City of Albuquerque

December 7, 1999

James Topmiller, P.E.
7500 Jefferson NE
Bohannan-Huston, Inc.
Albuquerque, NM 87109

RE: SYCAMORE PLAZA, TRACT B-9 (E20-D13A4). ENGINEER'S CERTIFICATION FOR CERTIFICATE OF OCCUPANCY. ENGINEER'S STAMP DATED OCTOBER 12, 1999.

Dear Mr. Topmiller:

Based on the information provided on your October 13, 1999 submittal, the above referenced project is approved for Certificate of Occupancy,

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: WR
File

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

June 11, 1999

James Topmiller, P.E.
Bohannan-Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Attn: Bruce Stidworthy

RE: SYCAMORE PLAZA, TRACT B-9 (E20-D13A4). FINAL GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT AND GRADING PERMIT APPROVALS. ENGINEER'S STAMP DATED APRIL 28, 1999.

Dear Mr. Topmiller:

Based on the information provided on your April 29, 1999 submittal, the above referenced project is approved for Building Pemit and Grading Permit.*** Note that a Building Permit covers Foundation and Grading Permits.

***This dual submittal for Hydrology (Grading & Drainage) and for Transportation (Traffic Circulation Layout - T.C.L.) is on twin tracks for review and will be approved as a package.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: M. Zamora
T.C.L.
File

DRAINAGE REPORT
FOR
SYCAMORE PLAZA

September 1992

PREPARED FOR:

SYCAMORE PLAZA LTD.
C/O BROWN AND ASSOCIATES, INC.
3411 CANDELARIA N.E.
ALBUQUERQUE, NEW MEXICO 87107

PREPARED BY:

BOHANNAN-HUSTON, INC.
7500 JEFFERSON N.E.
ALBUQUERQUE, NEW MEXICO 87109

I certify that I am a registered professional engineer in the State of New Mexico and that this report was prepared by me or under my supervision.

Joe Kelley 9/23/92

Joe Kelley, P.E. Date

JOE P. KELLEY NEW MEXICO 9996 REGISTERED PROFESSIONAL ENGINEER

Job No. 9129.42

PURPOSE

The purpose of this report is to provide for the safe conveyance of runoff from the developed Sycamore Plaza tract in accordance with prior Drainage Reports to the City of Albuquerque, and in accordance with the Development Process Manual of the City of Albuquerque.

LEGAL DESCRIPTION

Tracts B and 2A, Sycamore Plaza. Tract B is being subdivided into Tracts 1 through 7 in conjunction with the present submittal.

LOCATION

The site is located at the southeast corner of the intersection of Wyoming Boulevard, NE and Academy Road, NE. The site is bounded on the north by Academy Road, NE, on the east by Moon Street, NE, on the south by the concrete-lined Bear Arroyo, and on the west by Wyoming Boulevard, NE.

FLOOD HAZARD ZONES

As shown by Panel 3500020017 of the National Flood Insurance Program Flood Boundary and Floodway Maps for the City of Albuquerque, dated September 15, 1983, this site borders on a designated 100-year Flood Hazard Zone: the Bear Arroyo Tributary. The Bear Arroyo adjacent to the site has been lined since the original mapping in 1983. In a Letter of Map Revision dated May 5, 1987, FEMA acknowledged the amendment of the Flood Hazard Zone. The 100-year Flood Hazard Zone is now confined to the constructed channel. Thus none of the site lies within a designated Flood Hazard Zone.

PRESENT LAND USAGE

Sycamore Plaza, Tracts B and 2A, are presently undeveloped. Adjacent to the southwest corner of Tract B is Sycamore Plaza, Tract A, which is presently developed as the One Sycamore Plaza office complex and parking structure. The surrounding streets: Wyoming, Academy, and Moon, are City of Albuquerque streets, fully developed with paving and utilities. The Bear Arroyo, on the south, is a concrete-lined City of Albuquerque drainage channel.

Across Academy to the north is the site of Albuquerque Academy. Across Moon to the east is a fully-developed residential subdivision. Across Wyoming to the west is a fully-developed multi-family residential complex. And across the arroyo to the south are two tracts of land. The tract bordering Wyoming is presently being developed and is zoned SU-1, while the remainder of the land is undeveloped and is zoned R-2.

PRESENT DRAINAGE PATTERN

The site slopes down from north to south. Its historical point of discharge is into the Bear arroyo on the south. Moon Street diverts offsite runoff into the arroyo away from the site, while Academy Road conveys offsite runoff around the site on paved surfaces. Thus no offsite runoff discharges across the site.

PRIOR REPORTS

The present report conforms to the Final Grading and Drainage Report for One Sycamore Plaza, dated February 10, 1987. This prior approved report provided for the discharge of the present site into the Bear channel at two points: 1)through a storm drain which was constructed as part of the One Sycamore Plaza plan; and 2)over the edge of the Bear channel at a point just east of the One Sycamore Plaza site (Tract A).

The present report is also in conformance with the *Conceptual Drainage Plan* for Sycamore Plaza submitted to the City of Albuquerque in August, 1991.

PROPOSED GRADING PLAN AND IMPROVEMENTS

The Drainage and Grading Plan shows: 1)existing and proposed grades indicated by spot elevations and contours at 1'0" intervals; 2)the limit and character of existing improvements; 3)the limit and character of proposed improvements; and 4)continuity between existing and proposed grades. As shown by this Plan, the proposed improvements consist of a retail shopping complex, complete with buildings, paving, and landscaping. Tracts 2A and 7 are not proposed for development at this time. Grading Plans for Tracts 2A and 7 will be presented by a separate submittal, but their interim drainage is to follow the present Plan, which conforms to prior drainage submittals.

PROPOSED DRAINAGE PATTERN

The proposed drainage pattern follows the existing drainage pattern: the site slopes down from north to south, and discharges into the channel at the same two points.

DRAINAGE BASIN A

A portion of the site's runoff (40.0 cfs) will be discharged into the existing storm drain system. The previous One Sycamore Plaza submittal provided for 55.9 cfs to be discharged into the system at this point by future development, so the present plan is within this limit.

