1 Type II
S = 0.0033
Q = 15 cfs

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



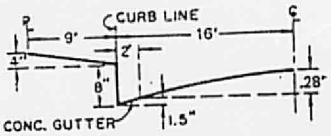
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

Inlet #5 = Gutter Flow Double "C"
S = 0.004
Q = 15 cfs

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION (ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

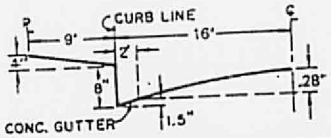
INLET #6 = Gutter Flow "Double 'C'"

S = 0.004

Q = 15 cfs

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

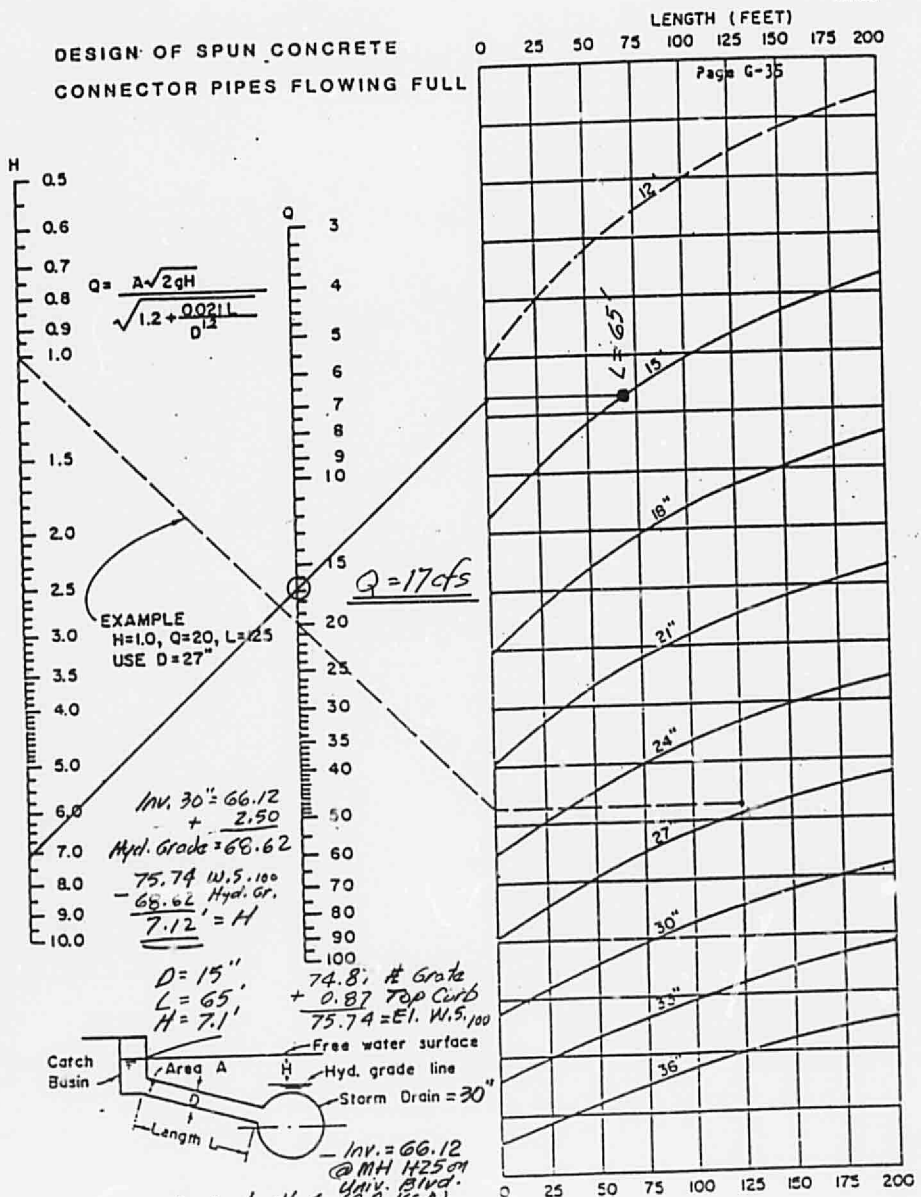
D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

INLET #7 = Gutter Flow
61-1 Type II

S = 0.015
Q = 20 cfs

DESIGN OF SPUN CONCRETE CONNECTOR PIPES FLOWING FULL

Page G-35



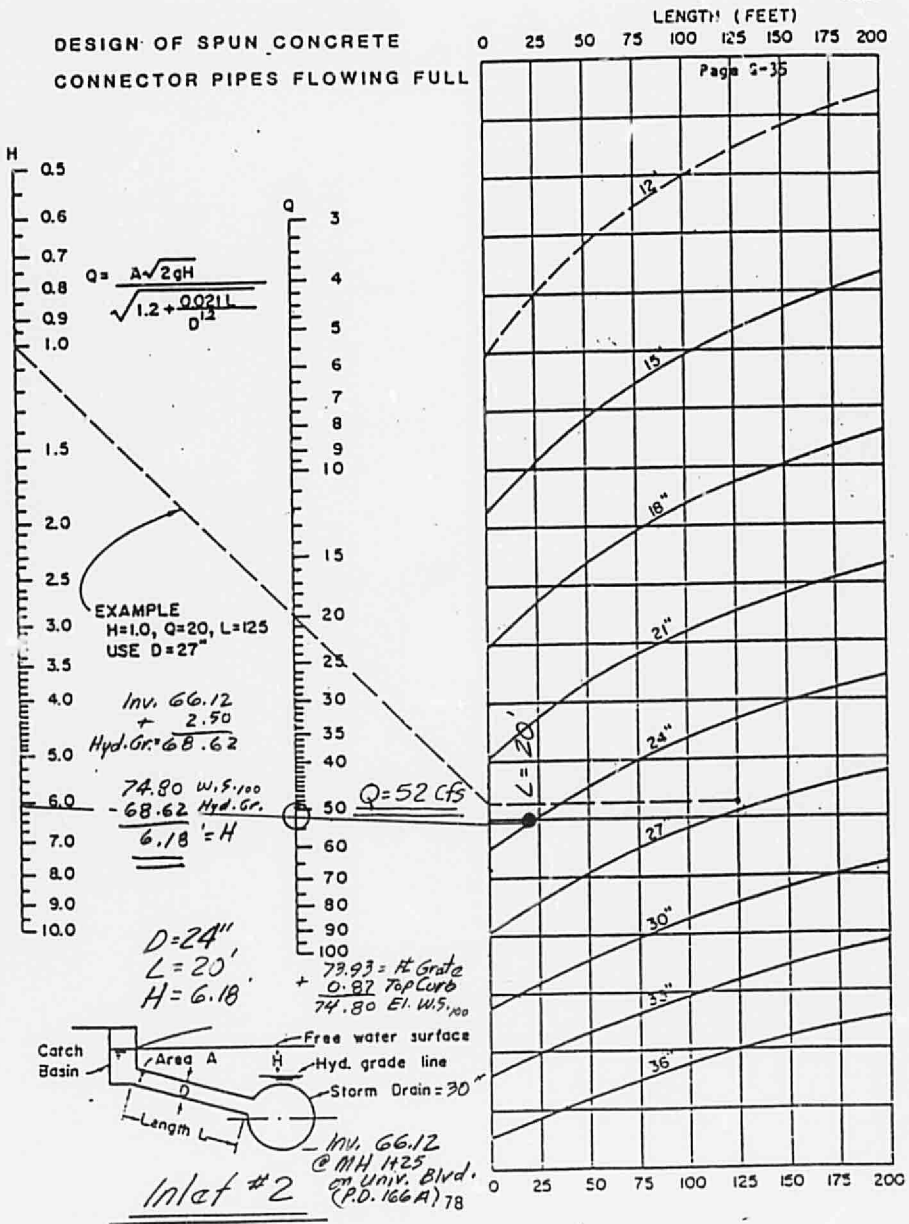
Inlet #1

Inlet Capacity Q = 10 cfs < Connect. Pipe Q = 17 cfs.
∴ use Inlet capacity of 10 cfs for system analysis.

