City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 20, 1993

Kerry Davis, P.E.
Bohannan-Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

RE: ENGINEER'S CERTIFICATION FOR TRACT H-16A, RIVERVIEW RIDGE, (D-12/D1N)
RECEIVED SEPTEMBER 30, 1993 FOR FINANCIAL GUARANTY RELEASE
STAMPED & DATED 9-27-93

Dear Mr. Davis:

Based on the information included in the submittal referenced above, City Hydrology accepts the Engineer's Certification for this project.

The Construction Division must accept City Project 4583.90 before the Financial Guaranty will be released.

If you have any questions about this project, you may contact me at 768-2727.

Sincerely,

John P. Curtin

John P. Curtin, P.E.
Civil Engineer/Hydrology

xc: Lynda-Michelle DeVanti, Project # 4583.90

WPHYD+3725

ALBUQUERQUE
NEW MEXICO
1706

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 14, 1993

Kerry Davis, P.E.
Bohannan-Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

RE: DRAINAGE REPORT FOR TRACT H-16A, RIVERVIEW RIDGE, (D-12/D1N)
RECEIVED DECEMBER 18, 1992 FOR FINAL PLAT & WORK ORDER APPROVAL
STAMPED & DATED 12-17-92

Dear Mr. Davis:

Based on the information included in the submittal referenced above, City Hydrology approves this project for Final Plat & Work Order approval.

The Drainage & Grading plan must be included in the set of construction document that you submit for Work Order.

A separate permit will not be required for construction within City right of way since a public storm drain will be connected to the existing inlets.

Certification of grades in accordance with the DPM checklist will be required before the Financial Guarantee is released.

If you have any questions about this project, you may contact me at 768-2727.

Sincerely,

John P. Curtin

John P. Curtin, P.E.
PWD/Hydrology

xc: Alan Martinez

WPHYD+3725

DRAINAGE REPORT
FOR
RIVERVIEW RIDGE

Riverview Tract H-16A

December 1992

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.

12-17-92

KERRY L. DAVIS, P.E. — DATE

DRAINAGE MANAGEMENT PLAN

PURPOSE

The purpose of this report is to present the Drainage Management Plan for work order and rough grading approval for Riverview Ridge (formerly Tract 16A, Riverview Properties). The plan is prepared in accordance with prior reports approved by the City of Albuquerque and in accordance with the Development Process Manual (DPM) of the City of Albuquerque including recently proposed revisions dated August, 1991 (DPM update). The parcel is currently zoned R-2 although Riverview Ridge is being subdivided into a single-family, detached residential subdivision consisting of approximately 55 lots on approximately 14.5 acres.

SITE LOCATION AND EXISTING CONDITIONS

The property is located within the Riverview Master Plan area of Taylor Ranch on Albuquerque's west mesa. The site lies between Calle Nortena to the north and Butterfield Trail to the south with Golf Course Road bordering the site on the east. The developed Prairie Ridge Subdivision, Unit 8, borders the site to the west (refer to the Location Map in Appendix 1).

The majority of the site drains to the south branch of the Piedras Marcadas Arroyo at the intersection of Golf Course Road and Butterfield Trail. Initially, an approved "South Branch of the Piedras Marcadas Arroyo" Drainage Report prepared by Bohannan-Huston Inc. in August 1992, included a portion of the site which, under developed conditions, would generate approximately 25.3 cfs. This flow rate was assured by the report to be collected at the existing inlet at Golf Course Road south of Butterfield Trail. Please refer to Plates 2 and 3 which are excerpts from the South Branch Study. Currently, a revised Drainage Report is being assembled for the South

Branch Study which will continue to include the developed flow conditions at the aforementioned existing inlet. Data reflecting this revision is enclosed with this submittal.

The remaining portion of the site drains north and northeast into the existing storm sewer system at Golf Course Road and Calle Nortena which conveys flows to the middle branch of the Piedras Marcadas Arroyo to the northeast. Their flows are eventually discharged into AMAFCA's Piedras Marcadas Dam.

The parcel consists of slopes from west to east ranging from 2% to 30%. The site vegetation consists of native grasses and weeds. Site soils are classified by the SCS's "Soil Survey of Bernalillo County" as those of BCC (Blue Point) at the north end of the site, a small portion of AMB (Alameda Series) at the northern middle of the site, and a majority of MWS (Madurey-Wink Association) to the south (see A-1-3 Appendix). The working descriptions of the Alameda Sandy Soil and Bluepoint Loamy Fine Sand are similar to that for the Madurey-Wink Soils which are described as "deep, well drained soils that formed on piedmont and alluvial wind." These soils experience slow runoff and moderate to severe wind erosion potential. Basalt outcrops are evident along the east boundary of the site. A detailed geotechnical analysis of the site was performed by Vinyard and Associates, dated September 28, 1992.

HYDROLOGIC ANALYSIS

The new rational method hydrologic procedures identified within the proposed revision to Chapter 22, Section 22.2 of the Development Process Manual (DPM Update) has been utilized to determine peak flow rates for comparison with the master storm sewer design (south branch of the Piedras Marcadas Arroyo) to the south, and a comparison of developed versus undeveloped flows and inlet capacities of the existing storm system to the north. Currently, Molzen-Corbin and Associates are

preparing a report for AMAFCA which will analyze the entire Piedras Marcadas Watershed including the middle branch in order to determine the effects of upstream development on the existing dam.

As shown by Panel 3500020008 of the National Flood Insurance Program, Flood Boundary and Floodway Maps (see Figure A-1.2, Appendix 1), the project site does not lie within a designated 100-year flood hazard zone. The major purpose of the South Branch Study was to remove the flood hazard designation from downstream property within this watershed. At this time, the study is being reviewed by the Federal Emergency Management Agency (FEMA) for the purpose of a Conditional Letter of Map Revision (CLOMR).

The hydrologic calculations which appear herein analyze both the existing and developed discharge for the 100-year, 6-hour rainfall event. Street and channel capacities were computed using Mannings equation with Mannings N values as identified within the latest edition of the DPM. The capacities of streets were computed with the maximum water elevation at the top of curb. Hydraulic grade line calculations were made in accordance with DPM guidelines. Computations of inlet capacities in sumps were made using the orifice and weir equations per currently accepted procedures. As required by the City's Hydrology Department, the sump conditions have been over designed to discharge 200% of the 100-year event to the existing inlet tie-ins to eliminate the need for right-of-way for emergency overflow conditions. All calculations described above have been included in Appendix 2 (Hydrology Computations).

DRAINAGE MANAGEMENT PLAN

Under developed conditions, the site will be graded to deliver runoff from developed lots into the street sections which will utilize standard or rolled curb. All the street sections proposed for rolled curb can contain the 100-year flood flows within the

pavement sections. Standard curb and gutter are utilized at or near inlet locations in order to increase the headwater available over inlet gradings. A small portion of the rear of lots adjacent to Golf Course Road, Calle Nortena, and Butterfield Trail will drain to these streets via turned block weep holes. Slope paving is proposed to be utilized in lieu of tall retaining walls in order to achieve an aesthetic solution to extreme grade difficulties at the rear of lots near the Calle Nortena/Golf Course Road intersection. Surface treatment and type of slope pavement will be determined through the DRC review and approval process. As shown on the enclosed Grading and Drainage Plan (Plate I), the majority of the site will drain on to Ridge Drive which will be constructed with a high point basin divide at the center of the site.

Flows from the south half of the project will be conveyed to a low point near the southern entrance to the site where sump inlets designed for 200% of the 100-year event will be installed to convey 40.2 cfs to the existing inlet at the northwest corner of the Golf Course Road/Butterfield Trail intersection via a 30-foot utility easement across lot 55. Flows generated from the north portion of Ridge Drive and the eastern portion of Riverhill Drive will convey 12.2 cfs into the inlet at the north end of the Ridgeview Drive cul-de-sac. Again, this inlet was designed to carry 200% of the 100-year event (24.2 cfs). Flows collected here will be conveyed to the existing double 'C' inlet near the southwest corner of the Golf Course/Calle Nortena intersection via a 20-foot storm drain easement.

Flows generated on the western portion of Riverhill Drive will freely discharge into Calle Nortena. The two lots at the Bursera Road/Calle Nortena intersection will drain 1.0 cfs directly onto Bursera Road which drains on to Calle Nortena northwest. These flows will continue east to the existing battery of inlets on the south side of Calle Nortena. This existing storm system, which drains to the middle branch of the Piedras Marcadas is currently being analyzed by Molzen-Corbin and Associates. The impact of development within this basin involves the increase in discharge of 3.3 cfs, from 18.2 cfs in underdeveloped conditions, verses 14.9 cfs under developed

conditions. This increase in discharge in minimal and allowed should have no significant impact upon downstream facilities.

The Grading and Drainage Plan shows: 1) existing grades indicated by spot elevations and contours at 1'0" intervals; 2) proposed grades indicated by spot elevations and slope limits; 3) the limit and character of existing and proposed improvements, and 4) continuity between existing and proposed grades. As shown by this plan, the proposed improvements consist of a 55-lot detached residential subdivision of Riverview Ridge, complete with paving, drainage, and utility improvements.

CONCLUSIONS

As shown by the calculations (Appendix 2), the proposed development will result in an increase in run-off generated by the site compared to underdeveloped conditions of 33.8 cfs (100-year or approximately 30%. However, downstream storm sewer systems were previously designed to convey developed run-off generated on this project, which included the existing South Branch Storm Sewer in Butterfield Trail and the existing Middle Branch Storm Sewer in Calle Nortena and Golf Course Road.

The existing South Branch system was previously analyzed to accept 25.3 cfs versus the actual 23.9 cfs generated from the southerly portions of the site. As stated before, the South Branch System has been re-analyzed to correlate with the latest FEMA submittal Hydraulic data shown in this report reflect the latest changes in their analysis. The northerly portion of the site draining to the existing Middle Branch Storm Sewer System will discharge 18.2 cfs versus 14.9 cfs under undeveloped conditions, a net increase of 3.3 cfs.

Therefore, due to the close proximity of the existing storm system in relation to the outfall from the northern portion of the site, the flows generated are expected to

have minimal impact on the existing downstream storm sewer systems. That is to say that the peak discharge from this site will have been conveyed by the downstream system long before the peak flows from upstream basins pass by the site within Calle Nortena to the Middle Branch Storm Sewer System.

BASIN ANALYSIS

ZONE 1

DEVELOPED

BASIN	AREA	% LAND TYPE A	B	C	D	Q_{100}
A	0.34	0%	35	35	30	1.0 cfs
B	1.45	0	35	35	30	4.4
C	0.22	0	40	40	20	0.6
D	0.99	0	20	20	60	3.6
E	4.31	0	40	40	20	12.2
F	7.10	0	40	40	20	20.1
G	0.05	0	10	10	80	0.2

UNDEVELOPED FLOWS AT NORTH PORTION (INTO CALLE NORTENA)

BASIN	AREA	% LAND TYPE A	B	C	D	Q_{UDEV}	Q_{DEV}
A	0.34	0	60	40	0	0.8 cfs	1.0
B	1.45	0	60	40	0	3.4	4.4
C	0.22	0	60	40	0	0.5	0.6
D	0.99	0	60	40	0	2.3	3.6
E	4.31	0	60	40	0	10.2	12.2
F	7.10	0	65	35	0	16.5	20.1
G	0.05	0	65	35	0	0.1	0.2
						33.8	41.7

UNDEVELOPED FLOWS AT THE NORTH PORTION (INTO CALLE NORTENA)