DRAINAGE BASIN B

The remainder of the site's developed runoff will be discharged through a new storm drain into the Bear channel at the point previously approved by the One Sycamore Plaza submittal.

DRAINAGE BASIN C

The site's undeveloped runoff (Tracts 2A and 7) will be conveyed to the Bear channel over paved surfaces where velocities exceed 3fps, per the DPM. A side inlet will be constructed in compliance with DPM criteria to discharge this runoff into the channel. Note that runoff from a portion of Tract 2A (Drainage Basin C-1) has been computed under future commercially-developed conditions.

BASIS OF CALCULATIONS

The calculations which appear herein analyze both the existing and developed discharge for the 100-year, 6-hour rainfall event. The peak discharge of runoff has been calculated using the initial abstraction/uniform infiltration method as proposed by Section 22.2, Hydrology of the DPM, Vol. 2, August, 1991. The volume of runoff has been calculated using the excess precipitation method as proposed in Section 22.2.

CONCLUSION

As shown by these calculations, the proposed development will result in an increase in runoff generated by the site. However, the increased runoff produced by the site will be discharged directly into the Bear channel, and will have no adverse impact on downstream properties.

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

January 13, 1992

Gilbert Aldaz, P.E.
Hydrology Section
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Re: Offsite Grading and Landfill - Sycamore Plaza (E-20/D-13A)

Dear Gilbert:

The purpose of this letter is to provide the City of Albuquerque with confirmation that the Owner(s) of Tract 2A, Lands of William O. and Mary L. Edward, have given consent to the grading of Tract 2A by the Owners of Sycamore Plaza, Tracts 1 thru 7. This grading will be performed during construction grading of the above referenced project in accordance with the City-approved grading plan.

The following signed statement is provided:

THE UNDERSIGNED OWNERS OF TRACT 2A, LANDS OF WILLIAM O. AND MARY L. EDWARD, DO HEREBY GRANT THE OWNERS OF TRACTS 1 THRU 7, SYCAMORE PLAZA, PERMISSION TO PERFORM GRADING, EXCAVATION AND DISPOSAL OF EARTH FILL ON TRACT 2A FOR LANDFILL AND DRAINAGE PURPOSES. GRADING WILL BE PERFORMED IN ACCORDANCE WITH THE CITY-APPROVED GRADING PLAN.

SIGNED: W O Edward DATE: 1-14-92

Mary Lee Edward

OWNERS OF TRACT 2A, LANDS
OF WILLIAM O. AND MARY L.
EDWARD, A TRACT WITHIN
THE CORPORATE LIMITS OF THE
CITY OF ALBUQUERQUE, N. M.

If we can provide any additional information, please contact us.

Sincerely,

Joe Kelley

Joe Kelley, P.E.
Project Engineer
Community Development and Planning

JRT/mls
Job No. 91249.42

HYDROLOGIC CALCULATIONS

Hydrologic procedure in accordance with *Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, New Mexico, August, 1991.* Procedure for watersheds 40 acres and less in size.

From Figure A: Zone = 3

From Table 8: The excess precipitation, E, for the 100-year storm, is:

E_A = 0.66 IN.
E_B = 0.92 IN.
E_C = 1.29 IN.
E_D = 2.36 IN.

From Table 9: The peak discharge, Q_P, for the 100-year storm, is:

Q_{PA} = 1.87 CFS/AC
Q_{PB} = 2.60 CFS/AC
Q_{PC} = 3.45 CFS/AC
Q_{PD} = 5.02 CFS/AC

EXISTING CONDITION

1. BASIN U-1 – including existing offsite office building:

TOTAL AREA = 7.57 AC = 329,700 SF
A_A = 0.72 AC (0.10)
A_B = 1.06 AC (0.14)
A_D = 5.79 AC (0.76)

Weighted E = 1.99 IN = 0.166 FT
V_{360} = E x A = 54,600 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 33.2 CFS

2. BASIN U-2

TOTAL AREA = 20.38 AC = 887,800 SF
A_A = 20.38 AC (1.00)

Weighted E = 0.66 IN = 0.055 FT
V_{360} = E x A = 48,800 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 38.1 CFS

3. BASIN U-3

TOTAL AREA = 28.80 AC = 1,255,000 SF
A_A = 28.80 AC (1.00)

Weighted E = 0.66 IN = 0.055 FT
V_{360} = E x A = 69,000 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 53.9 CFS

DEVELOPED CONDITION

1. BASIN A

a. BASIN A-1

TOTAL AREA = 1.2104 AC = 52,700 SF
A_B = 0.8343 AC (0.69)
A_D = 0.3761 AC (0.31)

Weighted E = 1.37 IN = 0.114 FT
V_{360} = E x A = 6,000 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 4.1 CFS

b. BASIN A-2 (runoff from previous Sycamore Plaza hydrology submittal E-20/D-13)

Q_P = 6.1 CFS

c. BASIN A-3 (runoff from previous Sycamore Plaza hydrology submittal E-20/D-13)

Q_P = 1.0 CFS

d. BASIN A-4 (runoff from previous Sycamore Plaza hydrology submittal E-20/D-13)

Q_P = 1.2 CFS

e. BASIN A-5 (runoff from previous Sycamore Plaza hydrology submittal E-20/D-13)

Q_P = 5.5 CFS

f. BASIN A-6

TOTAL AREA = 0.3294 AC = 14,400 SF
A_B = 0.1003 AC (0.30)
A_D = 0.2291 AC (0.70)

Weighted E = 1.93 IN = 0.161 FT
V_{360} = E x A = 2,300 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 1.4 CFS

g. BASIN A-7

TOTAL AREA = 4.505 AC = 176,400 SF
A_B = 0.3500 (0.09)
A_D = 3.7005 (0.91)

Weighted E = 2.24 IN = 0.187 FT
V_{360} = E x A = 32,900 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 19.5 CFS

h. BASIN A-8

TOTAL AREA = 3.9995 AC = 174,200 SF
A_B = 0.4203 AC (0.11)
A_D = 3.5792 AC (0.89)

Weighted E = 2.21 IN = 0.184 FT
V_{360} = E x A = 32,100 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 19.1 CFS