A-21

22.3

DESIGN OF SPUN CONCRETE CONNECTOR PIPES FLOWING FULL



Inlet #2

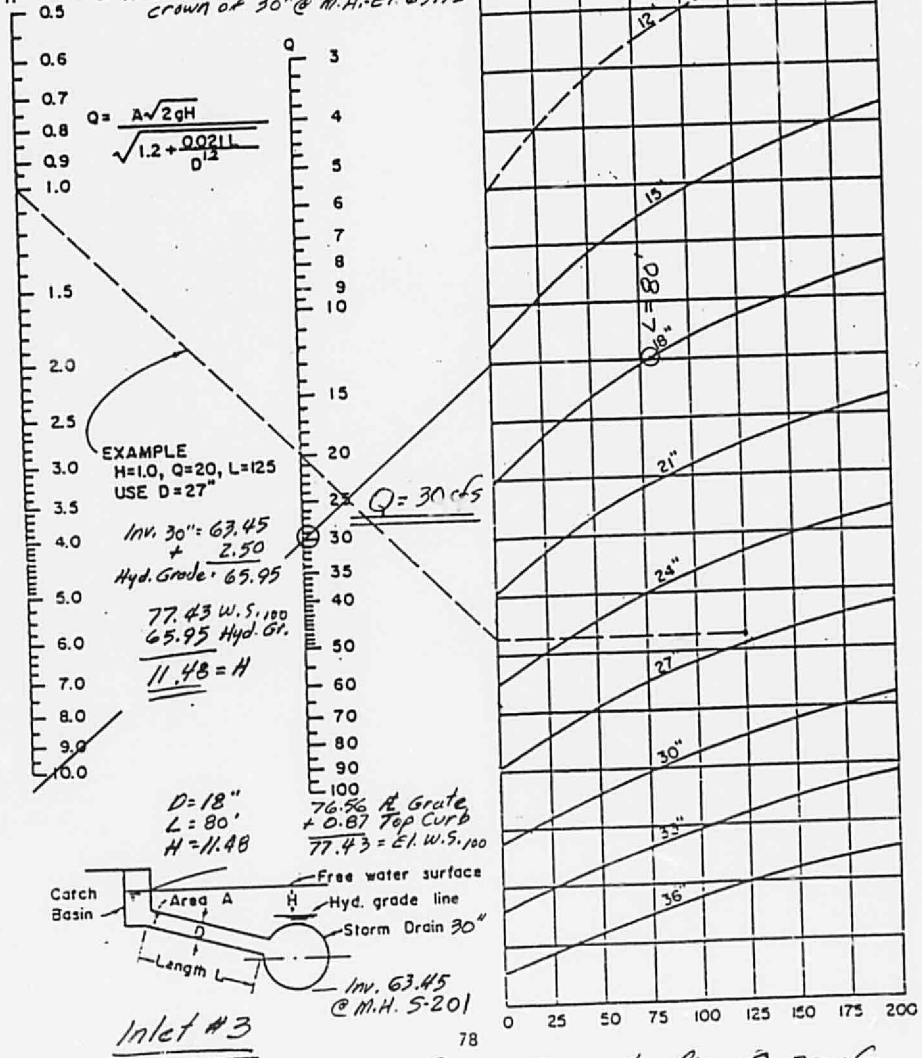
Inlet Capacity Q = 43 cfs < Connector Pipe Q = 52 cfs.
∴ Use Grated Inlet Capacity Q = 43 cfs for System Analysis A-22

10

22.3

DESIGN OF SPUN CONCRETE CONNECTOR PIPES FLOWING FULL

El. 68.62 H.W. @ Upstream Manhole
-5.94 friction loss 60 cfs
= El. 62.68 Hyd. Grade @ Manhole < crown of 30" @ M.H. = El. 65.95

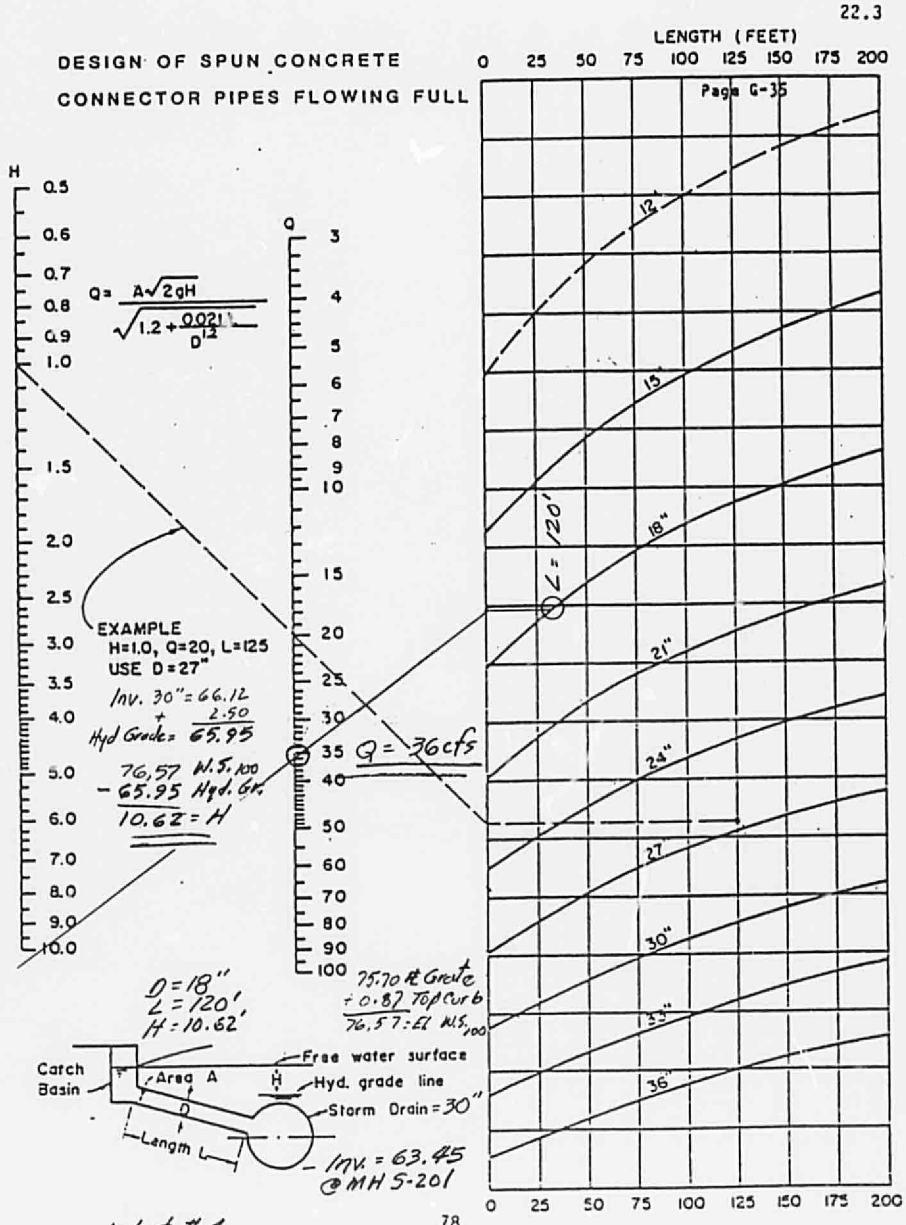


Inlet #3

78

Inlet Capacity Q = 3.5 cfs < Connector Pipe Q = 30 cfs
∴ USE Grated Inlet Capacity Q = 3.5 cfs for system analysis, A-23

