

CITY OF ALBUQUERQUE



March 7, 2013

Michael Balaskovits, P.E.
Bohannon Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: USS Bullhead Park
Grading and Drainage Plan
Engineer's Stamp dated 02-06-2013 (M18/D12)

Dear Mr. Balaskovits,

Based upon the information provided in your submittal received 02-19-13, the above referenced plan is approved for Grading and Paving Permit.

Upon completion of the project, please provide an Engineer Certification for our files.

If you have any questions, you can contact me at 924-3986.

Sincerely,

Curtis Cherne, P.E., CFM.
Principal Engineer, Planning Dept.
Development and Building Services

C: Email

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(Rev. 12/2005)

PROJECT TITLE: Bullhead Park – New Day Site ZONE MAP/DRG. FILE # M-18/D12
DRB#: _____ EPC#: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: U.S.S. Bullhead Park
CITY ADDRESS: South of San Pedro and Ridgecrest Intersection

ENGINEERING FIRM: Bohannon Huston, Inc. CONTACT: Mike Balaskovits
ADDRESS: 7500 Jefferson St. NE Courtyard 1 PHONE: 823-1000
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

OWNER: Sites Southwest. CONTACT: Jesse Scott
ADDRESS: 121 Tijeras NE, Suite 3100 PHONE: (505) 822-8200
CITY, STATE: Albuquerque, NM ZIP CODE: 87102

ARCHITECT: _____ CONTACT: _____
ADDRESS: _____ PHONE: _____
CITY, STATE: _____ ZIP CODE: _____

SURVEYOR: _____ CONTACT: _____
ADDRESS: _____ PHONE: _____
CITY, STATE: _____ ZIP CODE: _____

CONTRACTOR: _____ CONTACT: _____
ADDRESS: _____ PHONE: _____
CITY, STATE: _____ ZIP CODE: _____

TYPE OF SUBMITTAL:
____ DRAINAGE REPORT
____ DRAINAGE PLAN 1st SUBMITTAL
☒ DRAINAGE PLAN RESUBMITTAL
____ CONCEPTUAL G & D PLAN
☒ GRADING PLAN
____ EROSION CONTROL PLAN
____ ENGINEER'S CERT (HYDROLOGY)
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT
____ ENGINEER CERT (TCL)
____ ENGINEER CERT (DRB SITE PLAN)
____ OTHER (SPECIFY) _____

CHECK TYPE OF APPROVAL SOUGHT:
____ SIA/FINANCIAL GUARANTEE RELEASE
____ PRELIMINARY PLAT APPROVAL
____ S. DEV. PLAN FOR SUB'D APPROVAL
____ S. DEV. FOR BLDG. PERMIT APPROVAL
____ SECTOR PLAN APPROVAL
____ FINAL PLAT APPROVAL
____ FOUNDATION PERMIT APPROVAL
____ BUILDING PERMIT APPROVAL
____ CERTIFICATE OF OCCUPANCY (PERM)
____ CERTIFICATE OF OCCUPANCY (TEMP)
☒ GRADING PERMIT APPROVAL
____ PAVING PERMIT APPROVAL
____ WORK ORDER APPROVAL
____ OTHER (SPECIFY) _____

WAS A PRE-DESIGN CONFERENCE ATTENDED:
____ YES
____ NO
____ COPY PROVIDED

RECEIVED
FEB 19 2013

SUBMITTED BY: Mike Balaskovits DATE: 2/18/13

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope to the proposed development define the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan.** Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.
2. **Drainage Plans.** Required for building permits, grading permits, paving permits and site plans less than five (5) acres
3. **Drainage Report.** Required for subdivision containing more than ten (10) lots or constituting five (5) acres or more

CITY OF ALBUQUERQUE



February 16, 2012

Michael Balaskovits, P.E.
Bohannon Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: USS Bullhead Park
Grading and Drainage Plan
Engineer's Stamp dated 2-10-12 (M18/D12) sheet LG-101
Engineer's Stamp dated 2-8-12 (M18/D12) sheets LG-101 – LG-104

Dear Mr. Balaskovits,

Based upon the information provided in your submittal received 2-10-12, the above referenced plan is approved for Grading Permit.