2. BASIN B

a. BASIN B-1

TOTAL AREA = 11.5029 AC = 501,100 SF
A_B = 1.0590 AC (0.09)
A_C = 0.5716 AC (0.05)
A_D = 9.8723 AC (0.86)

Weighted E = 2.18 IN = 0.181 FT
V_{360} = E x A = 90,900 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 54.3 CFS

b. BASIN B-2

TOTAL AREA = 12.32 AC = 536,700 SF
A_B = 1.0829 AC (0.09)
A_D = 11.2371 AC (0.91)

Weighted E = 2.23 IN = 0.186 FT
V_{360} = E x A = 100,000 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 59.2 CFS

3. BASIN C

a. BASIN C-1

TOTAL AREA = 22.79 AC = 992,000 SF
A_A = 22.79 AC (1.00)

Weighted E = 0.66 IN = 0.055 FT
V_{360} = E x A = 55,000 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 42.6 CFS

b. BASIN C-2

The 2.5 acres at the corner of Moon & Academy will be calculated as commercially developed land (15% landscaped), while the remainder will be calculated as undeveloped land.

TOTAL AREA = 4.71 AC = 205,000 SF
A_A = 2.21 AC (0.47)
A_B = 0.40 AC (0.08)
A_D = 2.10 AC (0.45)

Weighted E =1.45 IN = 0.121 FT
V_{360} = E x A = 24,700 CF

$Q_P = \Sigma Q_{Pi} \times A_i$ = 15.7 CFS

SUMMARY OF HYDRAULIC GRADELINE CALCULATIONS

CLOSED CONDUIT

BY: JPK
DATE: 1/10/92
SHEET: 9 OF 20

PROJECT: SYCAMORE PLAZA

LINE: A

STATION	STRUCT	S	D	Q	A	V	K	S_f	L	Δ	JUNCTION D	JUNCTION θ	LOSSES h_f	h_c	h_j	h_{mh}	h_t	h_b	Σ	E.G.	h_v	H.G.	INV. EL.	SOFFIT EL.	SURFACE EL.
9+03.93	OUTLET																			48.56	1.26	47.30[b]	43.10	47.10	50.00
9+45.00	M.H.	0.0065	48"	113.5	12.57	9.03	1436	0.0062	41.57		45		0.26			0.06		0.18	0.50	49.06	1.26	47.80	43.35	47.35	51.30
10+00.00	INLET	0.0065	48"	113.5	12.57	9.03	1436	0.0062	55.00		28		0.34			0.06		0.13	0.53	49.59	1.26	48.33	44.08	48.08	50.20
14+76.08	M.H.	0.0120	36"	59.2	7.07	8.37	666	0.0079	476.08		10		3.76			0.05		0.07	3.88	54.81	1.09	53.75[c]	50.75	53.75	63.00
17+91.22	INLET	0.0080	36"	59.2	7.07	8.37	666	0.0079	315.14		30	26[a]	2.49		0.12	0.05		0.13	2.79	57.63	1.09	56.54	53.34	56.34	58.00
18+10.74	INLET	0.0060	30"	34.0	4.91	6.92	410	0.0069	19.52				0.13			0.03			0.16	57.38	0.68	56.70	53.90	56.10	57.80
18+33.20	INLET	0.0050	24"	18.0	3.14	5.73	226	0.0063	22.16				0.14			0.02			0.16	57.24	0.38	56.86	54.46	56.46	57.80

MANNING'S n: 0.013

$$K = \frac{1.486}{n} AR^{2/3}$$

$$S_f = \left(\frac{Q}{K}\right)^2$$

$$h_f = S_f L$$

$$h_{m.h.} = 0.05\left(\frac{V_2^2}{2g}\right)$$

JUNCTIONS:

$$\Delta y = \left(V_2^2 - V_1^2 - \frac{A_3}{A_2} V_3^2 \cos\theta\right) g^{-1}$$

$$h_j = \Delta y + h_{v_1} - h_{v_2}$$

CURVES:

$$h_c = 0.002\,\Delta h_v$$

BENDS:

$$h_b = 0.20\sqrt{\frac{D}{90°}}\left(\frac{V^2}{2g}\right)$$

TRANSITIONS:

$h_t = k_2 \times h_v$ SUDDEN EXPANSION
$h_t = k_3 \times h_v$ SUDDEN CONTRACTION
} FULL CONDUIT

k_2 AND k_3 FROM BRATER AND KING, TABLE 6-6 TO 6-10

NOTES: [a] Q_3=15.4 cfs, V_3=4.9 fps [b] ELEV. OF H.G.L. FROM BEAR ARROYO TRIBUTARY, C.O.A. PROJECT 1930. [c] H.G.L. INSIDE PIPE - ASSUME AT SOFFIT.

SUMMARY OF HYDRAULIC GRADELINE CALCULATIONS

CLOSED CONDUIT

BY: JPK
DATE: 1/10/92
SHEET: 10 OF 20

PROJECT: SYCAMORE PLAZA LINE: B

STATION	STRUCT	S	D	Q	A	V	K	S_f	L	Δ	JUNCTION D	JUNCTION θ	LOSSES h_f	h_c	h_j	h_{mh}	h_t	h_b	Σ	E.G.	h_v	H.G.	INV. EL.	SOFFIT EL.	SURFACE EL.
0+00	HEADWALL																			44.43	0.33	44.10[g]	35.50	39.50	44.0
0+20	BEND	0.0100	48"	57.9	12.57	4.6	1436	0.0016	20		45		0.03					0.05	0.08	44.51	0.33	44.18	35.70	39.70	46.5
0+80	M.H.	0.0100	48"	57.9	12.57	4.6	1436	0.0016	60		45	45[a]	0.10		-0.58	0.02		0.05	-0.41	44.10	0.33	43.77	36.30	39.30	48.5
1+37.58	8" J_x	0.0194	36"	53.8	7.07	7.6	666	0.0065	57.58			90[b]	0.37		0.21				0.58	45.25	0.90	44.35	37.42	40.42	48.5
1+68	4" J_x			47.7		6.7		0.0051	30.42			90[c]	0.16		0.01				0.17	45.23	0.71	44.52	38.01	41.01	49.5
2+65	4" J_x			46.7		6.6		0.0049	97			90[d]	0.48		0.09				0.52	45.72	0.68	45.04	39.89	42.89	54.0
4+00	18" J_x			45.5		6.4		0.0047	135			45[e]	0.63		0.07				0.70	46.38	0.64	45.74	42.51	45.51	53.5
4+69.36	18" J_x			40.0		5.7		0.0036	69.36			45[f]	0.25		-0.24				0.01	47.36	0.50	46.86[h]	43.86	46.86	52.5
5+00	M.H.			22.8		3.9		0.0017	30.64		90		0.05			0.01		0.05	0.11	47.74	0.24	47.50[h]	45.50	47.50	54.7
6+37.19	INLET	0.0110	24"	22.8	3.14	7.3	226	0.0102	137.19		90		1.40					0.17	1.57	49.90	0.83	49.07	47.47	48.97	53.3
8+58.99	INLET	0.0120	18"	11.4	1.77	6.5	105	0.0118	221.75				2.62						2.62	52.35	0.66	51.69	50.05	51.55	54.3