22.3



78

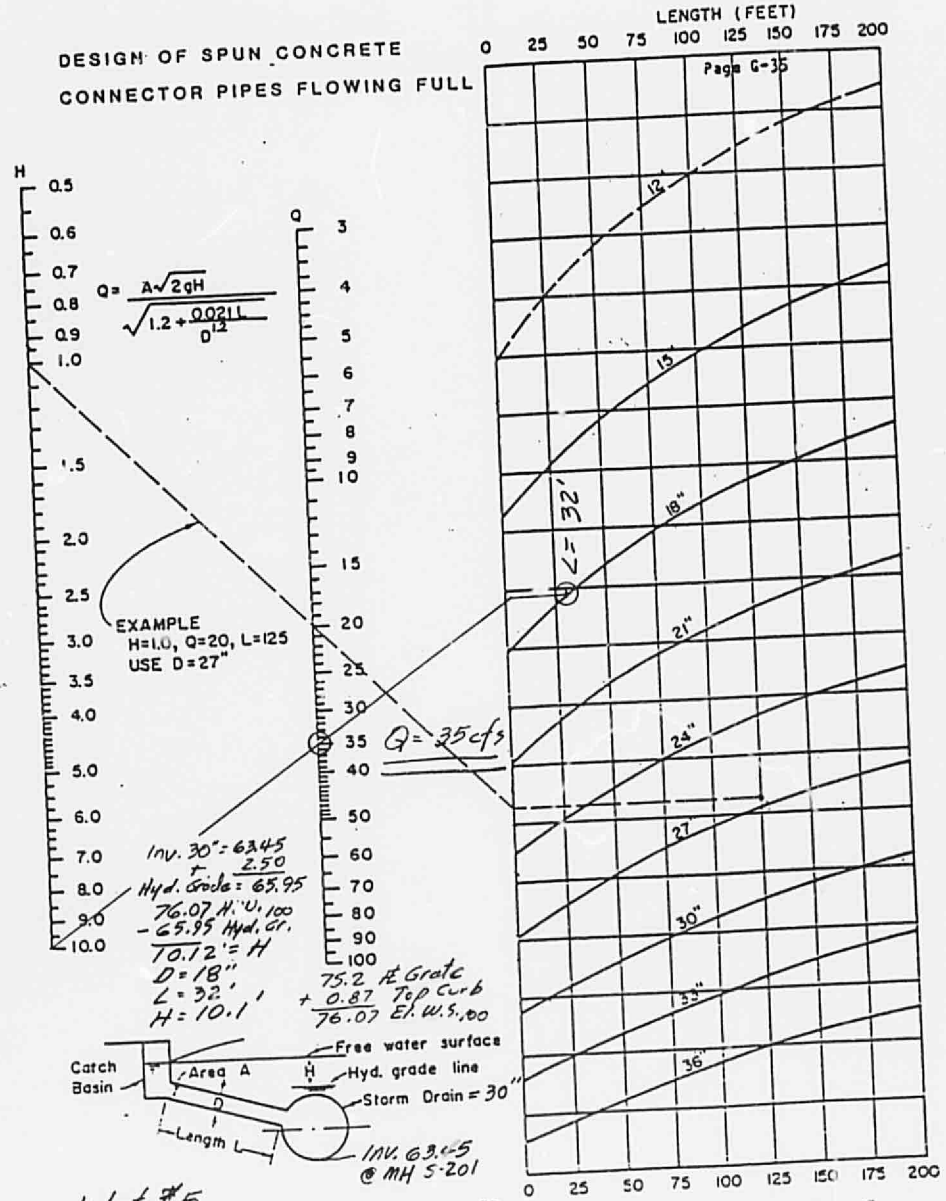
Inlet #4

Inlet Capacity = 15 cfs < Connector Pipe Q = 36 cfs
∴ Use Grated Inlet Capacity, Q = 15 cfs for system analysis

A-24

12

DESIGN OF SPUN CONCRETE CONNECTOR PIPES FLOWING FULL



78

Inlet #5

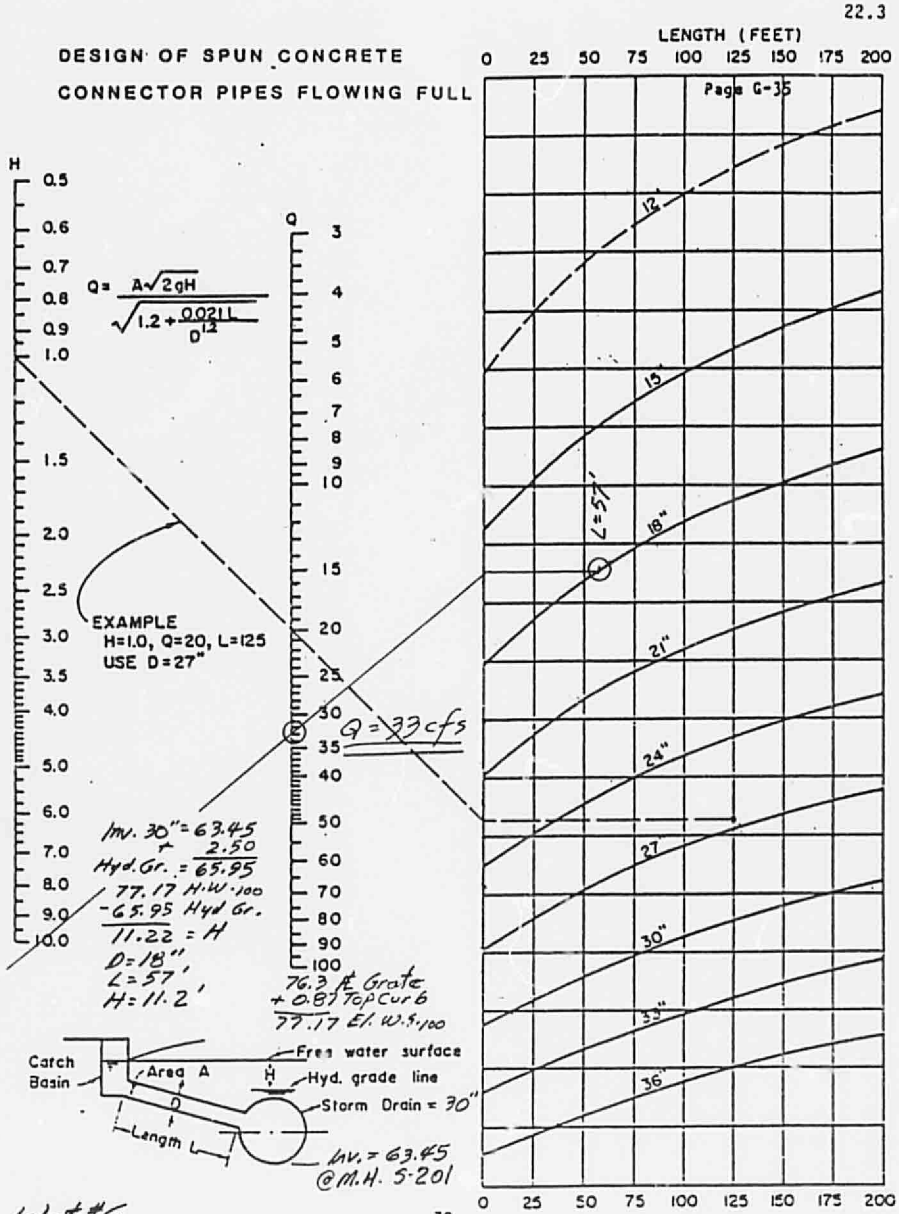
Inlet Capacity: Q = 15 cfs < Connector Pipe Capacity Q = 35 cfs