PO Box 1293

Upon completion of the project, please provide an Engineer Certification for our files.

Albuquerque

If you have any questions, you can contact me at 924-3986 or Rudy E. Rael at 924-3977.

NM 87103

Sincerely,

Curtis Cherne, P.E., CFM.
Principal Engineer, Planning Dept.
Development and Building Services

www.cabq.gov

C: CAC/RER
File

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(Rev. 12/2005)

PROJECT TITLE: Bullhead Park – New Day Site ZONE MAP/DRG. FILE # M-18/D12
DRB#: _____ EPC#: _____ WORK ORDER#: _____

LEGAL DESCRIPTION: U.S.S. Bullhead Park
CITY ADDRESS: South of San Pedro and Ridgecrest Intersection

ENGINEERING FIRM: Bohannon Huston, Inc. CONTACT: Mike Balaskovits
ADDRESS: 7500 Jefferson St. NE Courtyard 1 PHONE: 823-1000
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

OWNER: Sites Southwest CONTACT: Jesse Scott
ADDRESS: 121 Tijeras NE, Suite 3100 PHONE: (505) 822-8200
CITY, STATE: Albuquerque, NM ZIP CODE: 87102

ARCHITECT: _____ CONTACT: _____
ADDRESS: _____ PHONE: _____
CITY, STATE: _____ ZIP CODE: _____

SURVEYOR: _____ CONTACT: _____
ADDRESS: _____ PHONE: _____
CITY, STATE: _____ ZIP CODE: _____

CONTRACTOR: _____ CONTACT: _____
ADDRESS: _____ PHONE: _____
CITY, STATE: _____ ZIP CODE: _____

TYPE OF SUBMITTAL:

☐ DRAINAGE REPORT
☐ DRAINAGE PLAN 1st SUBMITTAL
☐ DRAINAGE PLAN RESUBMITTAL
☐ CONCEPTUAL G & D PLAN
☒ GRADING PLAN
☐ EROSION CONTROL PLAN
☐ ENGINEER'S CERT (HYDROLOGY)
☐ CLOMR/LOMR
☐ TRAFFIC CIRCULATION LAYOUT
☐ ENGINEER CERT (TCL)
☐ ENGINEER CERT (DRB SITE PLAN)
☐ OTHER (SPECIFY) _____