MANNING'S n: 0.013

$$K = \frac{1.486}{n} AR^{2/3}$$

$$S_f = \left(\frac{Q}{K}\right)^2$$

$$h_f = S_f L$$

$$h_{m.h.} = 0.05\left(\frac{V_2^2}{2g}\right)$$

JUNCTIONS:

$$\Delta y = \left(V_2^2 - V_1^2 - \frac{A_3}{A_2} V_3^2 \cos\theta\right) g^{-1}$$

$$h_j = \Delta y + h_{v_1} - h_{v_2}$$

CURVES:

$$h_c = 0.002\,\Delta h_v$$

BENDS:

$$h_b = 0.20\sqrt{\frac{D}{90°}}\left(\frac{V^2}{2g}\right)$$

TRANSITIONS:

$h_t = k_2 \times h_v$ SUDDEN EXPANSION
$h_t = k_3 \times h_v$ SUDDEN CONTRACTION
} FULL CONDUIT

k_2 AND k_3 FROM BRATER AND KING, TABLE 6-6 TO 6-10

NOTES: [a] $Q_3 = 4.1$ cfs, $V_3 = 2.3$ fps [b] $Q_3 = 6.1$ cfs. [c] $Q_3 = 1.0$ cfs [d] $Q_3 = 1.2$ cfs [e] $Q_3 = 5.5$ cfs, $V_3 = 3.1$ cfs [f] $Q_3 = 17.2$ cfs, $V_3 = 9.7$ cfs

[g] ELEV. OF H.G.L. FROM BEAR ARROYO TRIBUTARY, C.O.A. PROJECT 1930. [h] H.G.L. INSIDE PIPE — ASSUME AT SOFFIT.

HYDRAULIC CALCULATIONS

EQUATIONS:

WEIR: $Q = 3.3 P h^{1.5} (0.7)$ ← 30% CLOGGING FACTOR

ORIFICE: $Q = 0.6 A \sqrt{2gh} (0.7)$

1. BASIN A

a. BASIN A-8 ($Q_{100} = 19.1$ CFS)

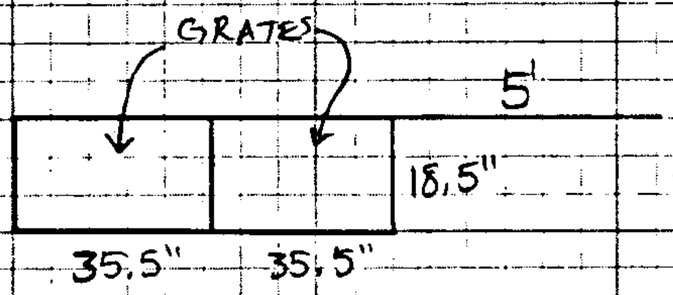
DBL A IN 6" SUMP

i) ORIFICE $A = 4.56$ SF/GRATE x 2 GRATES $= 9.12$ SF

$h = 0.5'$

$Q_{CAP} = 21.7$ CFS

ii) WEIR

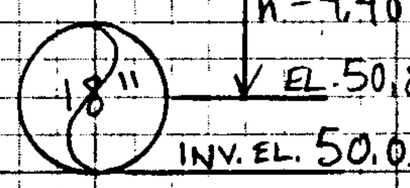


→ $P = 14'$

$h = 0.5'$

CONTROLS → $Q_{CAP} = 11.4$ CFS INTO INLET

iii) ORIFICE (OUTLET PIPE) EL. 5520



$A = 1.77$ SF

Q_{CAP} (NO CLOGGING FACTOR) $= 17.9$ CFS

$Q_{PAST} = 19.1 - 11.4 = 7.7$ CFS

BOHANNAN-HUSTON INC.

PROJECT NAME Sycamore Plaza SHEET 11 OF 21

PROJECT NO. _____ BY JPK DATE 1/20/92

SUBJECT _____ CH'D _____ DATE _____

b. BASIN A-7 (Q_{100} = 19.5+7.7 = 27.2 CFS)

DBL A IN 6" SUMP

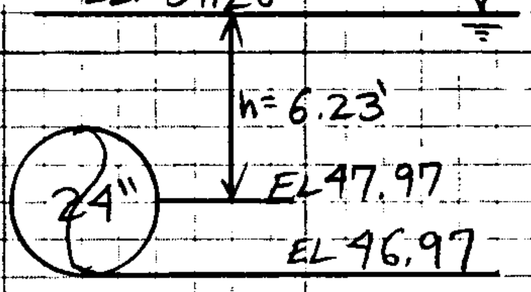
i) ORIFICE (SAME AS BASIN A-8)

Q_{CAP} = 21.7 CFS

ii) WEIR (SAME AS BASIN A-8)

CONTROLS → Q_{CAP} = 11.4 CFS

iii) ORIFICE (OUTLET PIPE)