∴ Use Grated Inlet Capacity Q = 15 cfs for system analysis.

A-25

DESIGN OF SPUN CONCRETE CONNECTOR PIPES FLOWING FULL

Page G-35



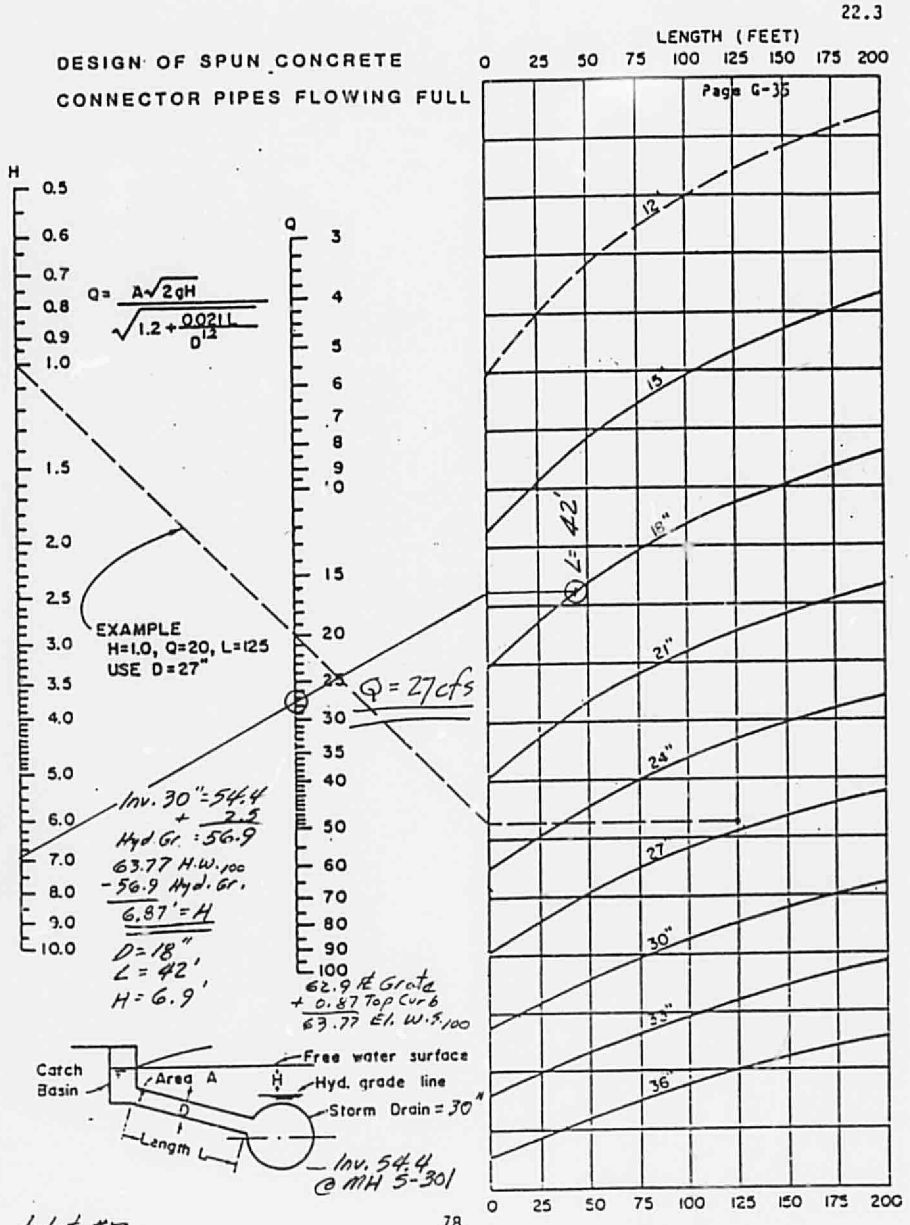
78

Inlet #6

Inlet capacity = 15 cfs < Connector Pipe Capacity = 33 cfs

∴ Use Grated Inlet Capacity Q = 15 cfs for system analysis

A-26

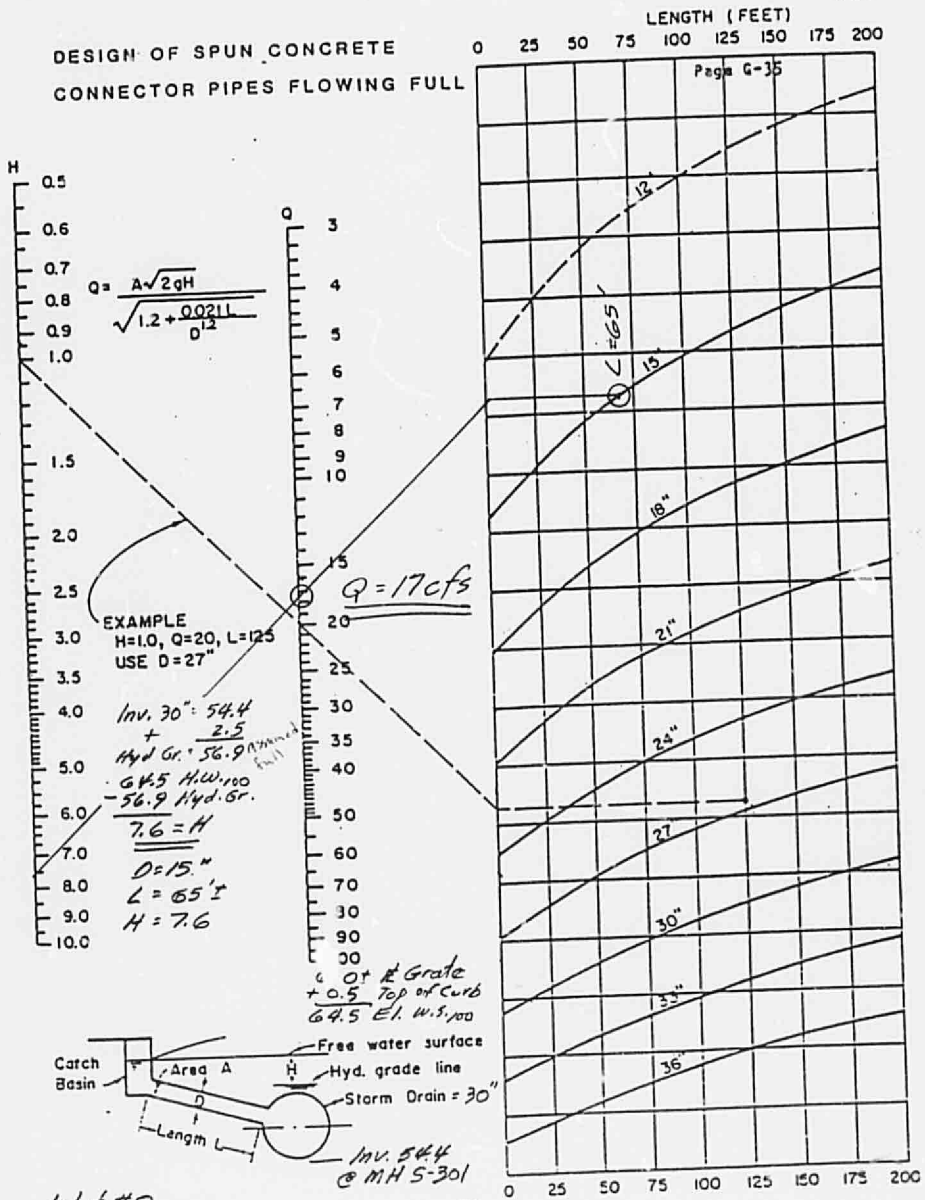


Inlet #7

Inlet capacity = 20 cfs < Connector Pipe Capacity = 27 cfs

∴ Use Grated Inlet Capacity Q = 20 cfs for system analysis.

DESIGN OF SPUN CONCRETE CONNECTOR PIPES FLOWING FULL



Inlet #8

Inlet capacity = 43 cfs > Connector Pipe Capacity Q = 17 cfs
∴ Use Connector Pipe Capacity Q = 17 cfs for system analysis.

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Project CASA SANDIA APTS. Sheet ___ of ___
Drainage Study Job No. 220
By REP Chk'd ✓ Date 23 Nov. 84

STORM SEWER SYSTEM No. 129

CAPACITY OF EXISTING 30" R.C.P. MAIN LINE

Assuming Open channel flow conditions, pipe flowing full. Use Mannings Formula

$$V = \frac{1.486}{n} \times R^{2/3} S^{1/2} \qquad Q = AV$$

where: V = Velocity in fps

Q = discharge in cfs

n = coefficient of friction = 0.013

R = Area over wetted perimeter
= 4.91 ft² / 7.85' = 0.63 for 30" dia.

S = slope of pipe invert in feet per foot

A = cross sectional Area = 4.91 ft² for 30" dia.

MH. to MH.	$\frac{1.486}{n}$	$R^{2/3}$	S	$S^{1/2}$	V (fps)	Q (cfs)
1+25	114	0.73	0.0077	0.0877	7.3	35.8
S-201	114	0.73	0.014	0.1183	9.8	48.3
S-200	114	0.73	0.0142	0.1192	9.9	48.7
S-301	114	0.73	0.0304	0.1744	14.5	71.2
S-300	114	0.73	0.0225	0.1500	12.5	61.2
Free outlet @ 3-120" cmp's						

Note: Under flow conditions for both 100 yr. and 10 yr. runoff, head conditions would exist and discharge of the 30" line would be greater than indicated above.

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Project CASA SANDIA APTS. Sheet ____ of ____
Subject: Drainage Study Job No. 720
Comp. by RSP Date 23 Mar. 81 Chk'd ✓ Date 23 Mar.

Evaluation of Friction Head Loss in Existing 30" Storm Sewer System

Using Scobey's formula for concrete pipe:

$$Q = 0.00546\, C_s\, d^{2.625}\, H_f^{0.5} \quad *$$