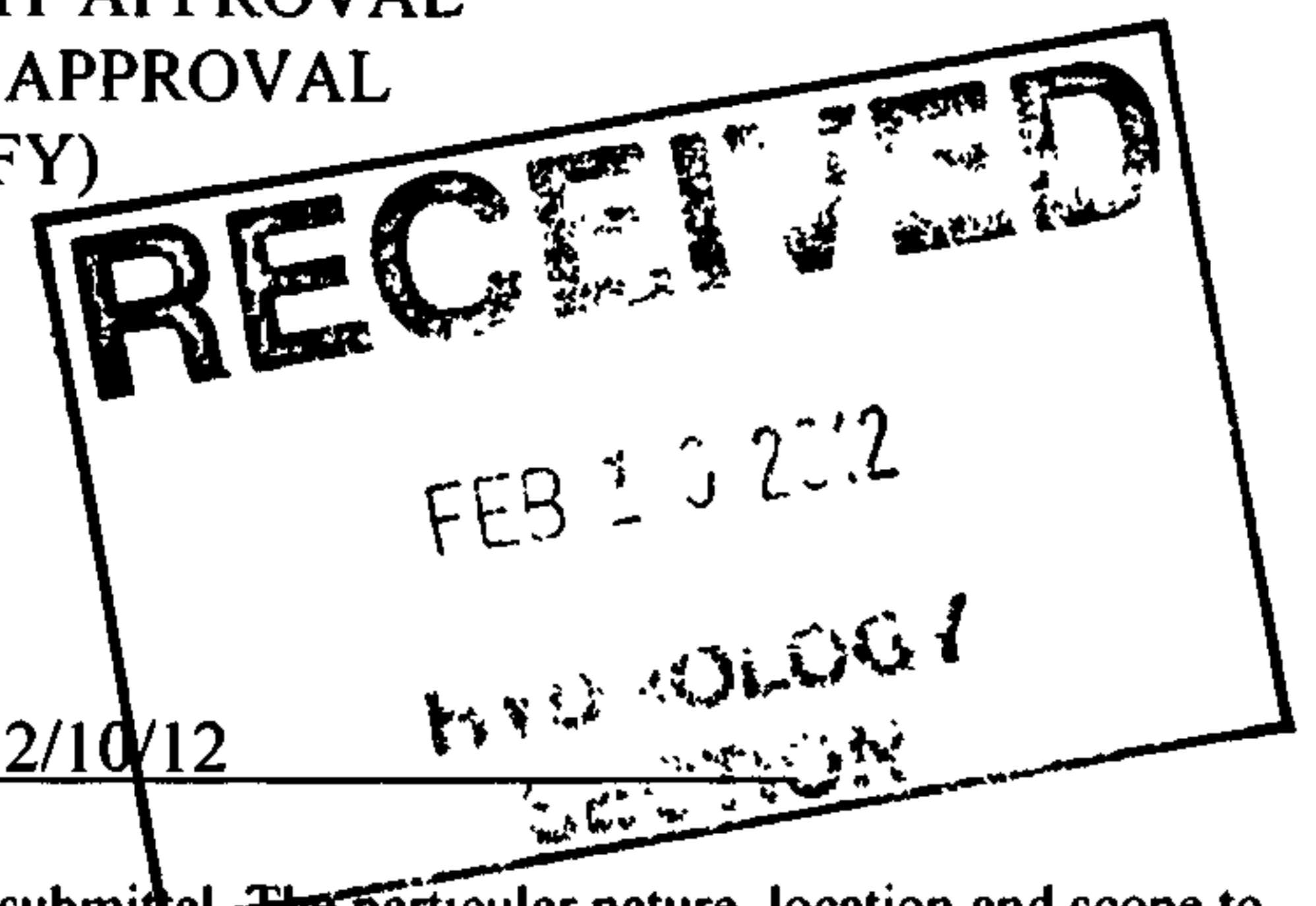
CHECK TYPE OF APPROVAL SOUGHT:

☐ SIA/FINANCIAL GUARANTEE RELEASE
☐ PRELIMINARY PLAT APPROVAL
☐ S. DEV. PLAN FOR SUB'D APPROVAL
☐ S. DEV. FOR BLDG. PERMIT APPROVAL
☐ SECTOR PLAN APPROVAL
☐ FINAL PLAT APPROVAL
☐ FOUNDATION PERMIT APPROVAL
☐ BUILDING PERMIT APPROVAL
☐ CERTIFICATE OF OCCUPANCY (PERM)
☐ CERTIFICATE OF OCCUPANCY (TEMP)
☒ GRADING PERMIT APPROVAL
☐ PAVING PERMIT APPROVAL
☐ WORK ORDER APPROVAL
☐ OTHER (SPECIFY) _____

WAS A PRE-DESIGN CONFERENCE ATTENDED:

☐ YES
☐ NO
☐ COPY PROVIDED

SUBMITTED BY: Mike Balaskovits DATE: 2/10/12



Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope to the proposed development define the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.
2. **Drainage Plans:** Required for building permits, grading permits, paving permits and site plans less than five (5) acres.
3. **Drainage Report:** Required for subdivision containing more than ten (10) lots or constituting five (5) acres or more.