A= 3.14 SF

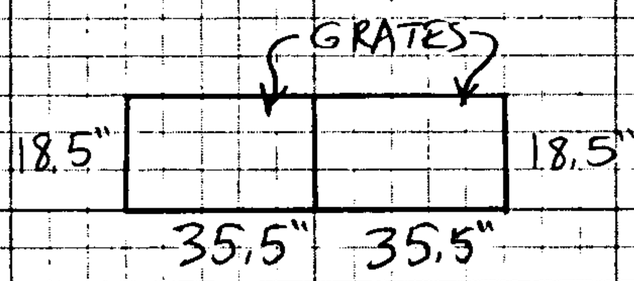
Q_{CAP} (NO CLOGGING FACTOR) = 37.7 CFS

Q_{PAST} = 27.2 - 11.4 = 15.8 CFS

c. BASIN A-6 (Q_{100} = 1.4+15.8 = 17.2 CFS)

DBL C IN 1'-0" SUMP

i) WEIR



P= 9' h= 1.0'

Q_{CAP} = 20.8 CFS

ii) ORIFICE

A= 9.12' h= 1.0'

Q_{CAP} = 30.7 CFS

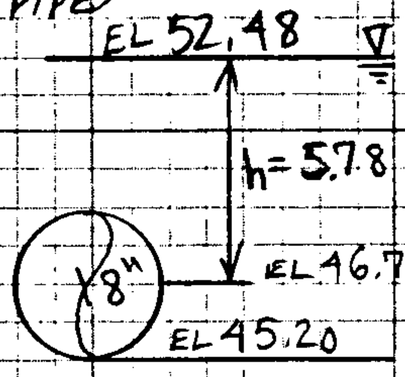
BOHANNAN-HUSTON INC.

PROJECT NAME SYCAMORE PLAZA SHEET 12 OF 21

PROJECT NO. BY JPK DATE 1/20/92

SUBJECT CH'D DATE

iii) ORIFICE (OUTLET PIPE)



$A = 1.77$ SF

CONTROLS → Q_{CAP} (NO CLOGGING FACTOR) = 20.5 CFS

$Q_{CAP} > Q_{100}$, THUS ALL OF THE RUNOFF FROM BASINS A-6 THRU A-8 WILL BE DISCHARGED BY THE STORM DRAIN SYSTEM.

d. BASINS A-1 THRU A-5

THE EXISTING INLETS IN THESE BASINS WERE DETERMINED TO BE SUFFICIENT BY THE PREVIOUSLY-APPROVED DRAINAGE PLAN PREPARED BY THIS OFFICE FOR ONE SYCAMORE PLAZA, DATED FEB. 10, 1987. DRAINAGE FILE: E-20/D-13.

2. BASIN B

a. BASIN B-2 (Q_{100} = 59.2 CFS)

1) CALCULATE DEPTH OF FLOW AT INLETS IN SUMP (LIMITING DEPTH = 6" PROVIDED BY A WATER BLOCK).

SECTION: $S = 0.0085$ | $S = 0.0266$

LONGITUDINAL $S = 0.0179$

$n = 0.017$

USING MANNING'S EQUATION, $D = 0.43'$; $V = 4.2$ fps

CALCULATE $F_1 = \frac{V}{\sqrt{g D_1}} = 1.13$

SO A SLIGHT JUMP OCCURS.

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FROM PLATE 22.3E-1: $\frac{TW\ DEPTH}{D_1} = 1.15$

COMPUTE TW DEPTH = 0.49'

2) CALCULATE INLET CAPACITIES FOR THE INLETS IN THE SUMP:

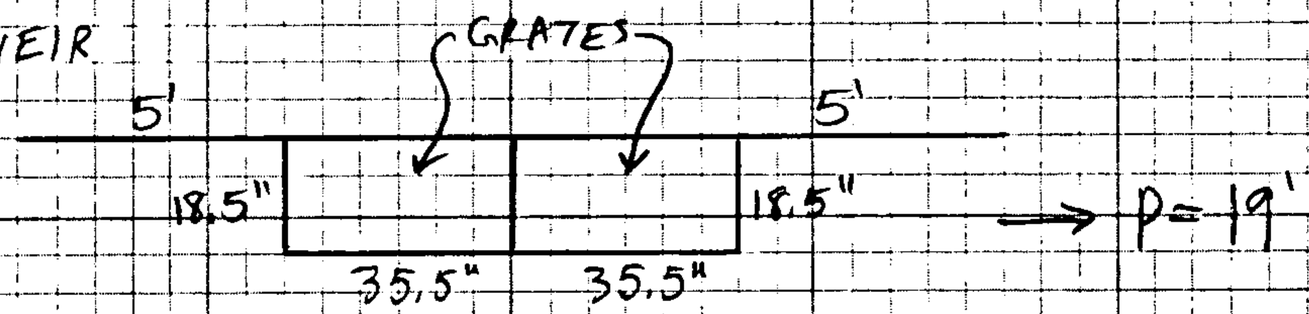
2a) DBL A'S IN 0.49' SUMP (Q_{100} = 18.0 CFS)

i) ORIFICE

A = 9.12 SF h = 0.49'

Q_{CAP} = 21.5 CFS

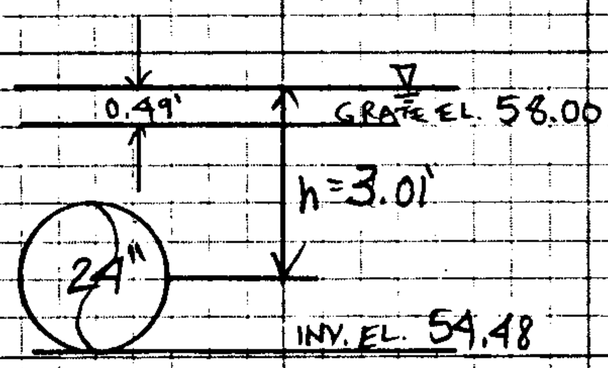
ii) WEIR



h = 0.49'

CONTROLS → Q_{CAP} = 21.5 CFS

iii) ORIFICE (OUTLET PIPE)