and

$$H_f = \left(\frac{Q}{0.00546\, C_s\, d^{2.625}}\right)^2$$

where:

Q = Discharge in cfs

C_s = Scobey's coefficient, use 0.37 *

H_f = Loss of head in feet per 1000 feet

d = diameter of pipe in inches

Q (cfs)	H_f (Ft./1000')	H_f (Ft./100')
20	1.72	0.172
40	6.89	0.689
60	15.50	1.550
80	27.57	2.757
100	43.08	4.308
120	62.04	6.204

* from "Handbook of Hydraulics" by Davis & Sorenson, Third Edition

STREET FLOW CAPACITY

Pages A-31 thru A-34

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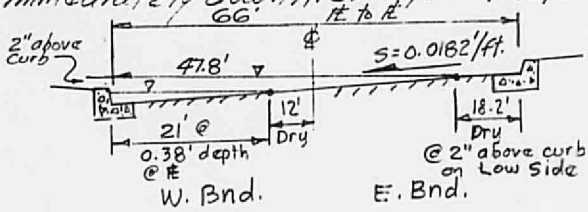
Project CASA SAN JOSE APTS. Sheet ___ of ___
Drainage Study Job No. 220
By RSP Chk'd ✓ Date 23 MAY 84

Street Capacity - Indian School Road 66' ℄ to ℄ w/continuous left turn lane.

@ Critical cross section on West side of intersection, Indian School Rd. & University Blvd., immediately downstream from inlets #5 & #6



1. Capacity with one lane dry, westbound, and 3 lanes dry Eastbound, max. depth of flow 0.38' @ west curb.

$Q = AV$ and $V = \frac{1.486}{0.015} \cdot R^{2/3} \cdot S^{1/2}$

$A = 3.99$ ☐ $wp = 21.4'$ $R = \frac{3.99}{21.4} = 0.1864$, $R^{2/3} = 0.3245$

$S = 0.004$, $S^{1/2} = 0.0632$

$V = \frac{1.486}{0.015} \times 0.3245 \times 0.0632 = 2.03$ fps

$Q = 3.99 \times 2.03 = \underline{8.1 \text{ cfs}}$

Runoff contributing to this street cross section = Area #1 (See page A-13)

$Q_{10} = 27$ cfs $Q_{100} = 41$ cfs

Capacity of inlets #3, 4, 5 and 6 immediately upstream from this section = 48.5 cfs (See p. A-14)

Capacity of 30" RCP storm sewer @ above inlets = 49 cfs (see p. A-29)

∴ Storm sewer capacity 49 cfs and inlet capacity 48.5 cfs. > Q_{10} 27 cfs and $Q_{100} = 41$ cfs and street flow criteria not exceeded.

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Project CASA SANDIA APTS. Sheet ___ of ___
Drainage Study Job No. 720
By RSL Chk'd ✓ Date 23 Mar. 1984

Street Capacity - University Blvd. 66' R to R w/ 22' raised median:

@ Critical cross section, approximately 300' South of intersection with Indian School Road, sag vertical curve and inlets #1 and #2; Drainage Area #2 outfall.