CLIENT/COURIER TRANSMITTAL

To: Curtis Cherne, P.E.
City of Albuquerque Hydrology
600 Second St, 2nd floor

Requested by: Mike Balaskovits

Date: 02/10/2012

Time Due: ☐ This A.M.
☒ This P.M.
☐ Rush _____
☐ By Tomorrow

Phone: 924-3986

Job No.: 20120163

Job Name: Bullhead Park - New Day Site

DELIVERY VIA

☒ Courier ☐ Federal Express
☐ Mail ☐ UPS
☐ Other

PICK UP

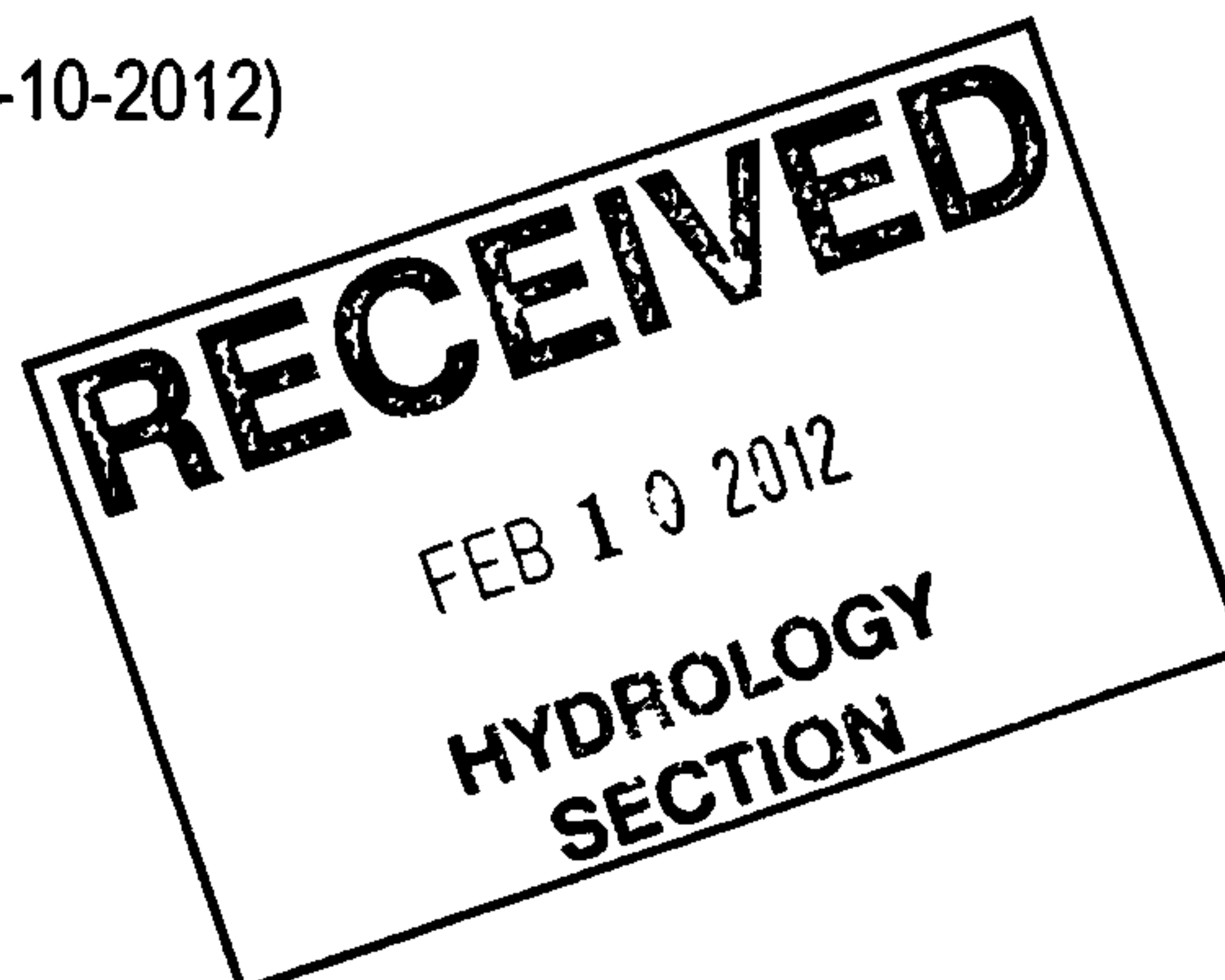
Item: _____

<u>ITEM NO.</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
1	4 sheets	Drainage Management Plan and Grading and Drainage Plan for GRADING PERMIT APPROVAL (Engineer Stamp dated 02-10-2012)

COMMENTS / INSTRUCTIONS

Curtis,
Let me know if you have any questions or concerns.