A = 3.14 SF

Q_{CAP} (NO CLOGGING FACTOR) = 26.2 CFS

$Q_{CAP} > Q_{100}$ ✓

$Q_{PAST} = 59.2 - 18.0(2) = 23.2$ CFS

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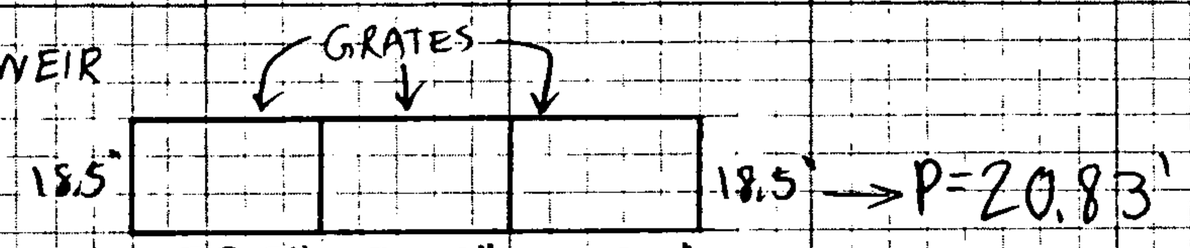
2b) TRPL D IN 0.49' SUMP (Q_{100} = 16.0 CFS)

i) ORIFICE

A = 13.68 SF h = 0.49'

Q_{CAP} = 32.3 CFS

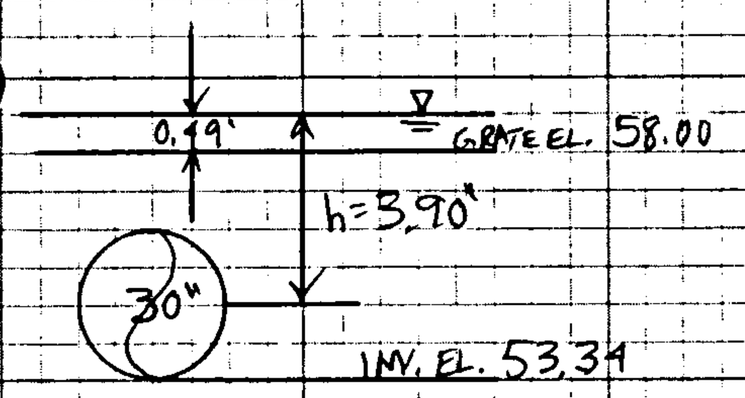
ii) WEIR



h = 0.49'

CONTROLS → Q_{CAP} = 16.5 CFS

iii) ORIFICE (OUTLET PIPE)



A = 4.91 SF

Q_{CAP} (NO CLOGGING FACTOR) = 46.7 CFS

$Q_{CAP} > Q_{100}$

Q_{PAST} = 23.2 - 16.0 = 7.2 CFS

2c) DBL D IN 0.49' SUMP (Q_{100} = 7.2 CFS)

i) ORIFICE

A = 9.12 SF h = 0.49'

Q_{CAP} = 21.5 CFS

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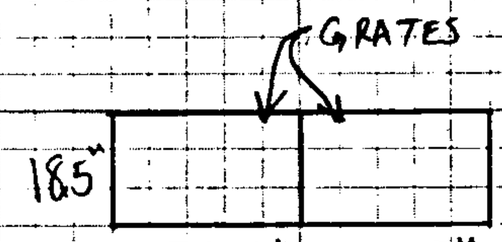
ii) WEIR

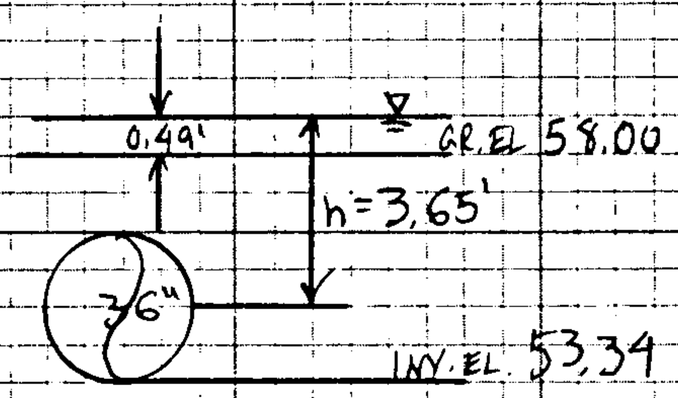


$\rightarrow P = 14.92'$

$h = 0.49'$

CONTROLS $\rightarrow Q_{CAP} = 11.8$ CFS

iii) ORIFICE (OUTLET PIPE)



$A = 7.07$ SF

Q_{CAP} (NO CLOGGING FACTOR) $= 65.0$

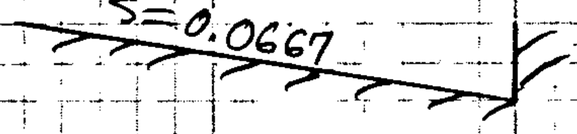
$Q_{CAP} > Q_{100}$

$Q_{PAST} = 0$ ✓

b. BASIN B-1 ($Q_{100} = 54.3$ CFS)

1) CALCULATE DEPTH OF FLOW AT INLETS IN SUMP (LIMITING DEPTH = 24" PROVIDED BY A WATERBLOCK).

SECTION:



LONGITUDINAL $S = 0.0385$

USING MANNING'S EQUATION, $D = 0.86'$, $V = 9.8$ fps

CALCULATE $F_1 = \frac{V}{\sqrt{g D_1}} = 1.86$

SO A JUMP OCCURS.