From page A-13, total runoff contributing to this section: $Q_{10} = 44$ cfs $Q_{100} = 67$ cfs

From page A-14, total inlet capacity = 53 cfs

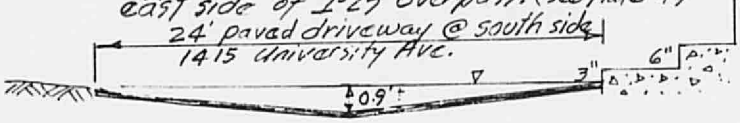
From page A-29, storm sewer capacity, = 36 cfs

∴ @ Q_{10}, 8 cfs in excess of storm sewer capacity flowing full, gravity flow.

and

@ Q_{100}, 31 cfs in excess of storm sewer capacity flowing full, gravity flow.

@ Q_{100}, street overflow is to the west via an asphalt paved, inverted crown, driveway on the south side of office building @ 1415 University Ave., to storm sewer inlets #7 and #8 at the sag vertical curve on Indian School Road, east side of I-25 overpass. (See Plate 4)



Capacity of driveway: $Q = AV$ $V = \frac{1.486}{0.015} \cdot R^{2/3} \cdot S^{1/2}$

$A = 10.8\ \#$ $R = \frac{10.8}{24} = 0.45$ $R^{2/3} = 0.58$

$S = 0.015$ $S^{1/2} = 0.12$ $V = (99)(0.58)(0.12) = 6.9$ fps

$Q = (10.8)(6.9) = \underline{74}$ cfs $>$ Q_{100} 31 cfs overflow OK

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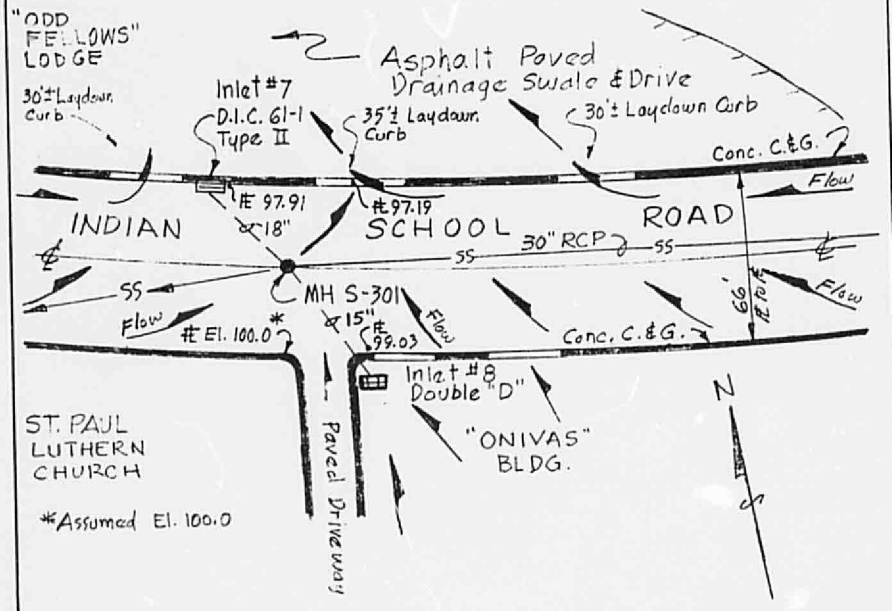
Project CASA SANDIA APTS. Sheet ____ of ____
Subject: Drainage Study Job No. 720
Comp. by REP Date 23 Mar. 84 Chk'd ✓ Date 23 Mar

STREET FLOW DISCHARGE ON INDIAN SCHOOL RD. 600'± WEST OF UNIVERSITY BLVD.



From page A-13, Total runoff contributing to storm sewer system at MH S-301 D.A. #1, 2, 3 and 4 : Q_{10} = 90 cfs Q_{100} = 128 cfs
From page A-29, capacity of 30" storm sewer downstream from MH S-301 = 71 cfs (flowing full, gravity flow)
∴ 71 cfs < Q_{10} Peak flow by 19 cfs ∴ Q_{10} 19 cfs street flow
and 71 cfs < Q_{100} Peak flow by 57 cfs ∴ Q_{100} 57 cfs street flow
All street flow within D.A. #1, 2, 3, 4 in excess of storm sewer capacity drains into this sag vertical curve and thence flows north through the three curb cuts into the historic drainageway (old Indian School Road paved roadway) thence westerly through I-25 drainage structures into historic Campus Drive drainage way on the west side of Interstate Route-25.
Note that gutter flowline on low side of street @ Inlet #7 is 0.7' higher than the gutter flowline at the low point of the sag.

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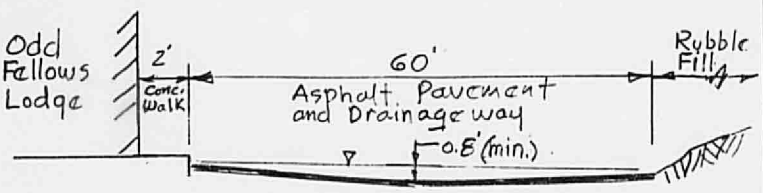
Project CASA SANDIA APTS Sheet ____ of ____
Drainage Study Job No. 720
By REP Chk'd ✓ Date 23 Mar. 84

CAPACITY OF HISTORIC DRAINAGEWAY (old Indian School Road paved roadway) North of Existing Indian School Road @ East side of I-25.



Critical Cross Section @ North Side of Lodge Bldg.
Not to Scale

$Q = AV \quad V = \frac{1.486}{0.015} \cdot R^{2/3} S^{1/2}$

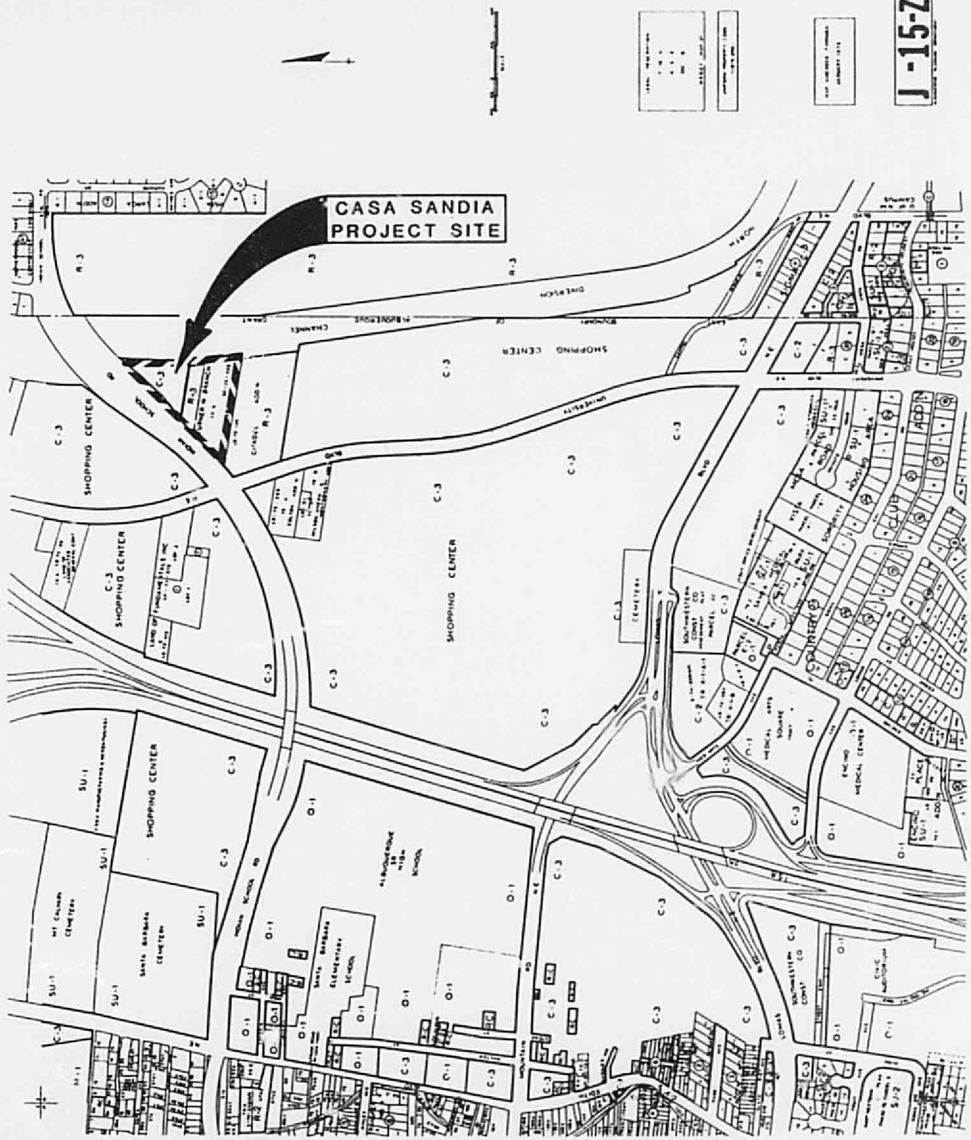
$A = \frac{(0.8)(60)}{2} = 24\#$ $\quad WP = 60' \quad R = \frac{24}{60} = 0.40 \quad R^{2/3} = 0.54$