Thanks,
Mike



REC'D BY: _____ DATE: _____ TIME: _____



City of Albuquerque

October 2, 2000

Bruce Stidworthy, PE
Bohannon Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: U.S.S. Bullhead Park Amended Grading Plan
Engineer's Stamp dated 8-24-00 (M18/D12)

Dear Mr. Stidworthy,

Based upon the information provided in your submittal dated 8-24-00, the above referenced plan can be approved for Grading Permit. It is also acceptable for your Work Order documents.

If you have any questions, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Sr. Engineer, Hydrology

C: file



BOHANNAN HUSTON

Courtyard One

7500 JEFFERSON NE

Albuquerque

NEW MEXICO 87109

voice 505 823 1000

fax 505 821 0892

August 23, 2000

Brad Bingham, P. E.
Design Review Division/PWD
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

Re: U.S.S. Bullhead Park Drainage and Grading Report - Amended Grading Plan
(COA # 5734.00)

Dear Brad:

Per our phone conversation I am submitting revised grading plans for the Bullhead Park Parking Lots. The location of the second parking lot has been moved from the Army Reserve land to an area on the east side of the park.

Drainage is similar to the first submittal with both parking lots draining down San Pedro and the fields draining toward the west side of the park. Please accept this amendment and call me at 823-1000 with your comments or questions.

Sincerely,
Bohannon Huston, Inc.

Colleen Ruiz, E. I.
Community Development
and Planning Group

CG/am
Enclosures

cc: Bob Johns, G. Robert Johns, ASLA
Tag Gay, Sites Southwest



City of Albuquerque

July 17, 2000

Bruce Stidworthy, PE
Bohannon Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: U.S.S. Bullhead Park Master Drainage Report
Engineer's Stamp dated 6-15-00 (M18/D12)

Dear Mr. Stidworthy,

Based upon the information provided in your submittal dated 6-14-00, the above referenced site can be approved for Grading Permit. It is also acceptable for your Work Order documents.

If you have any questions, you can contact me at 924-3986

Sincerely,

Bradley L. Bingham
Bradley L. Bingham, PE
Hydrology Review Engineer

C: file

DRAINAGE INFORMATION SHEET

E: U.S.S. Bullhead Park ZONE ATLAS/DRNG. FILE # M-18-7/1002

----- EPC #: ----- WORK ORDER #: 5734.00

DESCRIPTION: U.S.S. Bullhead Park

SS: South of San Pedro/Ridgecrest Intersection.

G FIRM: Bohannon Huston, Inc.

500 Jefferson NE, Albuquerque, NM 87109

City of Albuquerque

Site: Sites Southwest

5150-A San Francisco NE, Albuquerque, NM 87109

Site: _____

FOR: _____

CONTACT: Colleen Ruiz

PHONE: 823-1000

CONTACT: _____

PHONE: _____

CONTACT: Tag Gay

PHONE: 822-8200

CONTACT: _____

PHONE: _____

CONTACT: _____

PHONE: _____

UBMITTAL:

DRAINAGE REPORT

DRAINAGE PLAN

FINAL GRADING & DRAINAGE PLAN

GRADING PLAN

EROSION CONTROL PLAN

ENGINEER'S CERTIFICATION

OTHER _____

IGN MEETING:

YES

NO

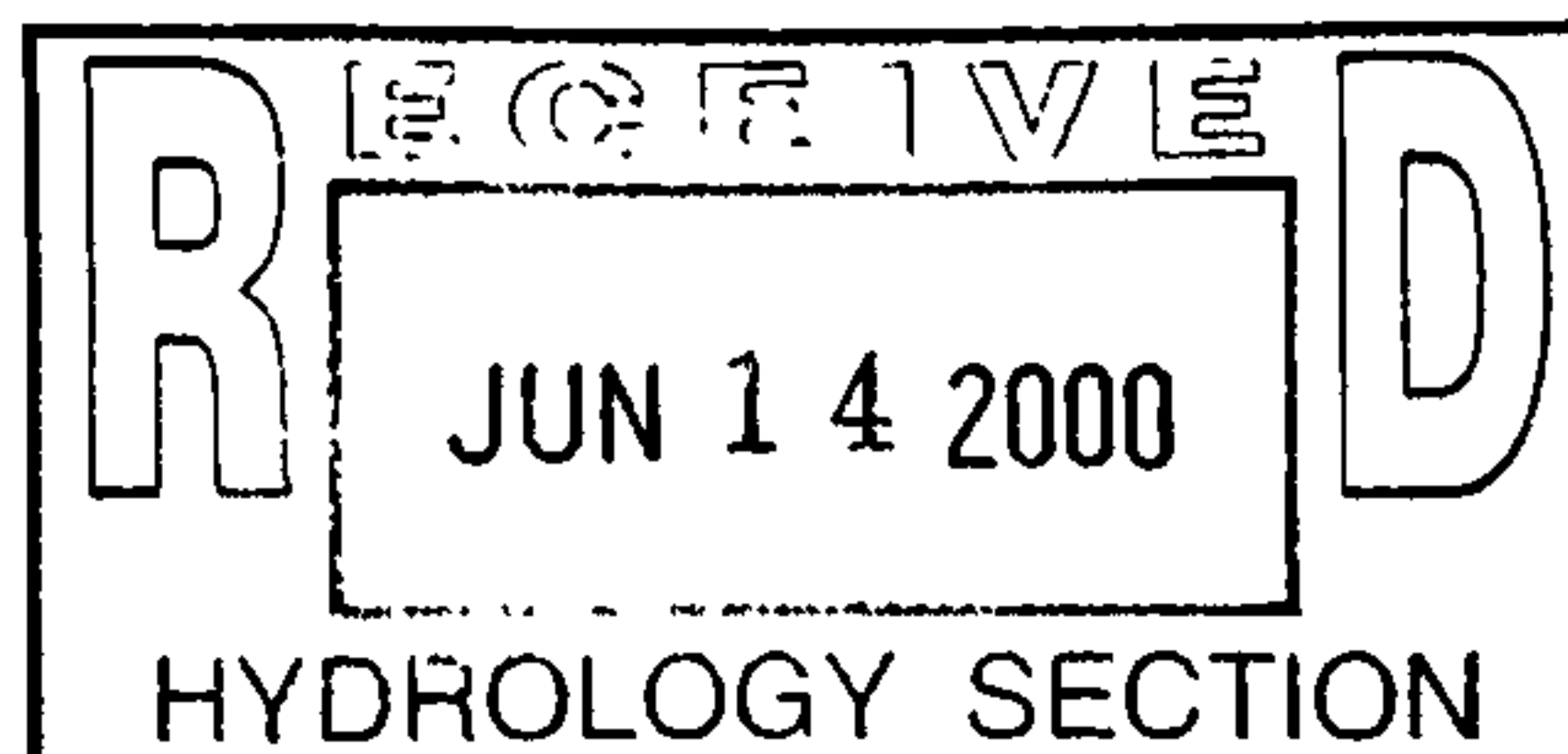
COPY PROVIDED _____

CHECK TYPE OF APPROVAL SOUGHT:

- | | |
|--------------|---|
| _____ | SKETCH PLAT APPROVAL |
| _____ | PRELIMINARY PLAT APPROVAL |
| _____ | S. DEV. PLAN FOR SUBD. APPROVAL |
| _____ | S. DEV. PLAN FOR BLDG. PERMIT APPROVAL |
| _____ | SECTOR PLAN APPROVAL |
| _____ | FINAL PLAT APPROVAL |
| _____ | FOUNDATION PERMIT APPROVAL |
| _____ | BUILDING PERMIT APPROVAL |
| _____ | CERTIFICATE OF OCCUPANCY APPROVAL |
| <u> X </u> | GRADING PERMIT APPROVAL |
| _____ | PAVING PERMIT APPROVAL |
| _____ | S.A.D. DRAINAGE REPORT |
| _____ | DRAINAGE REQUIREMENTS |
| _____ | SUBDIVISION CERTIFICATION |
| <u> X </u> | OTHER <u>DRC Construction Plan Approval</u> |

SUBMITTED: 06/14/00

BY: Colleen Ruiz, E.I.