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FROM PLATE 22.3 E-1: $\frac{\text{TW DEPTH}}{D_1} = 2.25$

COMPUTE TW DEPTH = 1.94'

2) CALCULATE INLET CAPACITY OF THE INLET IN THE SUMP:

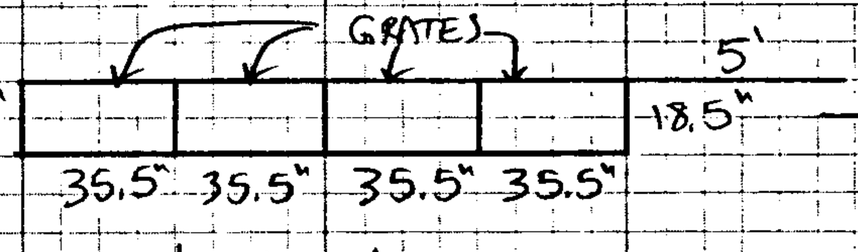
$Q_{DPL\ A\ INLET}$ (Q_{100} = 54.3 CFS)

i) ORIFICE

A = 4.56 x 4 = 18.24 SF h = 1.94'

CONTROLS → Q_{CAP} = 85.6 CFS

ii) WEIR

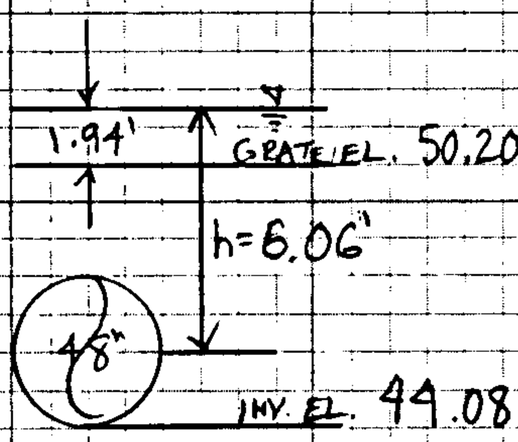


P = 19.92'

h = 1.94'

Q_{CAP} = 243 CFS

iii) ORIFICE (OUTLET PIPE)



$Q_{CAP.\ (NO\ CLOGGING\ FACTOR)}$ = 149.0 CFS

$Q_{CAP} > Q_{100}$

Q_{PASS} = 0 ✓

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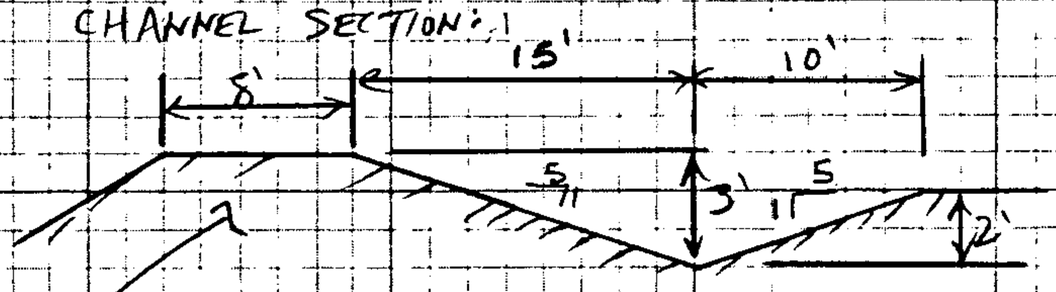
3. BASIN C

a. BASIN C-2 ($Q_{100} = 15.7$ CFS)

CHANNEL SECTION:



BERM PER DPM

LONGITUDINAL $S = 0.0050$

$n = 0.0300$ (DIRT – UNLINED)

USING MANNING'S EQUATION, CALCULATE:

$D = 1.15'$, $V = 2.4$ FPS.

VELOCITY < 3 FPS, SO CHANNEL CAN BE UNLINED PER DPM.

BERM PROVIDES 2' OF FREEBOARD PER DPM.

SINCE THERE ARE NO CURVES IN THE CHANNEL, IT DOESN'T NEED ANY BANK PROTECTION PER THE DPM.

b. BASIN C-1 ($Q_{100} = 15.7 + 92.6 = 58.3$ CFS)

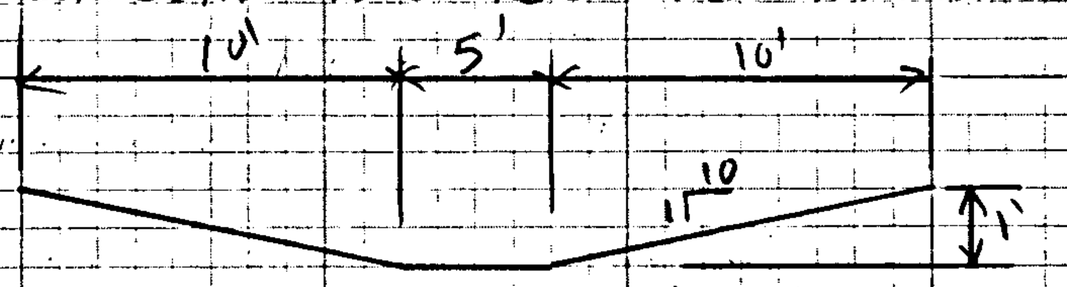
i) SAME CHANNEL SECTION, BUT LONGITUDINAL $S = 0.0050$ (MINIMUM) AND $n = 0.017$ (ASPHALT)

$D = 1.52'$, $V = 5.0$ FPS

$D = 1.52'$, $V = 5.0$ FPS

$$F_1 = \frac{V}{\sqrt{gD_1}} = 0.7 \rightarrow$$ NO HYDRAULIC JUMP WILL OCCUR.

ii) SIDE INLET CONNECTION TO CONCRETE-LINED CHANNEL



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RATING CURVE FOR SIDE INLET

MANNING'S N = .0130 SLOPE = .0080

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	1.00	3	15.00	0.00			
2	10.00	0.00	4	25.00	1.00			

	WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
	0.1	0.1	0.3	0.4	6.0	1.3	6.0
	0.1	0.1	0.6	1.2	7.0	2.0	7.0
	0.2	0.2	1.0	2.4	8.0	2.5	8.0
	0.2	0.2	1.4	4.1	9.0	3.0	9.0
	0.3	0.3	1.9	6.3	10.0	3.3	10.0
	0.3	0.3	2.4	8.9	11.0	3.7	11.0
	0.4	0.4	3.0	12.0	12.0	4.0	12.0
	0.4	0.4	3.6	15.6	13.0	4.3	13.0
	0.5	0.5	4.3	19.8	14.0	4.6	14.0
	0.5	0.5	5.0	24.5	15.0	4.9	15.0
	0.6	0.6	5.8	29.9	16.1	5.2	16.0
	0.6	0.6	6.6	35.8	17.1	5.4	17.0
	0.7	0.7	7.5	42.4	18.1	5.7	18.0
	0.7	0.7	8.4	49.7	19.1	5.9	19.0
Q = 58.3 CFS →	0.8	0.8	9.4	57.7	20.1	6.2	20.0
	0.8	0.8	10.4	66.4	21.1	6.4	21.0
	0.9	0.9	11.5	75.8	22.1	6.6	22.0
	0.9	0.9	12.6	86.0	23.1	6.8	23.0
	1.0	1.0	13.8	97.0	24.1	7.0	24.0
	1.0	1.0	15.0	108.8	25.1	7.3	25.0

FROM RATING CURVE: $D = 0.76'$, $V = 6.2$ FPS

$$F_1 = \frac{V}{\sqrt{g D_1}} = 1.25$$

A HYDRAULIC JUMP CAN OCCUR.