BASINS A, B, C, & E, (From Above) = 18.2

Net change = 18.2 − 14.0 = 3.3 cfs increase

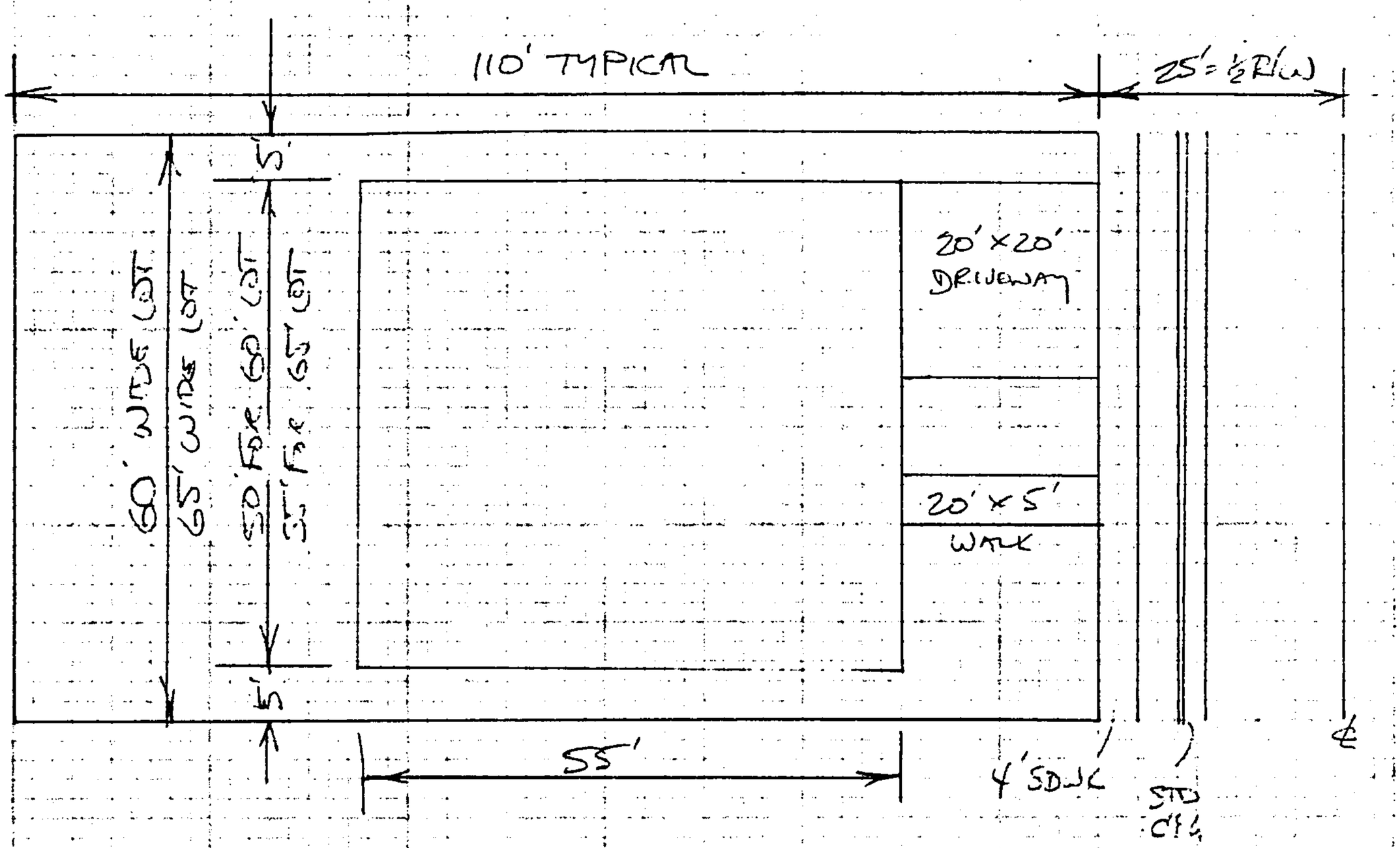
BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET _____ OF _____

PROJECT NO. 92137.02 BY GCS DATE 9/22/92

SUBJECT BASIN ANALYSIS CH'D _____ DATE _____

IMPERVIOUS AREA COMPUTATION



		60' LOT	65' LOT
HOUSE PAD	(55' DEEP)	2750 SF	3575 SF
DRIVEWAY	(20x20)	400	400
WALKWAY	(20x5)	100	100
BACK PATIO	(10x10)	100	100
SIDEWALK	(4' WIDE)	240	260
CURB & GUTTER	(2.5' WIDE)	150	162.5
PAVING	(14' WIDE)	840	910
TOTAL		4580 SF/LOT	5507.5 SF/LOT

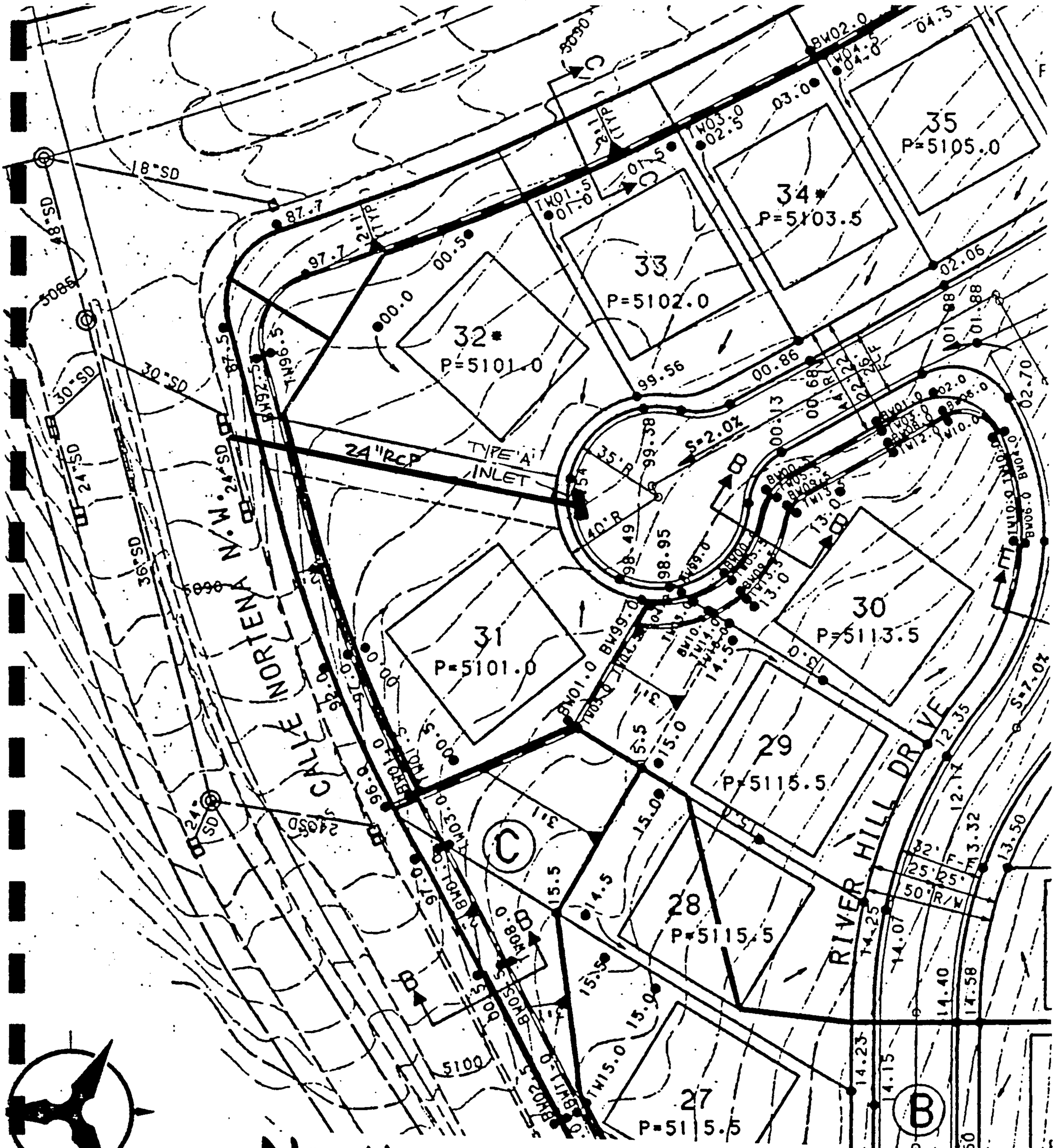
BOHANNAN-HUSTON INC.

PROJECT NAME KINGSVIEW KIDS

PROJECT NO. 72137.02 BY KLD DATE 9/18/02

SUBJECT TYPICAL LOTS CH'D DATE

North End of Ridgeview Drive



Elevations are Incorrect

Pipe is unsealed.

SUMMARY OF HYDRAULIC CALCULATIONS

CLOSED CONDUIT

BY: CrCJ

DATE: 11/5/02

SHEET: OF:

PROJECT: Riverview Ridge Subdivision

LINE: North Discharge

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
STATION	STRUCT	D	Q	A	V	K	S_f	L	Δ	JUNCTION D	JUNCTION θ	LOSSES h_f	LOSSES h_b	LOSSES h_j	LOSSES h_{mh}	LOSSES h_f	LOSSES h_{misc}	LOSSES Σ	E.G.	h_v	H.G.
CASE A																					
North Discharge (Calle Norteña) Q100																					
Sta 0+00	EXIST. 36X30 WPE																				
		30"	40.2	4.909	8.19	410.1	6.92	56.0	3.88			.54						.54	85.04	1.04	84.00
0+56	EXIST INLET									INLET	45°			.78				.78	85.58	1.04	84.54
		18"	12.2	1.767	6.90	105.0	8.64	135	11.66			2.3						2.3	84.59	.049	85.32
1+91	INLET											1.8							87.67	.049	87.62
CASE B																					
South Discharge (Calle Norteña) Q200%																					
Sta 0+00	EXIST 36 X30 WPE																				
		30"	52.4	4.909	10.67	410.1	6.92	56.0				.91						.91	84.91	1.77	84.00
0+56	EXIST INLET									INLET	45°			2.21				2.21	86.68	1.77	84.91
		18"	24.4	1.767	13.81	105.0	8.64	135				8.5						8.5	90.08	2.96	87.12
1+91	INLET																		90.08	2.96	95.62

REMARKS:

MANNING'S n: .013

Head Losses @ North Discharge
CASE A (Q_{100} = 12.2 cfs)

1) EXISTING 36"x30" WYE TO EXISTING DOUBLE C INLET (INLET #1)

56'-30" RCP, S = 6.92%, Q = 40.2 cfs, $V = Q/A = \frac{40.2}{4.909} = 8.19$ cfs

$K = 410.1$ $V^2/2g = (8.19)^2/64.4 = 1.04'$

$H_L(\text{CONDUIT}) = \left[\frac{Q}{K}\right]^2 L = \left[\frac{40.2}{410.1}\right]^2 56 = .54'$

$H_L(\text{JUNCTION})$: $A_1 = 3.14$ $A_2 = 4.909$ $A_3 = 1.767$

$V_1 = 5.41$ $V_2 = 8.19$ $V_3 = 6.90$

$Q_1 = 17$ $Q_2 = 40.2$ $Q_3 = 12.2$

$hV_1 = \frac{V^2}{2g} = .45$ $hV_2 = 1.04$

$$\Delta y = \frac{Q_2V_2 - Q_1V_1 - Q_3V_3\cos\theta}{\left(\frac{A_1+A_2}{2}\right)g} = \frac{40.2(8.10) - 17(5.41) - 12.2(6.9)\cos 45^\circ}{\left(\frac{3.14 + 4.909}{2}\right)32.2}$$

$= 1.37$

$H_{junction} = \Delta y + hV_1 - hV_2 = 1.37 + .45 - 1.04 = .78'$

H_L @ INLET 1 = .54 + .78 = 1.32

HGL @ INLET 1 = 84 + 1.32 = 85.32

2) EXISTING DOUBLE C INLET TO PROPOSED DOUBLE A INLET AT RIDGEVIEW DRIVE CUL-DE-SAC

135'-18" RCP, S = 8.64%, $Q_{(100)}$ = 12.2 cfs, $V = Q/A = \frac{12.2}{1.767} = 6.90$

FROM DPM NOMOGRAPH (22.3, p 78)