BOHANNAN HUSTON

Courtyard One

7500 JEFFERSON NE

Albuquerque

NEW MEXICO 87109

voice 505 823 1000

fax 505 821 0892

MASTER DRAINAGE REPORT FOR U.S.S. BULLHEAD PARK

**(including proposed
improvements)**

June 15, 2000

Prepared for:

**SITES SOUTHWEST
5150-A SAN FRANCISCO NE
ALBUQUERQUE, NM 87109**

**MASTER DRAINAGE REPORT
FOR
U.S.S. BULLHEAD PARK
(including proposed improvements)**

JUNE 15, 2000

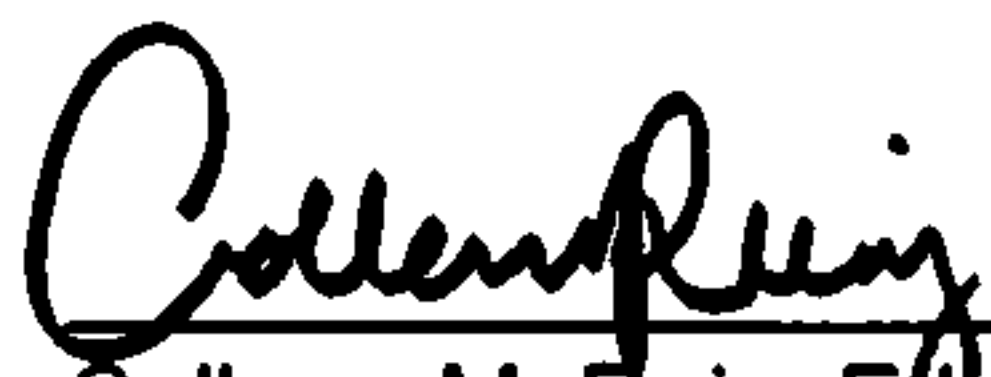
Prepared for:

**SITES SOUTHWEST
5150-A SAN FRANCISCO NE
ALBUQUERQUE, NM 87109**

Prepared by:

**BOHANNAN HUSTON, INC.
COURTYARD I
7500 JEFFERSON NE
ALBUQUERQUE, NEW MEXICO 87109**

PREPARED BY:


Colleen M. Ruiz, E.I. 6-15-00
June 15, 2000

UNDER THE SUPERVISION OF:


Bruce J. Stidworthy, P.E. 6/15/00
June 15, 2000





1

TABLE OF CONTENTS

Page

I.	INTRODUCTION	1
II.	STUDY METHODOLOGIES	1
III.	EXISTING CONDITIONS	2
	A. Onsite Drainage Basins	2
	B. Offsite Drainage Basins	2
	C. Flow at Gibson/San Pedro	3
IV.	PROPOSED DEVELOPED CONDITIONS	3
V.	PARK DEVELOPMENT	4
	Onsite Drainage Basins	4
VI.	CONCLUSION	4

APPENDICES

- APPENDIX 1 - LOCATION MAP
- APPENDIX 2 - EXISTING BASIN CALCULATIONS
- APPENDIX 3 - CONTRIBUTING BASIN ANALYSIS
- APPENDIX 4 - PROPOSED BASIN CALCULATIONS

PLATES

- PLATE 1 - EXISTING CONDITIONS MAP
- PLATE 2 - PROPOSED CONDITIONS MAP
- PLATE 3 - PROPOSED GRADING PLAN

I. INTRODUCTION

U.S.S. Bullhead Park is an existing facility located at the end of San Pedro Boulevard, south of Gibson Boulevard. Please refer to the location map enclosed in the Appendix for the specific location. The site is approximately 73 acres, consisting of softball, football, and soccer fields, a playground and three parking lots.

This report analyzes existing and proposed conditions for designed additional/enlarged parking lots and outlines the study methodologies used. Basin Maps, the Grading Plan, Calculations and supporting data are presented in the Appendices. This report is in compliance with the City of Albuquerque standards.

The primary purpose of this report is to obtain approval for the Grading Plan and Public Infrastructure Construction Plans of U.S.S. Bullhead Park. Secondly, this report will provide City Hydrology with a comprehensive analysis of the Park's drainage.