FROM PLATE 22.3E-1:

$$\frac{\text{TW DEPTH}}{D_1} = 1.3 \rightarrow \text{TW DEPTH} = 0.99'$$

THE RUNOFF WILL REMAIN ON PAVED SURFACES IN THE EVENT OF A JUMP.

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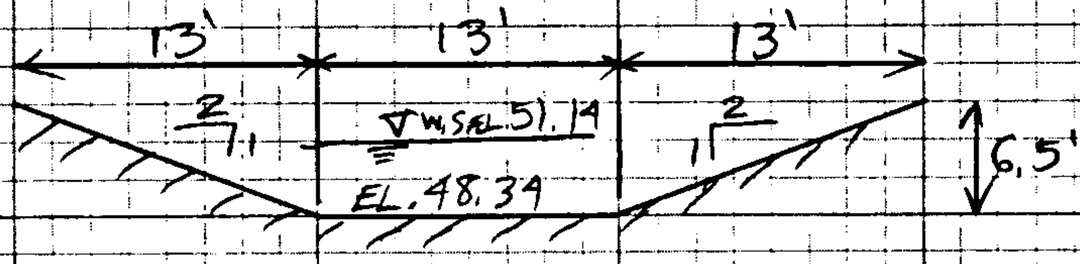
iii) ANALYSIS OF SURFACE INLET (SIDE CHANNEL) INTO MAIN CHANNEL:

ACCORDING TO THE DPM, WHEN A MAIN CHANNEL IS NARROW AND THE SIDE INFLOW IS 3 TO 6% OF THE MAIN FLOW, HIGH WAVES COULD BE PRODUCED. THE PREVENTION OF HIGH WAVES WOULD REQUIRE SPECIAL PROTECTIVE MEASURES.

ACCORDING TO C.O.A. PROJ. # 1930, THE Q_{100} IN THE MAIN CHANNEL IS: 1520 CFS.

SECTION:



$n = 0.013$ $S = 0.0256$

USING MANNING'S EQUATION: $V = 29.4$ FPS, $D = 2.8'$.

FROM THE PREVIOUS CALCULATIONS, THE DATA FOR THE SIDE INLET IS: $Q_{100} = 58.3$ CFS, $V = 6.1$ FPS, $D = 1.38'$

W.S.EL @ INLET = 53.00 + 1.38 = 59.38

THE SIDE CHANNEL FLOW IS $58.3/1520 = 3.8\%$ OF THE MAIN FLOW. THIS FALLS INTO THE 3% - 6% RANGE MENTIONED BY THE DPM. HOWEVER, THE DPM ALSO SAYS THE LIKELIHOOD OF HIGH WAVES IS GREATER WHEN $V_{SIDE\ INLET} \rightarrow V_{MAIN\ CHANNEL}$.

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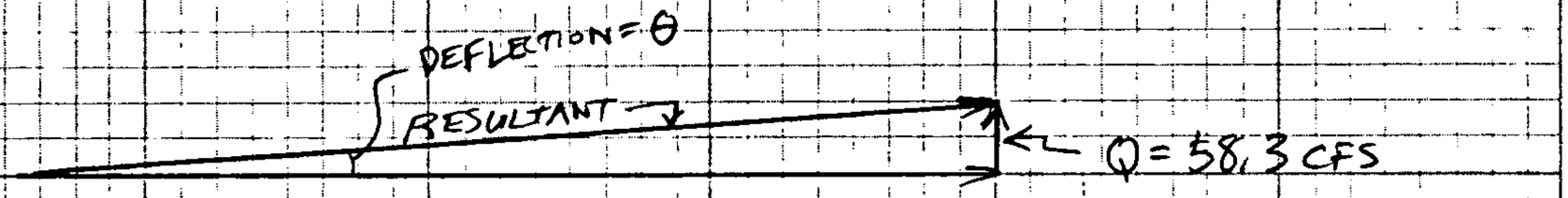
BUT $V_{SIDE\,INLET} = 6.1$ FPS, AND $V_{MAIN\,CHANNEL} = 29.4$ FPS.

SO $V_{SIDE\,INLET} << V_{MAIN\,CHANNEL}$.

ANALYZE THE CONFLUENCE OF FLOWS USING A MOMENTUM EQUATION:



$Q = 1520$ cfs

$M_{MASS\,FLOW} = M_{..} = 94{,}800$ #/S

$V = 29.4$ FPS

$M \times V = 2{,}790{,}000$ F#/S²

$\theta = \tan^{-1} 22/2790 = 0.45°$

THEREFORE, IT IS FELT THAT ANY HIGH WAVE PRODUCED BY THE SIDE INLET WILL BE NEGLIGIBLE IN MAGNITUDE FOR THE FOLLOWING REASONS:

1) THE MOMENTUM ANALYSIS SHOWS ONLY A SLIGHT (0.45°) DEFLECTION OF THE MAIN CHANNEL FLOW.

2) THE SIDE CHANNEL VELOCITY IS MUCH LESS THAN THE MAIN CHANNEL VELOCITY.

3) THE MAIN CHANNEL IS CURVING IN THE DIRECTION OF THE FLOW DISPLACEMENT, WHICH OFFSETS THE EFFECT OF THE DIVERSION.

4) THE SIDE INLET IS 360' UPSTREAM OF THE STILLING BASIN AT THE HEADWALL, WHICH WOULD CAUSE ANY SLIGHT WAVES TO BE STILLED JUST A SHORT DISTANCE DOWNSTREAM.

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