$H_L = 2.3'$

∴ HGL @ Double "A" INLET = 85.32 + 2.3 = 87.62

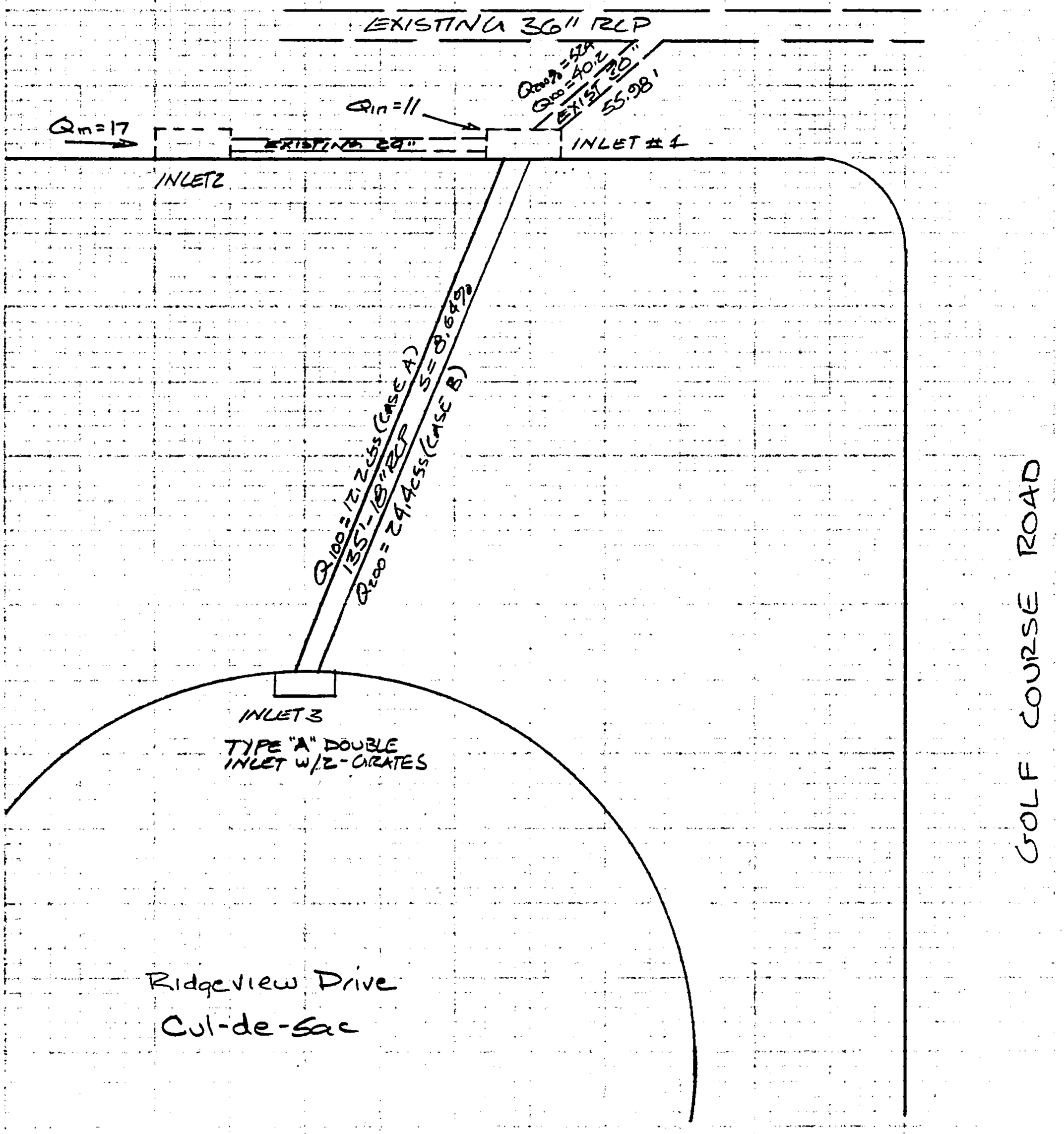
BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO. 02137.02 BY GCJ DATE 11/9/02

SUBJECT North Discharge CASE A CH'D ____ DATE ____

CALLE NORTENA



Ridgeview Drive
Cul-de-Sac

BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO. 02137.02 BY GCJ DATE 11/5/02

SUBJECT ____ CH'D ____ DATE ____

Head Losses @ North Discharge
CASE B (Q_{100} = 24.4 cfs)

1) EXISTING 36"x30" WYE TO EXISTING DOUBLE "C" INLET (INLET #1)

56'-30" RCP, S = 6.92%, Q_{100} = 52.4, $V = \frac{52.4}{4.909} = 10.67$ fps

$K = 410.1$ $\frac{V^2}{2g} = \frac{(10.67)^2}{64.4} = 1.77'$

$H_L(\text{CONDUIT}) = \left[\frac{Q}{K}\right]^2 L = \left[\frac{52.4}{410.1}\right]^2 (56') = .91'$

$H_L(\text{JUNCTION})$: $A_1 = 3.14$ $A_2 = 4.909$ $A_3 = 1.767$

$V_1 = 5.41$ $V_2 = 10.67$ $V_3 = 13.81$

$Q_1 = 17$ $Q_2 = 52.4$ $Q_3 = 24.4$

$h_{V_1} = \frac{V^2}{2g} = .45$ $h_{V_2} = 1.77$

$$\Delta y = \frac{Q_2V_2 - Q_1V_1 - Q_3V_3\cos\theta}{\left(\frac{A_1+A_2}{2}\right)g} = \frac{52.4(10.67) - 17(5.41) - 24.2(13.81\cos 45)}{\left(\frac{3.14+4.909}{2}\right)32.2}$$

$\Delta y = 3.53'$

$H_{\text{JUNCTION}} = \Delta y + h_{V_1} - h_{V_2} = 3.53 + .45 - 1.77 = 2.21$

H_L @ INLET #1 = .91 + 2.21 = 3.12'

HGL @ INLET #1 = 84 + 3.12 = 87.12'

2) EXISTING DOUBLE "C" INLET TO PROPOSED DOUBLE "A" INLET AT RIDGEVIEW DRIVE CUL-DE-SAC

135'-18" RCP, S = 8.64, Q_{100} = 24.4 cfs, $V = Q/A = 24.4/1.767 = 13.81$

FROM DPM NOMOGRAPH (22.3, p 78)

H_L = 8.5'

HGL @ Double "A" INLET = 87.12 + 8.5 = 95.62

BOHANNAN-HUSTON INC.

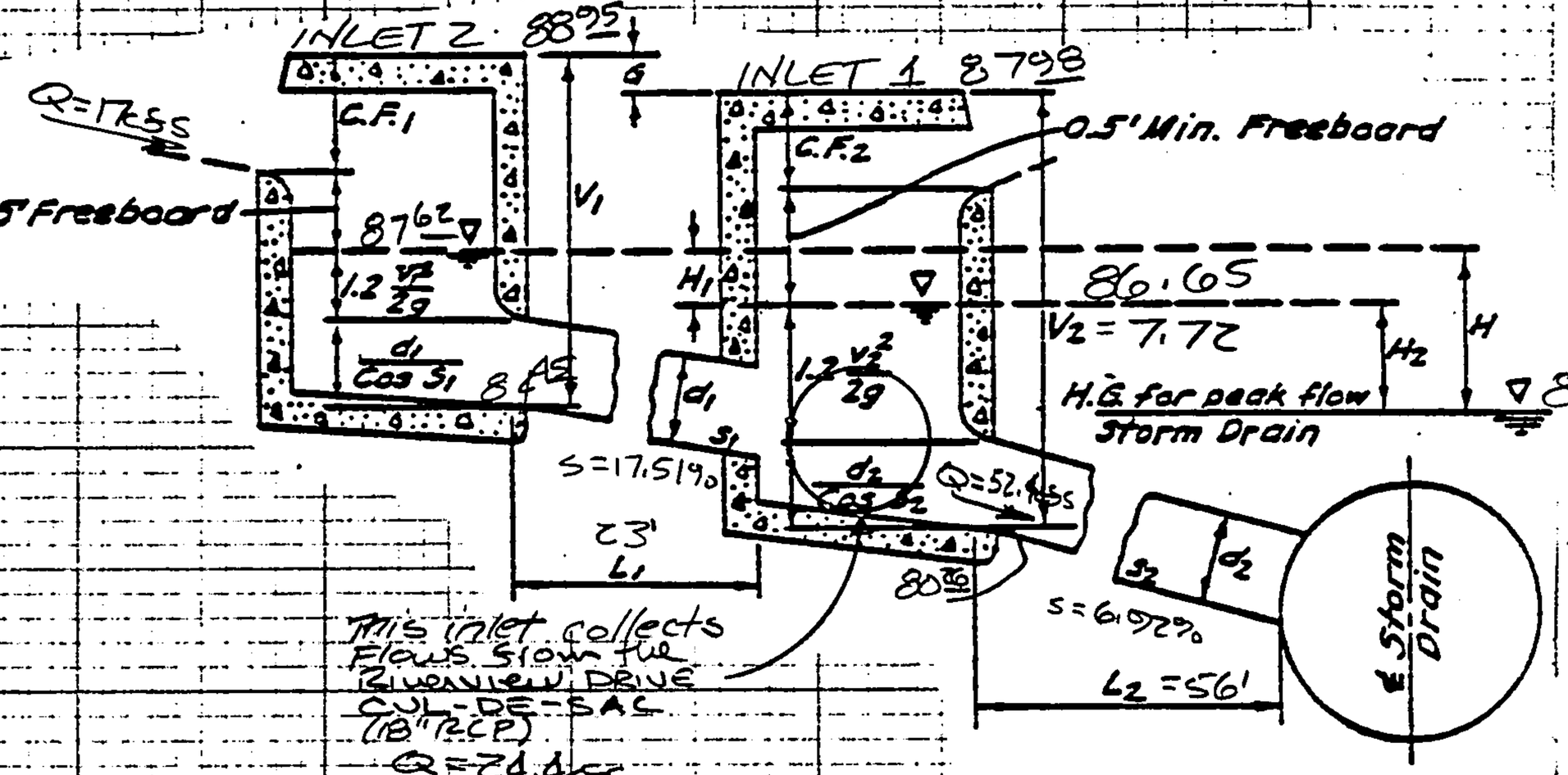
PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO. 92137.02 BY GCS DATE 11/9/92

SUBJECT North Discharge Case B CH'D ____ DATE ____

EXISTING INLETS @ CALLE NORTENA

Q(200) = 24.4cfs (from Ridgeview Drive Culde-sac sump)
(CASE B ONLY)



This inlet collects flows from the Riverview Drive cul-de-sac (18" RCP)
Q_{200} = 24.4cfs

INLET #1

Q = 52.4cfs; V = 52.4/π(2.5)²/4 = 10.67fps

Hreq = 1.2V²/2g = 1.2(10.67)²/64.4 = 2.12'

$V_{1(existing)}$ = 7.72 w/invert = 80.16

HAVAIL = 2.7 > HREQ [OK]

OUTLET CONTROL : HREQ = 2.7 = HAVAIL [OK]

INLET #2

Q = 17cfs; V = 17/π(4)²/4 = 5.41'

HREQ = 1.2(5.41)²/64.4 = .55'

$V_{2(existing)}$ = 4.5', INVERT = 84.45'

HAVAIL = 87.62 − 86.65 = .97 > HREQ [OK]

OUTLET CONTROL HREQ = .70 < HAVAIL [OK]

BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

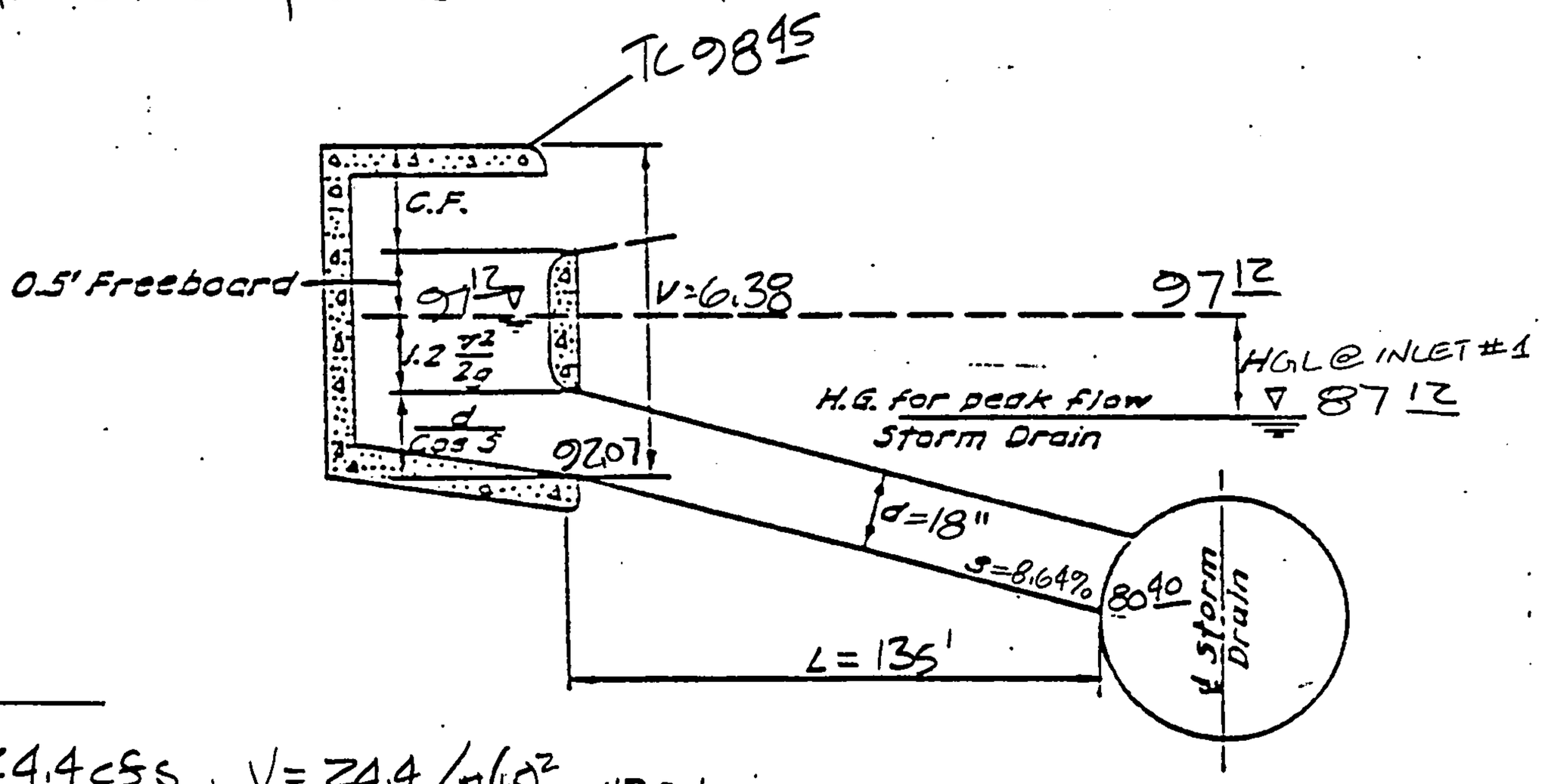
PROJECT NO. 92137.02 BY CCJ DATE 11/9/02