$S = 0.0370'/ft. \quad S^{1/2} = 0.1924 \quad V = (99)(0.54)(0.1924) = 10.3 fps$

$Q = (24)(10.3) = \underline{247 cfs}$ > Q_{10} 19 cfs and Q_{100} 57cfs Street flows from drainage areas #1, 2, 3 and 4, in excess of storm sewer capacity.

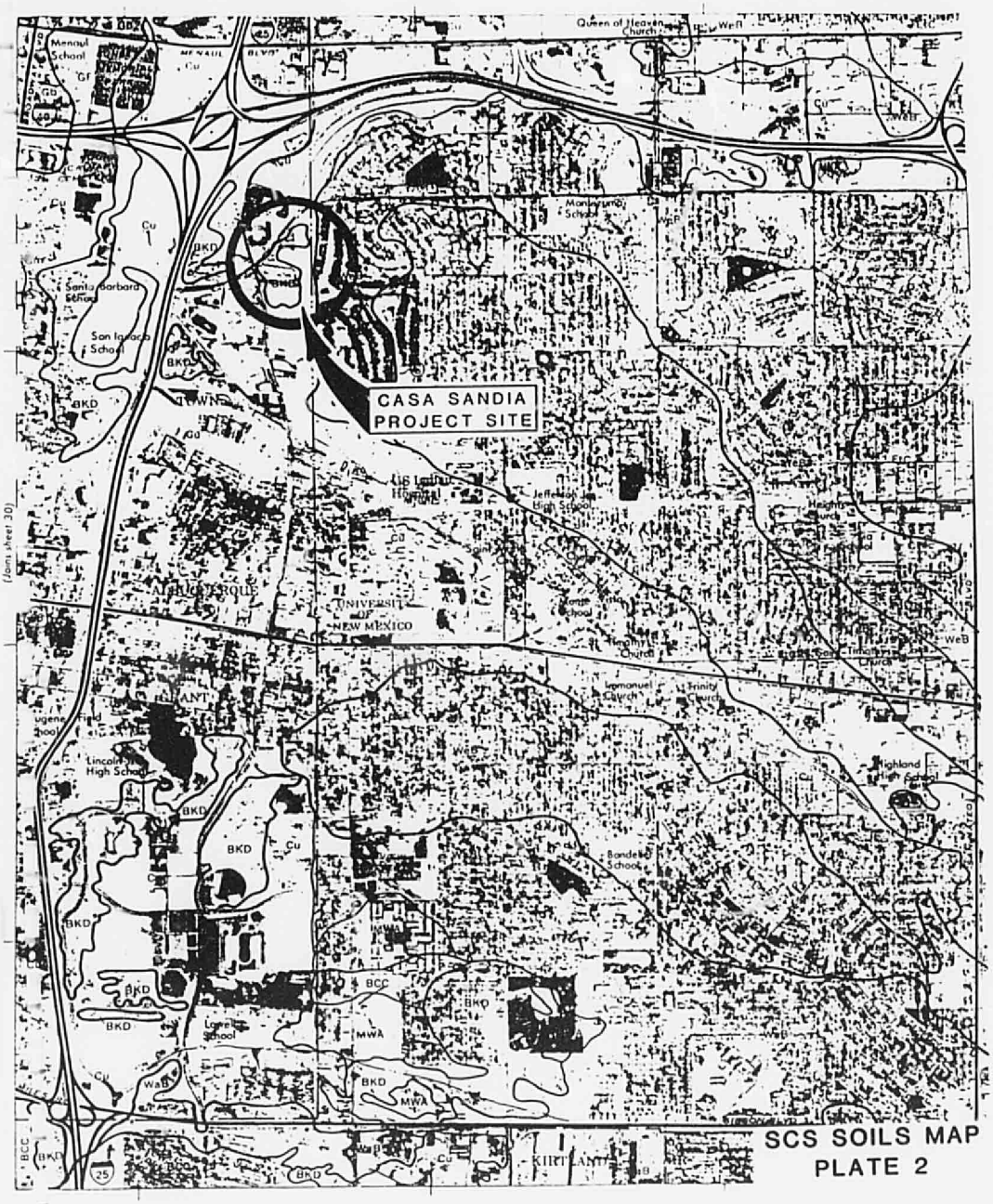
Note: This drainageway is the only outlet from the sag vertical curve on Indian School Road at the east side of the I-25 overpass and drains all street flows in Drainage Areas #1, 2, 3 and 4 that are in excess of the storm sewer capacity.