SUBJECT North Discharge Case B CH'D ____ DATE ____

INLET @ RIDGEVIEW DRIVE CUL-DE-SAC
(CASE-B ONLY)

$Q = 2 \times Q_{100} = 2(12.2) = 24.4 cfs$

200% Q is required for use of overflow easement instead of right of way overflow channel.



$Q = 24.4 cfs$, $V = 24.4 / \frac{\pi(1.5)^2}{4} = 13.81$ fps

$H_{req_{inlet}} = 1.2\frac{V^2}{2g} = \frac{1.2(13.81)^2}{64.4} = 3.55'$, $V = 1.33 + 3.55 + 1.5 = 6.38'$

INV = 98.45 - 6.38' = 92.07

$H_{AVAIL} = 97.12 - 87.12 = 10.00' > H_{req_{inlet}}$ [OK]

OUTLET CONTROL

$H_{req} = 8.5' < H_{AVAIL}$ [OK]

INLET @ NORTH END OF RIDGEVIEW DRIVE CUL-DE-SAC

Sump condition with Q_{200yr} = 24.4 cfs (CASE B)

1) Choose CDOT TYPE DOUBLE "A" INLET w/1 wing & 2-Grates
Q_{GRATE} = 26 cfs (see Figure 1)

2) CURB OPENING CAPACITY
Dimensions for the type A inlet
h = .52, L = 4' (single wing) ; D = 10 3/4 = .90
H/h = .90/.52 = 1.73
FROM FIGURE 2;

Q/L = 2.2 cfs

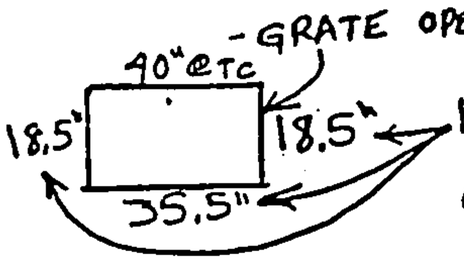
Q (CURB OPENING CAPACITY) = 4' x 2.2 = 8.8 cfs

Q (INLET TOTAL CAPACITY) = 26 + 8.8 = 34.8 cfs

BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____
PROJECT NO. 02137.02 BY GCJ DATE 11/9/02
SUBJECT INLET CAPACITY (North Disc.) CH'D ____ DATE ____

- GRATE OPEN AREA = 4.56 SF/GRATE



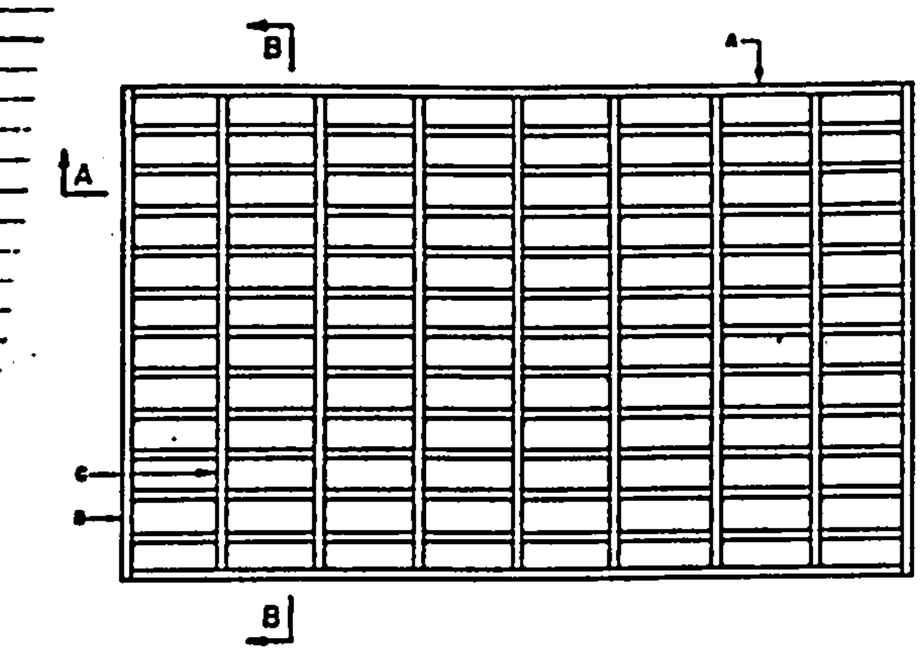
NET OPEN AREA FOR WEIR

GRATE @ 10 3/4" (0.90') BELOW TC

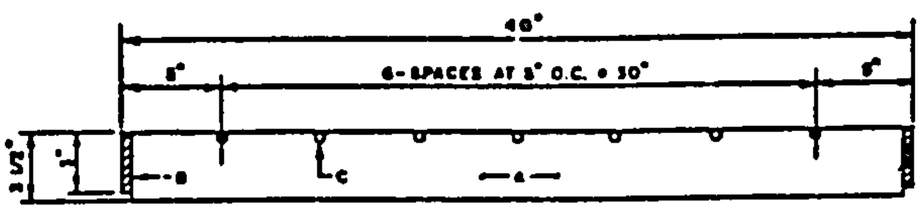
EQUATION	SGL C	DBL C	TRPL C	QDPL C
1) ORIFICE	$22.0\,h^{0.5}$	$43.9\,h^{0.5}$	$65.9\,h^{0.5}$	$87.8\,h^{0.5}$
2) 3-SIDED WEIR ($h \le TC$)	$19.9\,h^{1.5}$	$29.7\,h^{1.5}$	$39.5\,h^{1.5}$	$49.2\,h^{1.5}$
3) 4-SIDED WEIR ($h > TC$)	ADD TO 2): $11(h-.90)^{1.5}$	ADD TO 2): $22(h-.90)^{1.5}$	ADD TO 2): $33(h-.90)^{1.5}$	ADD TO 2): $44(h-.90)^{1.5}$

1) $Q = 0.6A\sqrt{2gh}$

2) & 3) $Q = 3.3\,P\,h^{1.5}$

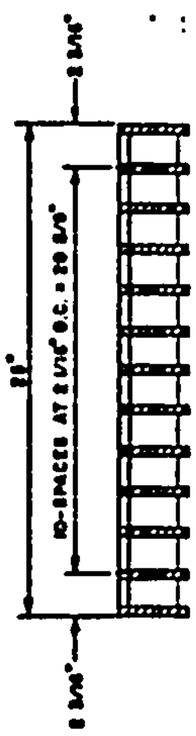


PLAN



CASE R ONLY

SECTION A-A



SECTION B-B

GRATE CAPACITY (Q) IN CFS

HEAD (h) IN FEET

FIGURE 1

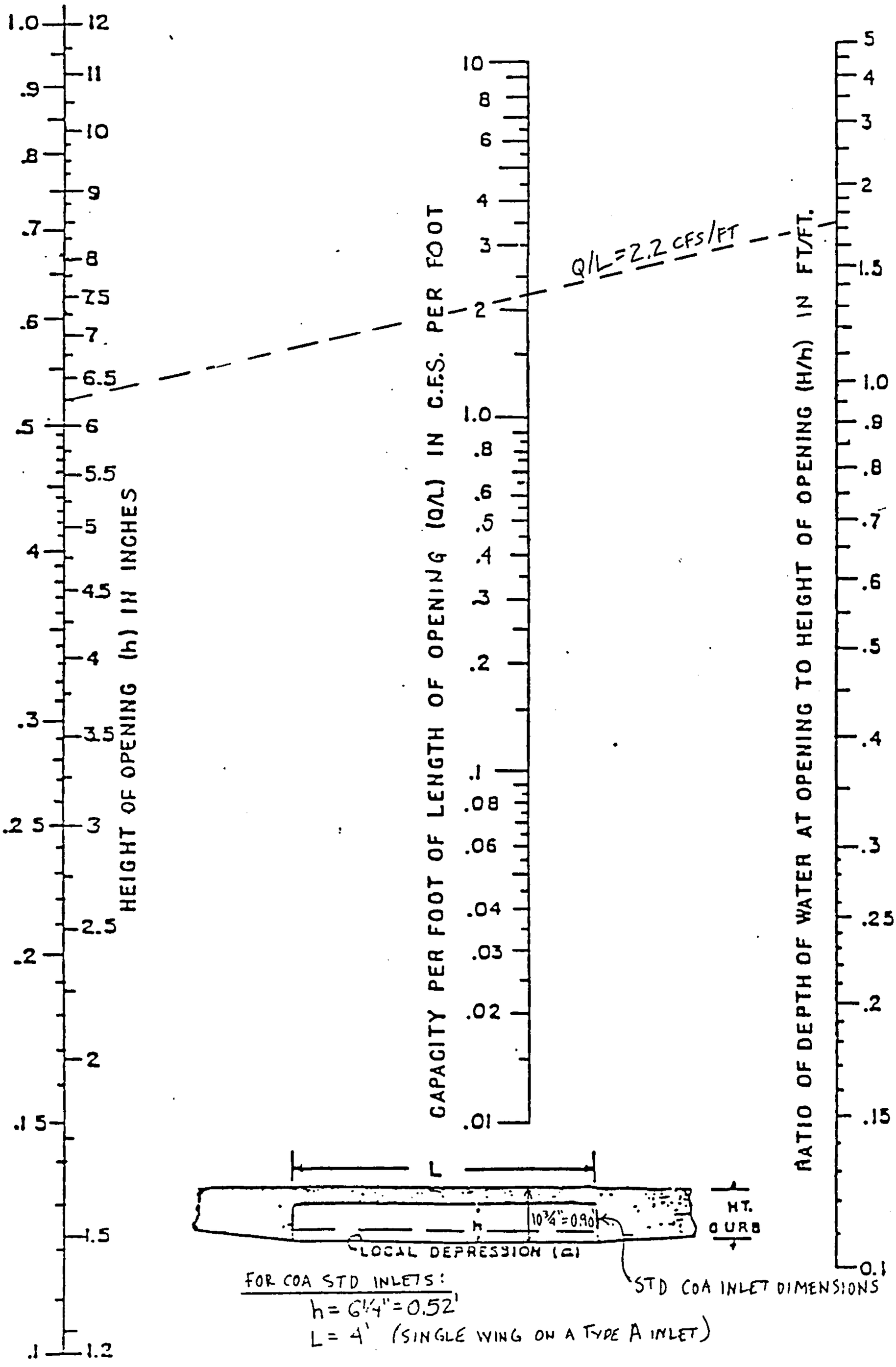
BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO. 92137.02 BY JPK DATE 8/20/92

SUBJECT RATING CURVE FOR STD COA GRATE IN SUMP CONDITION CH'D ____ DATE 10/16/02

FIGURE 2



FOR COA STD INLETS:
$h = 6\frac{1}{4}" = 0.52'$
$L = 4'$ (SINGLE WING ON A TYPE A INLET)

FOR CAPACITY OF COMBINATION GRATE & CURB OPENING INLETS IN A SUMP (E.G. TYPE A INLETS), ADD THE GRATE CAPACITY TO THIS CURB OPENING CAPACITY.

NOMOGRAPH FOR CAPACITY OF CURB OPENING INLETS AT LOW POINTS

RSE RD.

01.0

00.5

00.5 00.0

00.0

99.5

00.0

99.5

99.0

52*
P=5101.0

53
P=5100.5

54*
P=5100.0

55
P=5102.0

2*
5100.5

1
P=5100.0

98.80

98.18

98.62

98.13

98.87

98.00

99.21

98.61

98.25

99.5

99.5

99.0

15.2

5115

SINGLE INLET "A"

30" RCP

18" RCP

30 RCP

01.0

01.0

01.5

03.23

03.05

03.39

03.91

05.51

04.0

05.

5.95

18"SD

54"SD

36"SD

36"SD

48"SD

24"SD

24"SD

18"SD

18"SD

36"SD

18"SD

18"SD

24"SD

BUTTERFIELD TRAIL N.W.

G

South End of
Ridgeview Dr.

PIEDRAS MARCADAS SOUTH BRANCH STORM DRAIN HYDRAULIC GRADE LINE
***** ULTIMATE CONDITIONS *****

*REVISED JULY 10, 1992 TO REFLECT ADDITIONAL INLETS TO BE CONSTRUCTED WITH TRACT H-24B
*REVISED OCTOBER 13, 1992 TO SHOW CHANGES IN POND
*REVISED NOVEMBER 3, 1992 TO SHOW 2% SEDIMENT BULKING ON DEVELOPED BASINS

cdp:[c9213601.hydro]hglult_avg.w20

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	HF	Hb	Hj	Hth	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)
44+05	DPM																					
		72	582.8	28.27	20.61	4235	0.0189	260.00			4.92	0.00	0.00	0.00	0.00	0.00 4.92		5032.00	5032.00	6.6	5038.60	5038.60
41+45	MH								4													
		72	582.8	28.27	20.61	4235	0.0189	385.00			7.29	0.00	0.00	0.33	0.00	0.33 7.29	5036.92	5037.25	5042.00	6.6	5043.52	5043.85
37+60	MH								4													
		72	551.3	28.27	19.50	4235	0.0169	502.00			8.51	0.00	0.45	0.31	0.00	0.76 8.51	5044.54	5046.00	5048.85	5.9	5051.14	5051.90
32+58	WE/INLET								4													
		72	538.9	28.27	19.06	4235	0.0162	64.00			1.04	0.00	0.22	0.29	0.00	0.51 1.04	5054.51	5055.28	5058.71	5.64	5060.41	5060.92
31+94	EXPAN.																					
		66	538.9	23.76	22.68	3358	0.0258	328.00			8.45	0.00	0.00	0.35	0.04	0.39 8.45	5056.32	5054.36	5060.20	7.99	5061.96	5062.35
28+74	MH								4													
		66	526.2	23.76	22.15	3358	0.0246	279.00			6.85	0.00	0.00	0.39	0.00	0.39 6.85	5062.80	5063.57	5067.60	7.62	5070.79	5071.18
25+95	REDUC.																					
		72	526.2	28.27	18.61	4235	0.0154	13.00			0.20	0.00	0.00	0.32	0.02	0.34 0.20	5071.61	5073.00	5077.50	5.38	5078.03	5078.37
25+82	MH								4													
		72	526.2	28.27	18.61	4235	0.0154	8.00			0.12	0.00	0.00	0.27	0.00	0.27 0.12	5073.20	5073.47	5078.00	5.38	5078.58	5078.84
25+74	WE																					
		72	485.9	28.27	17.19	4235	0.0132	114.00			1.50	0.00	0.39	0.25	0.00	0.64 1.50	5073.59	5075.02	5078.10	4.59	5078.97	5079.61
24+60	NEW MH								4													
		72	485.9	28.27	17.19	4235	0.0132	410.00			5.40	0.00	0.00	0.23	0.04	0.27 5.40	5076.52	5076.79	5080.70	4.59	5081.11	5081.38
20+50	JBOX								4	0												
		66	324.7	23.76	13.67	3358	0.0093	133.00			1.24	0.00	1.61	0.18	0.04	1.83 1.24	5082.19	5085.70	5094.50	2.9	5086.77	5088.60
19+17	WE																					
		66	282.9	23.76	11.91	3358	0.0071	105.00			0.75	0.00	0.37	0.13	0.00	0.50 0.75	5086.95	5088.14	5196.80	2.2	5089.85	5090.34
18+12	WE&EXP.																					
		60	208.8	19.63	10.63	2604	0.0064	274.00			1.76	0.00	0.00	0.10	0.01	0.10 1.76	5088.89	5089.43	5198.00	1.76	5091.09	5091.19
15+38	MH								4	12												
		60	208.8	19.63	10.63	2604	0.0064	250.00			1.61	0.13	0.00	0.09	0.00	0.22 1.61	5091.20	5091.41	5107.00	1.76	5092.95	5093.17

DISCONTINUITY IN HGL AT THIS POINT. BEGIN HGL AT W.S. ELEVATION OF 5101.10

12+85	MH								4	12												
		60	309.0	19.63	15.74	2604	0.0141	199.00			2.80	0.00	0.00	0.00	0.00	0.00 2.80		5101.10	5105.30	3.85		5104.95
10+86	MH								4													
		60	309.0	19.63	15.74	2604	0.0141	452.00			6.36	0.00	0.00	0.19	0.00	0.19 6.36	5103.90	5104.09	5111.00	3.85	5107.75	5107.94
6+34	MH								4													
		60	259.0	19.63	13.19	2604	0.0099	474.00			4.69	0.00	0.57	0.16	0.00	0.74 4.69	5110.46	5112.34	5113.55	2.7	5114.30	5115.04
1+60	INLET											0.00	0.00	0.03	0.54	0.57	5117.02	5120.30	5121.00	0	5119.73	5120.30

NOTE: HGL ANALYZED FROM STATION 44+05 TO 12+85 AT PEAK DISCHARGE RATE.
HGL ANALYZED FROM STATION 12+85 TO 1+60 AT t=1.75 hours WHEN THE HIGHEST HGL EXISTS

PIEDRAS MARCADAS SOUTH BRANCH STORM DRAIN HYDRAULIC GRADE LINE (REVISED NOV. 3, 1992)

Elevation are incorrect Because Pipe is unsealed.

1 HYDRAULIC GRADE LINE CONTINUING FROM THE JUNCTION BOX (STATION 20+50 ABOVE)

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hth	Ht	Total Losses	HGL(dh)	HGL(up)	Low Point	HV	EGL(dh)	EGL(up)
20+49	JBOX								4	30		0.00	0.00	0.00	0.00	0.00		5083.94	5094.50	1.73		5085.68
		54	168.1	15.90	10.57	1966	0.0073	12.00			0.09					0.09						
20+37	CONNECT						0.0219			30		0.19	0.10	0.08	0.00	0.38	5084.03	5084.51		1.63	5085.77	5086.14
		54	163.1	15.90	10.26	1966	0.0069	173.00			1.19					1.19						
16+16	MH						0.0585		8	30		0.16	1.25	0.07	0.02	1.49	5085.70	5087.82	5095.19	1	5087.33	5088.82
		48	100.9	12.57	8.03	1436	0.0049	164.45			0.81					0.81						
14+63	MH						0.0385		4			0.00	2.16	0.10	0.12	2.38	5088.63	5088.85	5097.88	3.16	5089.63	5092.01
		36	100.9	7.07	14.27	667	0.0229	35.50			0.81					0.81						
14+09	MH						0.0385		6			0.00	0.00	0.13	0.02	0.15	5089.66	5090.86	5100.49	2.12	5092.83	5092.98
		24	36.7	3.14	11.68	226	0.0263	202.96			5.34					5.34						

Remarks: Manning's 'n': .013**

HYDRAULIC GRADE LINE CONTINUING FROM THE MANHOLE (STATION 16+16 ABOVE)

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hth	Ht	Total Losses	HGL(dh)	HGL(up)	Low Point	HV	EGL(dh)	EGL(up)
52+04	MANHOLE						0.0428		8	60		0.00	0.00	0.00	0.00	0.00		5086.76	5094.50	1.22		5087.98
		36	62.7	7.07	8.87	667	0.0088	26.00			0.23	1,11				0.23						
52+35	MANHOLE						0.0284		6	45		0.14	0.43	0.05	0.00	0.62	5086.99	5088.05	5095.19	0.79	5088.21	5088.83
		36	50.4	7.07	7.13	667	0.0057	56.00			0.32	1,59				0.32						
52+76	DBL C INLET	EXISTING INLET AT NW GOLF COURSE & BUTTERFIELD					0.0194					0.00	0.64	0.02	0.16	0.82	5088.36	5089.97	5094.17	0	5089.15	5089.97
		30	20.2	4.91	4.12	410	0.0024	36.00			0.09	0,70				0.09						
	MANHOLE 1						0.0200		6	30		0.03	0.00	0.01	0.00	0.04	5090.06	5089.84	5097.00	0.26	5090.06	5090.11
		30	20.2	4.91	4.12	410	0.0024	157.00			0.38	3,14				0.38						
	MANHOLE 2 — ADDED MANHOLE						0.0110		6	90		0.05	0.00	0.01	0.00	0.07	5090.22	5090.29	5098.13	0.26	5090.49	5090.55
		30	20.2	4.91	4.12	410	0.0024	61.00			0.15	0,71				0.15						
	INLET #2						0.0289					0.00	0.79	0.00	0.05	0.84	5090.22	5091.33	5097.40	0	5090.49	5091.33
		30	10.1	4.91	2.06	410	0.0006	41.61			0.03	1,20				0.03						
	INLET #1											0.00	0.00	0.00	0.01	0.02	5091.36	5091.37	5097.66	0	5091.36	5091.37

Remarks: Manning's 'n': .013**

PROPOSED RIVERVIEW RIDGE (SOUTH SYSTEM)

Revised 12/14/92

PROPOSED INLET ON RIO TRUMPEROS CT. TO STATION 20+37 (CONNECT) ABOVE
STATIONING BASED ON RIO TRUMPEROS CT. PNP (RIVERVIEW CROSSING SUBDIVISION – SHEET 7 of 11)

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	D	Angle	Hf	Hb	Hj	Hth	Ht	Total Losses	HGL(dh)	HGL(up)	Low Point	HV	EGL(dh)	EGL(up)
1+26.11	CONNECT									30		0.00	0.00	0.00	0.00	0.00		5084.27	5094.50	0.04		5084.31
		24	5.0	3.14	1.59	226	0.0005	50.30			0.02					0.02						
0+65.01	INLET								6	45		0.00	0.00	0.00	0.01	0.01	5084.30	5084.34	5092.64	0	5084.33	5084.34

Remarks: Manning's 'n': .013**

INLET #1 → INLET #2

30" AT 2.9%

CULVERT RATING TABLE

30. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.02900

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.05020	0.14080	2.80454	
2.00000	0.14054	0.61899	4.40441	
3.00000	0.25547	1.45829	5.70829	
4.00000	0.38908	2.66037	6.83757	
5.00000	0.53776	4.21763	7.84302	
6.00000	0.69890	6.11680	8.75208	
Q100 7.00000	0.87048	8.34066	9.58164	D=7.70" @ Q = 10.1cfs .64'
8.00000	1.05085	10.86890	10.34300	
9.00000	1.23855	13.67871	11.04413	
10.00000	1.43233	16.74512	11.69086	
2XQ100 11.00000	1.63102	20.04125	12.28757	D = 11.05" @ Q = 20.2cfs .92'
12.00000	1.83356	23.53843	12.83757	
13.00000	2.03894	27.20635	13.34339	
14.00000	2.24619	31.01302	13.80695	
15.00000	2.45437	34.92479	14.22965	
16.00000	2.66255	38.90630	14.61244	
17.00000	2.86980	42.92037	14.95589	
18.00000	3.07518	46.92778	15.26019	
19.00000	3.27772	50.88700	15.52514	
20.00000	3.47641	54.75381	15.75010	
21.00000	3.67019	58.48074	15.93400	
22.00000	3.85789	62.01608	16.07513	
23.00000	4.03825	65.30268	16.17103	
24.00000	4.20984	68.27570	16.21813	
25.00000	4.37098	70.85892	16.21122	
26.00000	4.51965	72.95792	16.14237	
27.00000	4.65327	74.44554	15.99856	
28.00000	4.76820	75.12486	15.75540	
29.00000	4.85853	74.59535	15.35348	
30.00000	4.90874	69.84964	14.22966	