PLATES

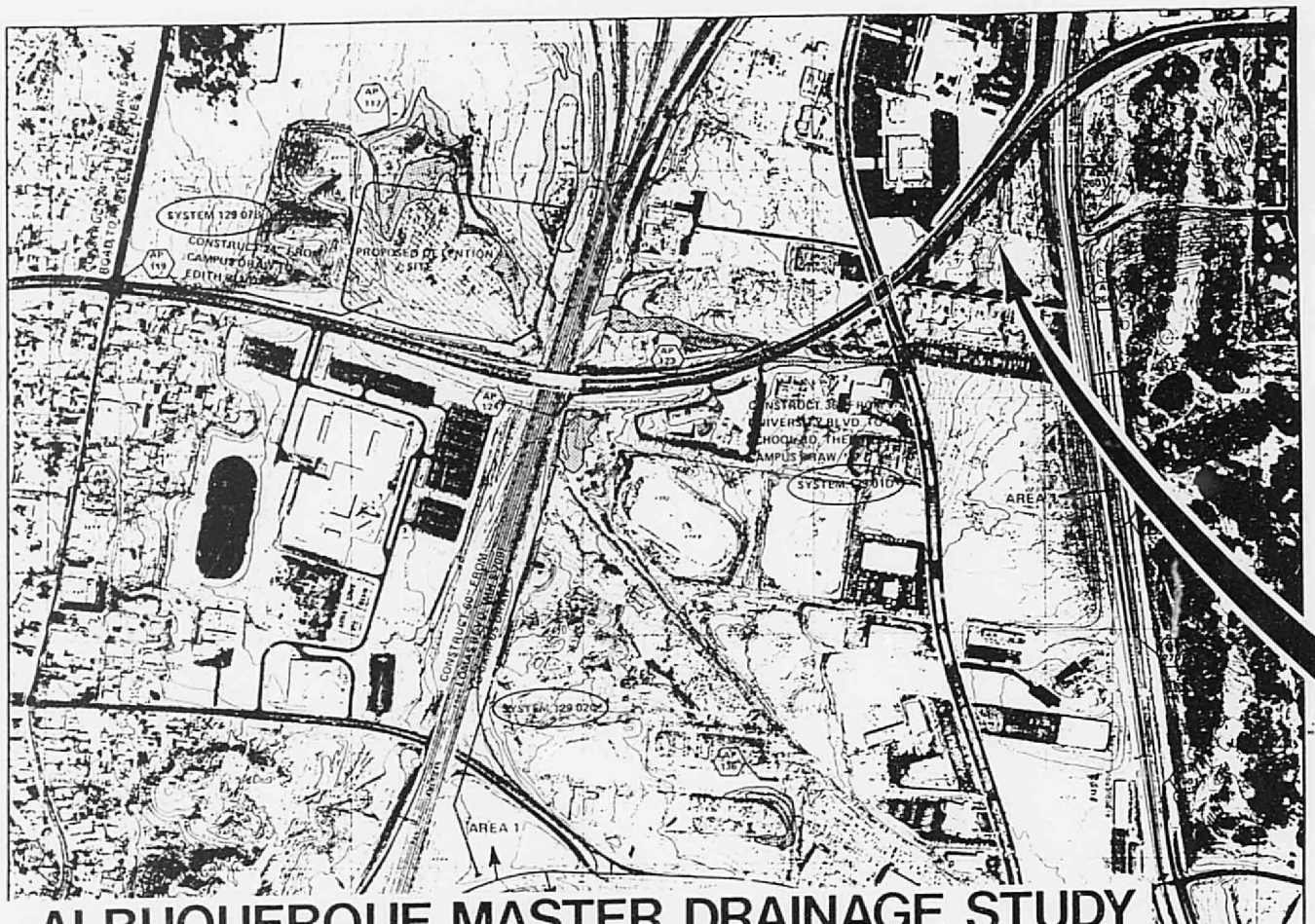


VICINITY MAP
PLATE 1

BERNALILLO COUNTY AND PARTS OF SANDOVAL AND VALENCIA



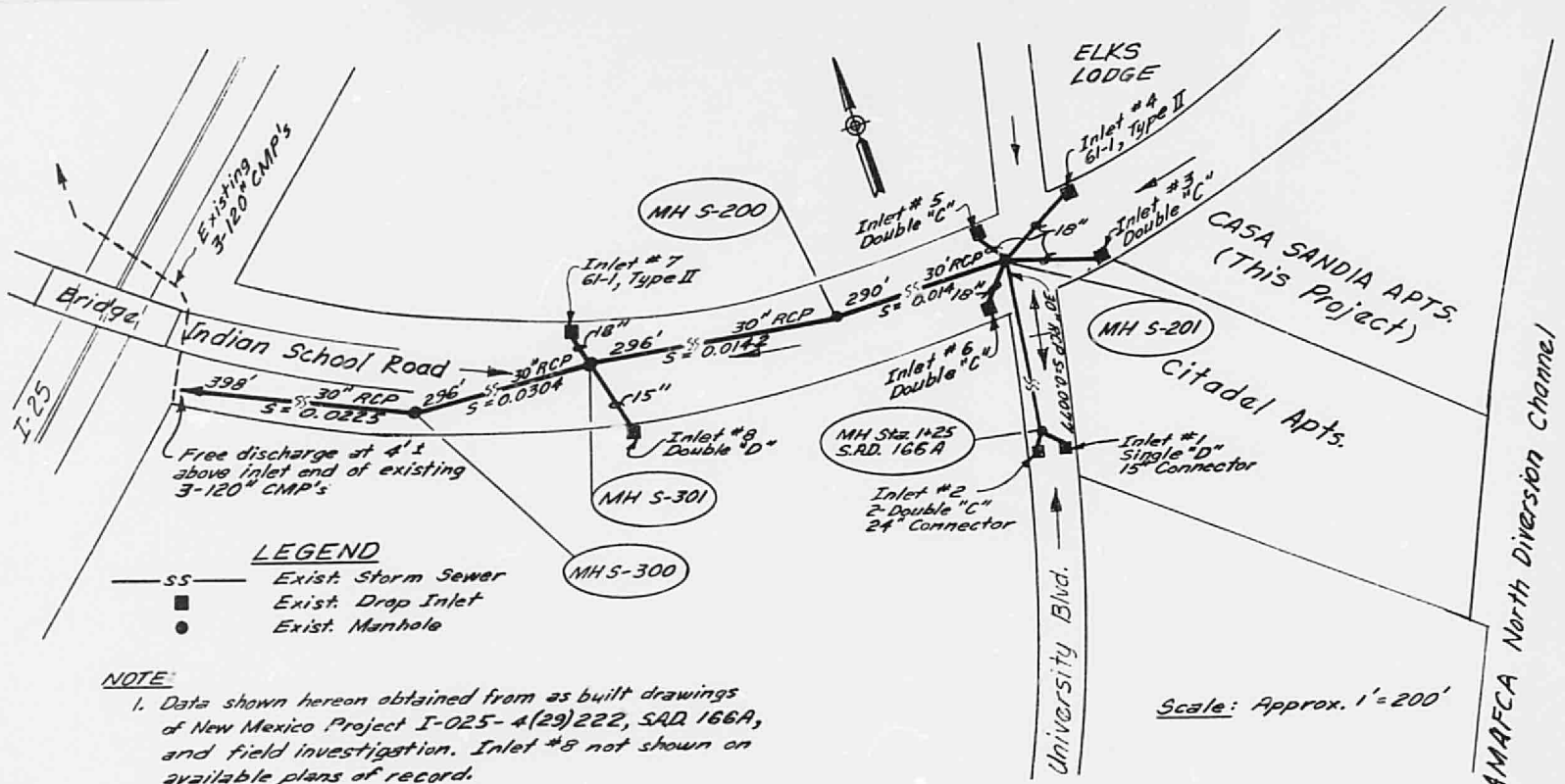
SCS SOILS MAP
PLATE 2



ALBUQUERQUE MASTER DRAINAGE STUDY

J-15

FLOOD HAZARD BOUNDARY MAP
PLATE 3



NOTE:

1. Data shown hereon obtained from as built drawings of New Mexico Project I-025-4(29)222, SAD. 166A, and field investigation. Inlet #8 not shown on available plans of record.
2. Existing curb and gutter not shown for clarity.
3. University Blvd. width is 66' ℄ to ℄.
4. Indian School Road width is 66' ℄ to ℄.

Scale: Approx. 1"=200'

EXISTING
STORM SEWER SYSTEM No. 129
PLATE 4