INLET 2 → MH#2

30" at s=1.16%

CULVERT RATING TABLE

30. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.01160

	FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
	1.00000	0.05020	0.08905	1.77374	
	2.00000	0.14054	0.39148	2.78560	
	3.00000	0.25547	0.92230	3.61024	
	4.00000	0.38908	1.68257	4.32446	
	5.00000	0.53776	2.66746	4.96036	
	6.00000	0.69890	3.86860	5.53530	
	7.00000	0.87048	5.27509	6.05996	
	8.00000	1.05085	6.87409	6.54149	
	9.00000	1.23855	8.65117	6.98492	
	10.00000	1.43233	10.59054	7.39395	
	11.00000	1.63102	12.67520	7.77134	
	12.00000	1.83356	14.88701	8.11919	
	13.00000	2.03894	17.20681	8.43910	
Q100	14.00000	2.24619	19.61436	8.73228	D=14.32" @ Q=20.4cfs
	15.00000	2.45437	22.08838	8.99962	
	16.00000	2.66255	24.60650	9.24172	
	17.00000	2.86980	27.14523	9.45894	
	18.00000	3.07518	29.67973	9.65139	
	19.00000	3.27772	32.18376	9.81896	
	20.00000	3.47641	34.62935	9.96124	
	21.00000	3.67019	36.98647	10.07755	
2xQ100	22.00000	3.85789	39.22241	10.16681	D=22.57" @ Q=40.4cfs
	23.00000	4.03825	41.30104	10.22745	
	24.00000	4.20984	43.18134	10.25724	
	25.00000	4.37098	44.81511	10.25288	
	26.00000	4.51965	46.14265	10.20933	
	27.00000	4.65327	47.08350	10.11837	
	28.00000	4.76820	47.51313	9.96459	
	29.00000	4.85853	47.17824	9.71039	
	30.00000	4.90874	44.17679	8.99962	

MH#2 - MH#1

30" AT 2.0%

CULVERT RATING TABLE

30. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.02000

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.05020	0.11693	2.32904	
2.00000	0.14054	0.51404	3.65767	
3.00000	0.25547	1.21104	4.74048	
4.00000	0.38908	2.20932	5.67829	
5.00000	0.53776	3.50255	6.51327	
6.00000	0.69890	5.07972	7.26820	
7.00000	0.87048	6.92654	7.95712	
8.00000	1.05085	9.02613	8.58939	
9.00000	1.23855	11.35955	9.17165	
10.00000	1.43233	13.90606	9.70873	
11.00000	1.63102	16.64335	10.20427	
Q100 12.00000	1.83356	19.54761	10.66102	D=12.21" @ Q=20.2cfs
13.00000	2.03894	22.59365	11.08108	
14.00000	2.24619	25.75491	11.46605	
15.00000	2.45437	29.00346	11.81708	
16.00000	2.66255	32.30992	12.13497	
17.00000	2.86980	35.64342	12.42019	
2XQ100 18.00000	3.07518	38.97139	12.67290	D=18.4" @ Q=40.4cfs
19.00000	3.27772	42.25935	12.89292	
20.00000	3.47641	45.47056	13.07975	
21.00000	3.67019	48.56561	13.23247	
22.00000	3.85789	51.50155	13.34967	
23.00000	4.03825	54.23092	13.42931	
24.00000	4.20984	56.69987	13.46842	
25.00000	4.37098	58.84512	13.46268	
26.00000	4.51965	60.58826	13.40551	
27.00000	4.65327	61.82365	13.28608	
28.00000	4.76820	62.38779	13.08415	
29.00000	4.85853	61.94806	12.75037	
30.00000	4.90874	58.00696	11.81708	

MH #1 TO EXIST INLET

30" at s=1.88%

CULVERT RATING TABLE

30. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.01880

	FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
	1.00000	0.05020	0.11336	2.25809	
	2.00000	0.14054	0.49838	3.54624	
	3.00000	0.25547	1.17415	4.59607	
	4.00000	0.38908	2.14201	5.50531	
	5.00000	0.53776	3.39585	6.31485	
	6.00000	0.69890	4.92498	7.04679	
	7.00000	0.87048	6.71553	7.71471	
	8.00000	1.05085	8.75115	8.32772	
	9.00000	1.23855	11.01349	8.89224	
	10.00000	1.43233	13.48243	9.41296	
	11.00000	1.63102	16.13633	9.89341	
Q_{100}	12.00000	1.83356	18.95211	10.33624	D = 12.43" @ Q = 20.2 cfs
	13.00000	2.03894	21.90535	10.74351	
	14.00000	2.24619	24.97031	11.11675	
	15.00000	2.45437	28.11990	11.45708	
	16.00000	2.66255	31.32563	11.76529	
	17.00000	2.86980	34.55759	12.04182	
$2 \times Q_{100}$	18.00000	3.07518	37.78417	12.28683	D = 18.82" @ Q = 40.4 cfs
	19.00000	3.27772	40.97196	12.50015	
	20.00000	3.47641	44.08535	12.68129	
	21.00000	3.67019	47.08611	12.82935	
	22.00000	3.85789	49.93261	12.94299	
	23.00000	4.03825	52.57883	13.02020	
	24.00000	4.20984	54.97257	13.05812	
	25.00000	4.37098	57.05247	13.05256	
	26.00000	4.51965	58.74250	12.99713	
	27.00000	4.65327	59.94026	12.88133	
	28.00000	4.76820	60.48721	12.68555	
	29.00000	4.85853	60.06087	12.36194	
	30.00000	4.90874	56.23984	11.45709	

EXISTING INLET → MH A
PLATE 3

36" AT S=2.84%

CULVERT RATING TABLE

36. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.02840

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.05509	0.15316	2.78025	
2.00000	0.15449	0.67578	4.37436	
3.00000	0.28134	1.59811	5.68028	
4.00000	0.42932	2.92699	6.81774	
5.00000	0.59457	4.65952	7.83682	
6.00000	0.77437	6.78700	8.76458	
7.00000	0.96662	9.29669	9.61772	
8.00000	1.16962	12.17278	10.40747	
9.00000	1.38191	15.39699	11.14179	
10.00000	1.60224	18.94898	11.82659	
11.00000	1.82946	22.80664	12.46634	
12.00000	2.06255	26.94625	13.06454	
13.00000	2.30056	31.34261	13.62393	
14.00000	2.54258	35.96918	14.14672	
15.00000	2.78778	40.79809	14.63464	
16.00000	3.03532	45.80019	15.08908	D = 16.89" @ Q = 50.4 cfs
17.00000	3.28442	50.94506	15.51114	
18.00000	3.53429	56.20099	15.90164	
19.00000	3.78416	61.53491	16.26118	
20.00000	4.03326	66.91235	16.59015	
21.00000	4.28080	72.29726	16.88872	
22.00000	4.52600	77.65195	17.15687	
23.00000	4.76802	82.93678	17.39437	
24.00000	5.00603	88.10987	17.60075	
25.00000	5.23912	93.12672	17.77526	
26.00000	5.46634	97.93964	17.91685	
27.00000	5.68667	102.49690	18.02408	
28.00000	5.89896	106.74148	18.09497	
29.00000	6.10196	110.60930	18.12686	
30.00000	6.29421	114.02620	18.11605	
31.00000	6.47401	116.90285	18.05726	
32.00000	6.63926	119.12526	17.94256	
33.00000	6.78723	120.53458	17.75902	
34.00000	6.91409	120.87514	17.48244	
35.00000	7.01349	119.60442	17.05348	
36.00000	7.06858	112.40206	15.90164	

MHA - MH B PLATE 3

36" AT S=4.28%

CULVERT RATING TABLE

36. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.04280

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.05509	0.18802	3.41308	
2.00000	0.15449	0.82960	5.37003	
3.00000	0.28134	1.96187	6.97320	
4.00000	0.42932	3.59322	8.36957	
5.00000	0.59457	5.72010	9.62061	
6.00000	0.77437	8.33184	10.75954	
7.00000	0.96662	11.41278	11.80687	
8.00000	1.16962	14.94351	12.77638	
9.00000	1.38191	18.90160	13.67785	
10.00000	1.60224	23.26208	14.51852	
11.00000	1.82946	27.99781	15.30389	
12.00000	2.06255	33.07966	16.03824	
13.00000	2.30056	38.47671	16.72497	
14.00000	2.54258	44.15637	17.36675	
15.00000	2.78778	50.08441	17.96572	
16.00000	3.03532	56.22507	18.52361	
17.00000	3.28442	62.54100	19.04173	D=17.02" @ Q=62.7cfs
18.00000	3.53429	68.99326	19.52111	
19.00000	3.78416	75.54127	19.96249	
20.00000	4.03326	82.14271	20.36634	
21.00000	4.28080	88.75331	20.73287	
22.00000	4.52600	95.32681	21.06206	
23.00000	4.76802	101.81456	21.35362	
24.00000	5.00603	108.16512	21.60697	
25.00000	5.23912	114.32391	21.82120	
26.00000	5.46634	120.23232	21.99502	
27.00000	5.68667	125.82690	22.12666	
28.00000	5.89896	131.03761	22.21369	
29.00000	6.10196	135.78580	22.25283	
30.00000	6.29421	139.98044	22.23956	
31.00000	6.47401	143.51187	22.16739	
32.00000	6.63926	146.24013	22.02658	
33.00000	6.78723	147.97023	21.80126	
34.00000	6.91409	148.38831	21.46172	
35.00000	7.01349	146.82835	20.93513	
36.00000	7.06858	137.98663	19.52112	

LINE B PLATE 3

24"RCP AT 3.85%

CULVERT RATING TABLE

24. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.03850

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.04479	0.14434	3.22283	
2.00000	0.12504	0.63111	5.04715	
3.00000	0.22665	1.47823	6.52193	
4.00000	0.34416	2.68023	7.78768	
5.00000	0.47417	4.22156	8.90314	
6.00000	0.61418	6.08037	9.89993	
7.00000	0.76224	8.23027	10.79741	
8.00000	0.91669	10.64125	11.60837	
9.00000	1.07605	13.28025	12.34163	
10.00000	1.23901	16.11144	13.00346	
11.00000	1.40432	19.09639	13.59831	
12.00000	1.57079	22.19414	14.12924	
13.00000	1.73727	25.36106	14.59824	
14.00000	1.90258	28.55067	15.00630	
15.00000	2.06554	31.71324	15.35351	
16.00000	2.22490	34.79517	15.63897	D=16.65" @ Q=36.7cfs
17.00000	2.37935	37.73800	15.86066	
18.00000	2.52741	40.47671	16.01512	
19.00000	2.66742	42.93696	16.09679	
20.00000	2.79743	45.02972	16.09683	
21.00000	2.91494	46.64020	16.00042	
22.00000	3.01655	47.59993	15.77960	
23.00000	3.09680	47.58661	15.36637	
24.00000	3.14159	44.38832	14.12925	

LINE B PLATE 3

36"RCP AT S=3.85%

CULVERT RATING TABLE

36. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.03850

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.05509	0.17832	3.23709	
2.00000	0.15449	0.78682	5.09314	
3.00000	0.28134	1.86071	6.61364	
4.00000	0.42932	3.40794	7.93801	
5.00000	0.59457	5.42515	9.12454	
6.00000	0.77437	7.90222	10.20474	
7.00000	0.96662	10.82430	11.19807	
8.00000	1.16962	14.17297	12.11759	
9.00000	1.38191	17.92697	12.97258	
10.00000	1.60224	22.06262	13.76990	
11.00000	1.82946	26.55416	14.51477	
12.00000	2.06255	31.37397	15.21126	
13.00000	2.30056	36.49273	15.86258	
14.00000	2.54258	41.87953	16.47126	
15.00000	2.78778	47.50191	17.03936	
16.00000	3.03532	53.32594	17.56847	
17.00000	3.28442	59.31619	18.05988	
18.00000	3.53429	65.43575	18.51454	
19.00000	3.78416	71.64613	18.93316	
20.00000	4.03326	77.90719	19.31619	
21.00000	4.28080	84.17693	19.66382	
22.00000	4.52600	90.41148	19.97603	
23.00000	4.76802	96.56470	20.25256	D=23.72" @ Q=100.9cfs
24.00000	5.00603	102.58781	20.49285	
25.00000	5.23912	108.42902	20.69603	
26.00000	5.46634	114.03277	20.86089	
27.00000	5.68667	119.33887	20.98574	
28.00000	5.89896	124.28091	21.06828	
29.00000	6.10196	128.78427	21.10541	
30.00000	6.29421	132.76262	21.09282	
31.00000	6.47401	136.11197	21.02437	
32.00000	6.63926	138.69955	20.89082	
33.00000	6.78723	140.34044	20.67712	
34.00000	6.91409	140.73697	20.35509	
35.00000	7.01349	139.25743	19.85566	
36.00000	7.06858	130.87161	18.51455	

LINE A PLATE 3

48"RCP AT S=3.85%

CULVERT RATING TABLE

48. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.03850

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.06374	0.20679	3.24416	
2.00000	0.17915	0.91653	5.11592	
3.00000	0.32701	2.17751	6.65890	
4.00000	0.50017	4.00727	8.01186	
5.00000	0.69437	6.41091	9.23276	
6.00000	0.90662	9.38615	10.35292	
7.00000	1.13465	12.92567	11.39172	
8.00000	1.37665	17.01842	12.36217	
9.00000	1.63109	21.65041	13.27357	
10.00000	1.89666	26.80526	14.13285	
11.00000	2.17222	32.46450	14.94531	
12.00000	2.45673	38.60796	15.71516	
13.00000	2.74927	45.21386	16.44575	
14.00000	3.04898	52.25898	17.13983	
15.00000	3.35506	59.71885	17.79966	
16.00000	3.66675	67.56777	18.42714	
17.00000	3.98337	75.77892	19.02385	
18.00000	4.30421	84.32436	19.59112	
19.00000	4.62865	93.17514	20.13009	19.85"C. Q=100.9cfs
20.00000	4.95605	102.30129	20.64171	
21.00000	5.28579	111.67177	21.12678	
22.00000	5.61729	121.25459	21.58597	
23.00000	5.94994	131.01671	22.01982	
24.00000	6.28318	140.92407	22.42878	
25.00000	6.61642	150.94150	22.81318	
26.00000	6.94907	161.03271	23.17326	
27.00000	7.28057	171.16031	23.50919	
28.00000	7.61031	181.28542	23.82102	
29.00000	7.93771	191.36806	24.10872	
30.00000	8.26215	201.36647	24.37218	
31.00000	8.58299	211.23740	24.61115	
32.00000	8.89961	220.93552	24.82532	
33.00000	9.21130	230.41344	25.01421	
34.00000	9.51738	239.62125	25.17723	
35.00000	9.81709	248.50600	25.31362	
36.00000	10.10962	257.01102	25.42241	
37.00000	10.39414	265.07541	25.50240	
38.00000	10.66969	272.63263	25.55206	
39.00000	10.93527	279.60883	25.56946	
40.00000	11.18970	285.92078	25.55213	
41.00000	11.43170	291.47189	25.49681	
42.00000	11.65974	296.14676	25.39909	
43.00000	11.87199	299.80063	25.25277	
44.00000	12.06619	302.24063	25.04855	
45.00000	12.23935	303.18488	24.77132	
46.00000	12.38720	302.15616	24.39260	

LINE A-PLATE 3

54"RCP AT S=2.19%

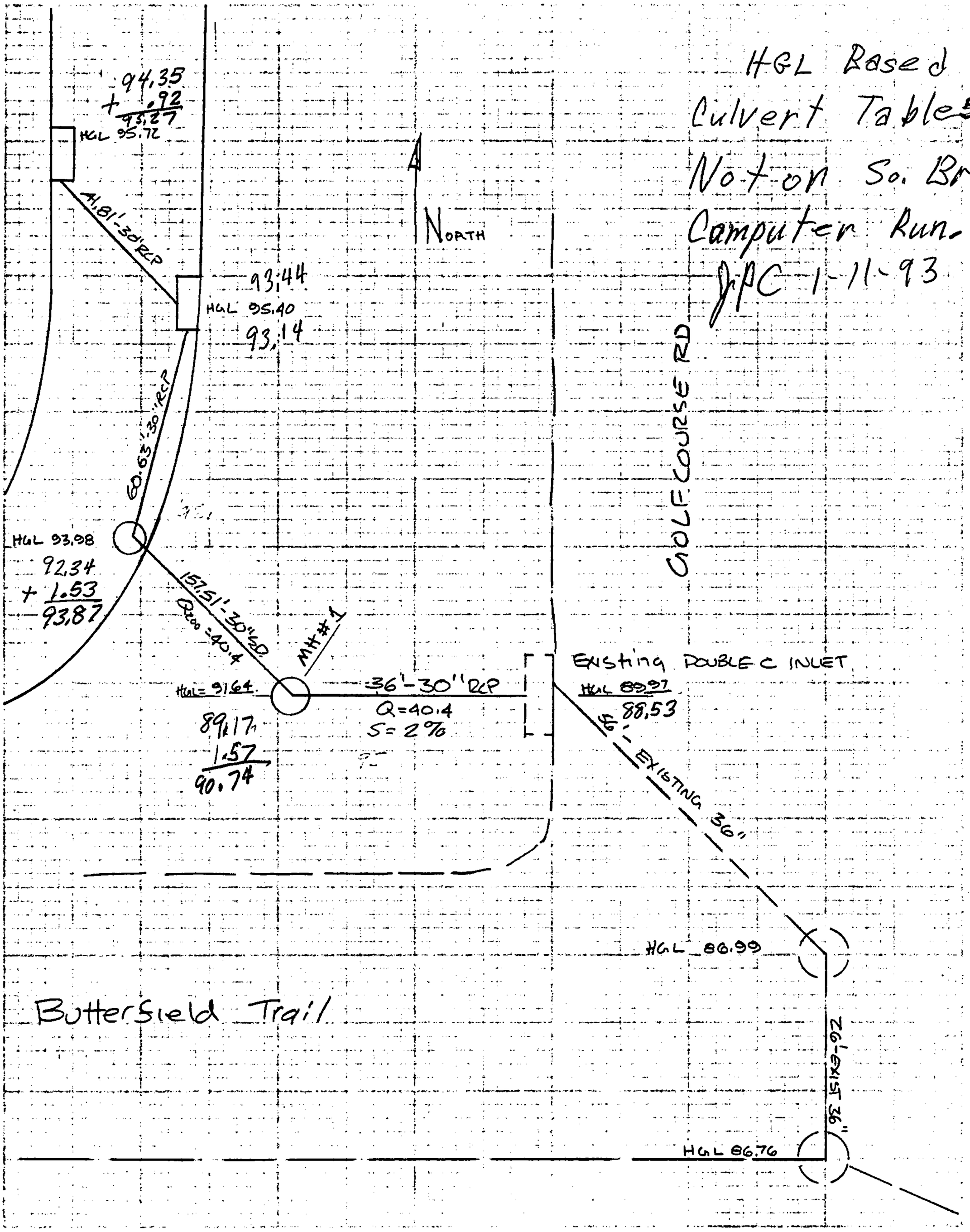
CULVERT RATING TABLE

54. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.02190

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)	
1.00000	0.06766	0.16565	2.44850	
2.00000	0.19029	0.73532	3.86418	
3.00000	0.34759	1.74962	5.03351	
4.00000	0.53206	3.22486	6.06104	
5.00000	0.73922	5.16746	6.99037	
6.00000	0.96597	7.57810	7.84508	
7.00000	1.20994	10.45352	8.63973	
8.00000	1.46924	13.78758	9.38413	
9.00000	1.74233	17.57184	10.08528	
10.00000	2.02785	21.79609	10.74839	
11.00000	2.32463	26.44847	11.37749	
12.00000	2.63164	31.51587	11.97573	
13.00000	2.94794	36.98396	12.54568	
14.00000	3.27267	42.83737	13.08943	
15.00000	3.60503	49.05978	13.60870	
16.00000	3.94429	55.63399	14.10496	
17.00000	4.28974	62.54202	14.57944	
18.00000	4.64074	69.76508	15.03319	
19.00000	4.99664	77.28363	15.46711	
20.00000	5.35686	85.07752	15.88197	
21.00000	5.72081	93.12585	16.27844	
22.00000	6.08792	101.40709	16.65709	
23.00000	6.45766	109.89899	17.01840	
24.00000	6.82947	118.57876	17.36280	
25.00000	7.20284	127.42287	17.69065	
26.00000	7.57724	136.40720	18.00224	
27.00000	7.95215	145.50688	18.29780	
28.00000	8.32706	154.69635	18.57754	D = 28.91" @ Q = 163.1 cfs
29.00000	8.70146	163.94942	18.84159	D = 29.45" @ Q = 168.1 cfs
30.00000	9.07483	173.23901	19.09006	
31.00000	9.44664	182.53734	19.32298	
32.00000	9.81638	191.81563	19.54037	
33.00000	10.18349	201.04430	19.74218	
34.00000	10.54744	210.19269	19.92832	
35.00000	10.90765	219.22906	20.09864	
36.00000	11.26356	228.12027	20.25294	
37.00000	11.61456	236.83192	20.39096	
38.00000	11.96001	245.32784	20.51234	
39.00000	12.29927	253.57005	20.61668	
40.00000	12.63163	261.51834	20.70346	
41.00000	12.95635	269.12982	20.77204	
42.00000	13.27265	276.35837	20.82164	
43.00000	13.57966	283.15390	20.85132	
44.00000	13.87645	289.46136	20.85990	
45.00000	14.16197	295.21884	20.84589	
46.00000	14.43505	300.35599	20.80741	

HGL Based on Culvert Tables, Not on So. Branch Computer Run. JPC 1-11-93

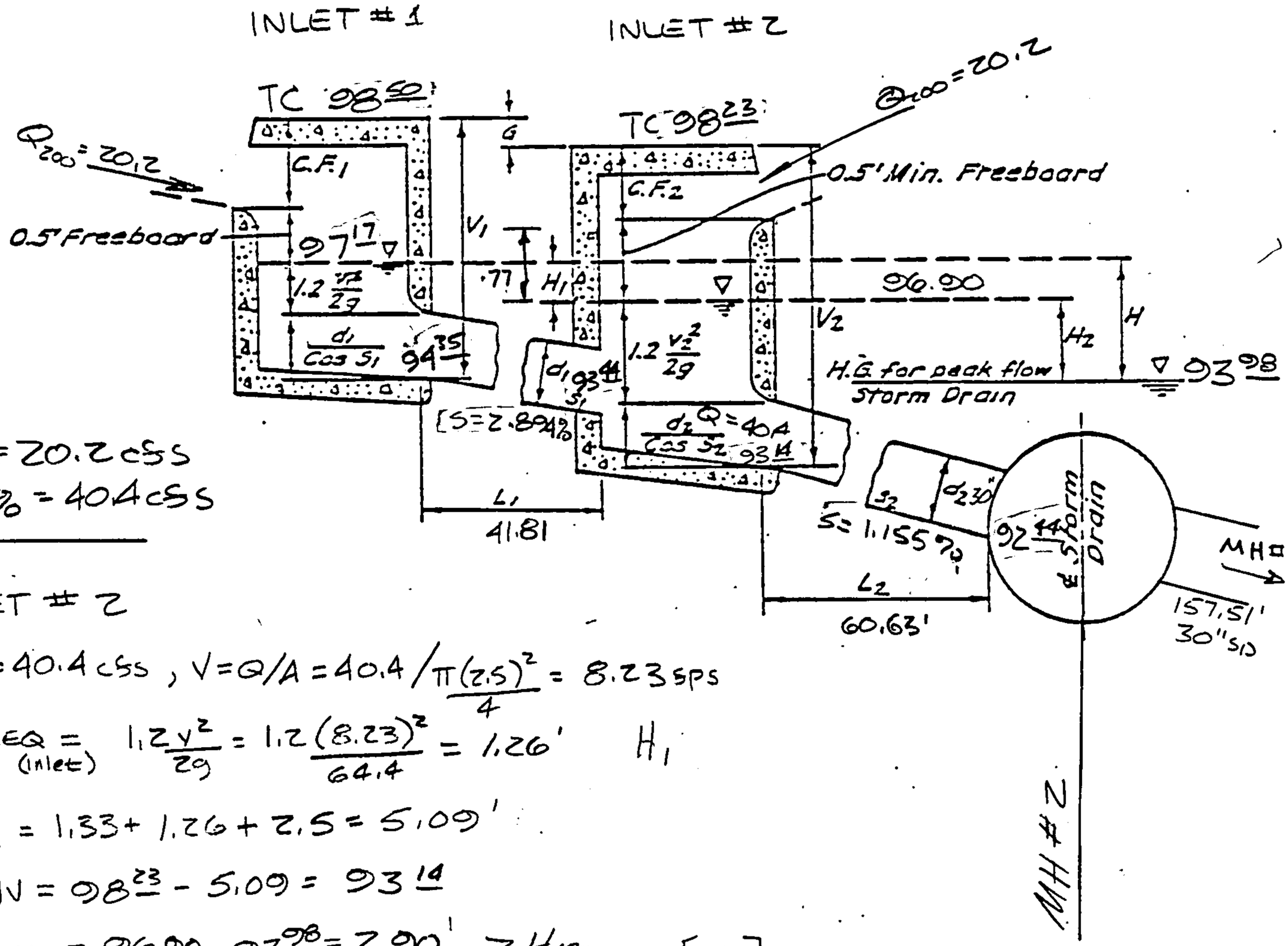


BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO. 92137.02 BY CJC DATE 10/22/92

SUBJECT (SOUTHEND) CH'D ____ DATE REVISED 12/14/92



$Q_{100_{yr}} = 20.2$ cfs

$Q_{200\%} = 40.4$ cfs

INLET # 2

$Q = 40.4$ cfs, $V = Q/A = 40.4 / \frac{\pi (2.5)^2}{4} = 8.23$ fps

H_{REQ} (inlet) $= 1.2\frac{V^2}{2g} = 1.2\frac{(8.23)^2}{64.4} = 1.26'$ H_1

$V_2 = 1.33 + 1.26 + 2.5 = 5.09'$

$INV = 98.23 - 5.09 = 93.14$

$H_{AVAIL} = 96.90 - 93.98 = 2.90' > H_{req\ inlet}$ [OK]

Check Outlet control

$H_{REQ} = 2.2' < H_{AVAIL}$

INLET # 1

$Q = 20.2$ cfs, $V = Q/A = 20.2 / \frac{\pi (2.5)^2}{4} = 4.12$ cfs

$H_{req} = 1.2\frac{V^2}{2g} = 1.2\frac{(4.12)^2}{64.4} = .32'$

$V_1 = 1.33 + .32 + 2.5 = 4.15$

$INV = 98.50 - 4.15 = 94.35'$

$H_{AVAIL} = 97.17 - 96.90 = .27 + .5 = .77$ at bottom of Grate

Check outlet Control

$H_{REQ} < .5 < H_{AVAIL}$ [OK]

BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO 92137.02 BY GCJ DATE 10/22/02

SUBJECT INLETS @ South side of site CH'D ____ REVISED DATE 12/14/02

INLETS @ SOUTH END OF RIDGE VIEW DRIVE @ SUMP

SUMP CONDITION w/ Q_{200yr} = 40.4 cfs

$Q_{(EACH\ INLET)}$ = 20.2 cfs each

1) Choose COA SINGLE GRATE TYPE "A" INLET

Q_{GUTTER} = 17 CFS

2) CURB OPENING CAPACITY FOR 4' WINN (SUMP)

Dimensions for type "A" INLET

h = .52, L = 4' (SINGLE WING), D = 10 3/4 = .90

H/h = .90/.52 = 1.73

FROM FIGURE 2;

$Q_{(CURB\ OPENING\ CAPACITY)}$ = 4' x 22 = 8.8 cfs

Q INLET TOTAL CAPACITY = 17 + 8.8 = 25.8 cfs / each INLET

TOTAL INLET CAPACITY:

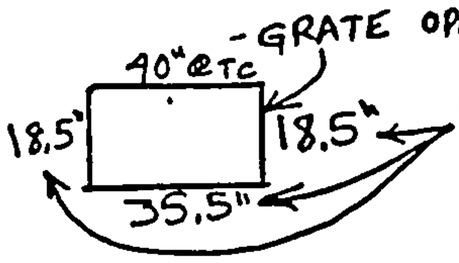
Q_{TOTAL} = 2 (25.8) = 51.60 cfs

BOHANNAN-HUSTON INC.

PROJECT NAME Riverview Ridge SHEET ____ OF ____

PROJECT NO. 02137.02 BY GCJ DATE 11/9/02

SUBJECT INLET CAPACITY (SOUTH DISC) CH'D ____ DATE ____



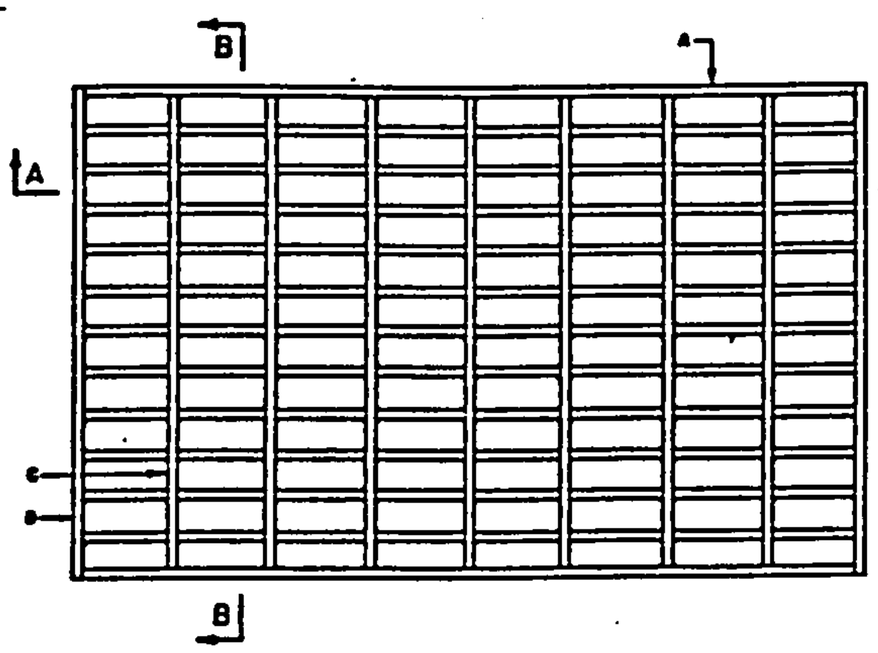
- GRATE OPEN AREA = 4.56 SF/GRATE

NET OPEN AREA FOR WEIR GRATE @ 10 3/4" (0.90') BELOW TC

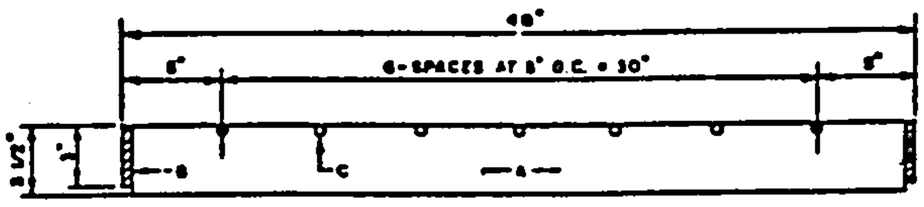
EQUATION	SGL C	DBL C	TRPL C	QDPL C
1) ORIFICE	$22.0\,h^{0.5}$	$43.9\,h^{0.5}$	$65.9\,h^{0.5}$	$87.8\,h^{0.5}$
2) 3-SIDED WEIR ($h \le TC$)	$19.9\,h^{1.5}$	$29.7\,h^{1.5}$	$39.5\,h^{1.5}$	$49.2\,h^{1.5}$
3) 4-SIDED WEIR ($h > TC$)	ADD TO 2): $11(h-.90)^{1.5}$	ADD TO 2): $22(h-.90)^{1.5}$	ADD TO 2): $33(h-.90)^{1.5}$	ADD TO 2): $44(h-.90)^{1.5}$

1) $Q = 0.6A\sqrt{2gh}$

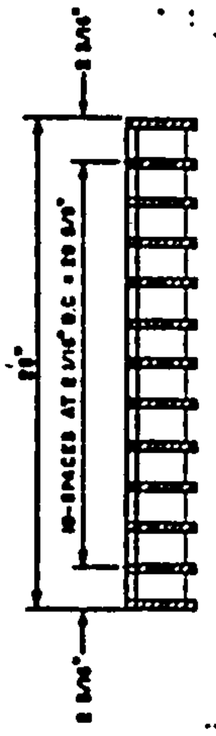
2) & 3) $Q = 3.3\,P\,h^{1.5}$



PLAN



SECTION A-A



SECTION B-B

FIGURE 1

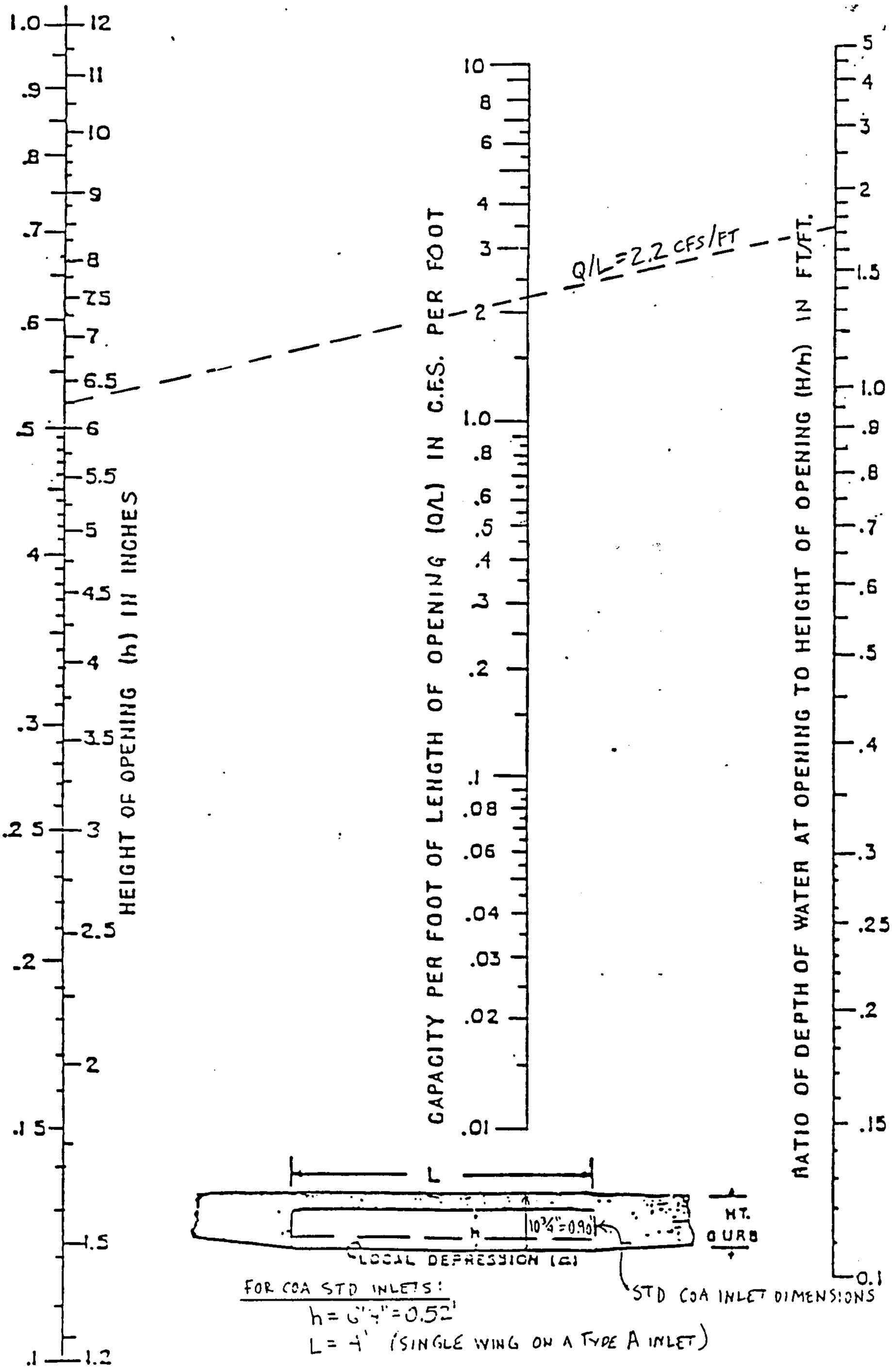
BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY JPK DATE 8/20/92

SUBJECT RATING CURVE FOR STD COA GRATE IN SUMP CONDITION CH'D _____ DATE _____

FIGURE 2



FOR COA STD INLETS:
h = 6¾" = 0.52'
L = 4' (SINGLE WING ON A TYPE A INLET)

FOR CAPACITY OF COMBINATION GRATE & CURB OPENING INLETS IN A SUMP (E.G. TYPE A INLETS), ADD THE GRATE CAPACITY TO THIS CURB OPENING CAPACITY.

NOMOGRAPH FOR CAPACITY OF CURB OPENING INLETS AT LOW POINTS