II. STUDY METHODOLOGIES

The City of Albuquerque standards for drainage analyses have been incorporated by this report. This drainage report contains all applicable calculations, per Section 22.2 of the Development Process Manual, for deriving the following values using the rational method analysis:

LAND TREATMENT	PEAK DISCHARGE (CFS/ACRE)	EXCESS PRECIPITATION (INCHES)
A	1.87	0.66
B	2.60	0.92
C	3.45	1.29
D	5.02	2.36

ZONE 3

Flow rate references in this report are 6-hour, 100-year storm event values.

III. EXISTING CONDITIONS

A. Onsite Drainage Basins



Under existing conditions, Bullhead Park was analyzed as four basins. The first basin (E-1) consists of the northernmost softball field and a playground. The flows from this basin are directed into San Pedro Boulevard and to the Gibson storm drain system west of San Pedro. E-1 is approximately 4.76 acres with a 100-year storm flow of 14.39 cfs.

The second basin (E-2) is made up of two parking lots and the surrounding area at the terminus of San Pedro. E-2 is approximately 4.40 acres with a 100-year storm flow of 20.37 cfs (E-2 is primarily impervious land treatment.). E-2 also flows into San Pedro and to the Gibson storm drain system.

The third existing basin (E-3) is made up of several undeveloped government properties that slope at roughly 20:1 towards the intersection of Ridgecrest Drive and San Pedro Boulevard. A berm has been constructed along the northern boundary of these properties to intercept and route flows to San Pedro and the Gibson storm drain system. This area is approximately 14.73 acres with a 100-year storm flow of 45.80 cfs.

The fourth and final onsite basin (E-4) consists of five soccer/football fields, three softball fields, a large portion of undeveloped land, and a parking lot that drains into an existing pond at the westernmost edge of the property. The approximate area of E-4 is 48.89 acres. The flows were calculated with AHYMO to be 118.17 cfs. A detailed analysis of the existing pond, as would be required to determine its hydrologic benefit, is beyond the scope of this report. The pond appears to discharge to the south.

B. Offsite Drainage Basins

A contributing basin to this analysis is the existing neighborhood bordered by San Pedro, Gibson, Louisiana, and Ridgecrest. This basin contributes to the overall drainage basin that flows down San Pedro, turns west on Gibson, and enters the Gibson storm drain system. This basin was included in the analysis (at the direction of City Hydrology staff) to provide a more

comprehensive analysis of the potential impact of development within the Park to the Gibson storm drain. Included in Appendix 3 is an illustration of the existing neighborhood with 10' contours on a USGS quadangle map of East Albuquerque. The area of the Contributing Basin is roughly 93.7 acres, and the 100-year flow was calculated with AHYMO to be approximately 332 cfs.



C. Flow at Gibson/San Pedro

The total flow from the Park and offsite contributing basin, at the intersection of Gibson and San Pedro, is 412.6 cfs.

IV. PROPOSED DEVELOPED CONDITIONS

The City of Albuquerque proposes to construct a circular turnaround, increase the capacity of the existing parking lot that is east of San Pedro by approximately 135 spaces, add another parking lot east of the enlarged parking lot, and grade an additional soccer field at the east side of the park. The additional 178-stall parking lot will be on the Army Reserve property and will have dual use for Bullhead Park and future Army Reserve facilities. The proposed parking lots will add 3.65 acres of parking to the site. Both parking lots will be graded, with slopes between 1% and 2%. Drainage analysis shows that the addition of this parking lot will increase the overall basin's flows from Bullhead Park and the analyzed contributing basin into the Gibson storm drain system by approximately 3.4% (from 412.6 cfs to 426.8 cfs at AP1). The overall basin analyzed includes the portion of Bullhead Park that drains to Gibson Boulevard and a contributing basin consisting of the existing residential neighborhood bordered by San Pedro, Gibson, Louisiana, and Ridgecrest. The City of Albuquerque considered these relatively small percentages of additional flows to the Gibson storm drain system acceptable in a pre-design meeting on February 15, 2000. Therefore, this report proposes to continue to allow free discharge from the Park.

V. PARK DEVELOPMENT

Onsite Drainage Basins



There are four proposed basins in the Bullhead Park analysis. The first basin (P-1) is identical to E-1 of the existing conditions. It is the area including a softball field and playground west of San Pedro. The approximate area of P-1 is 4.76 acres with a 100-year flow of 14.39 cfs.

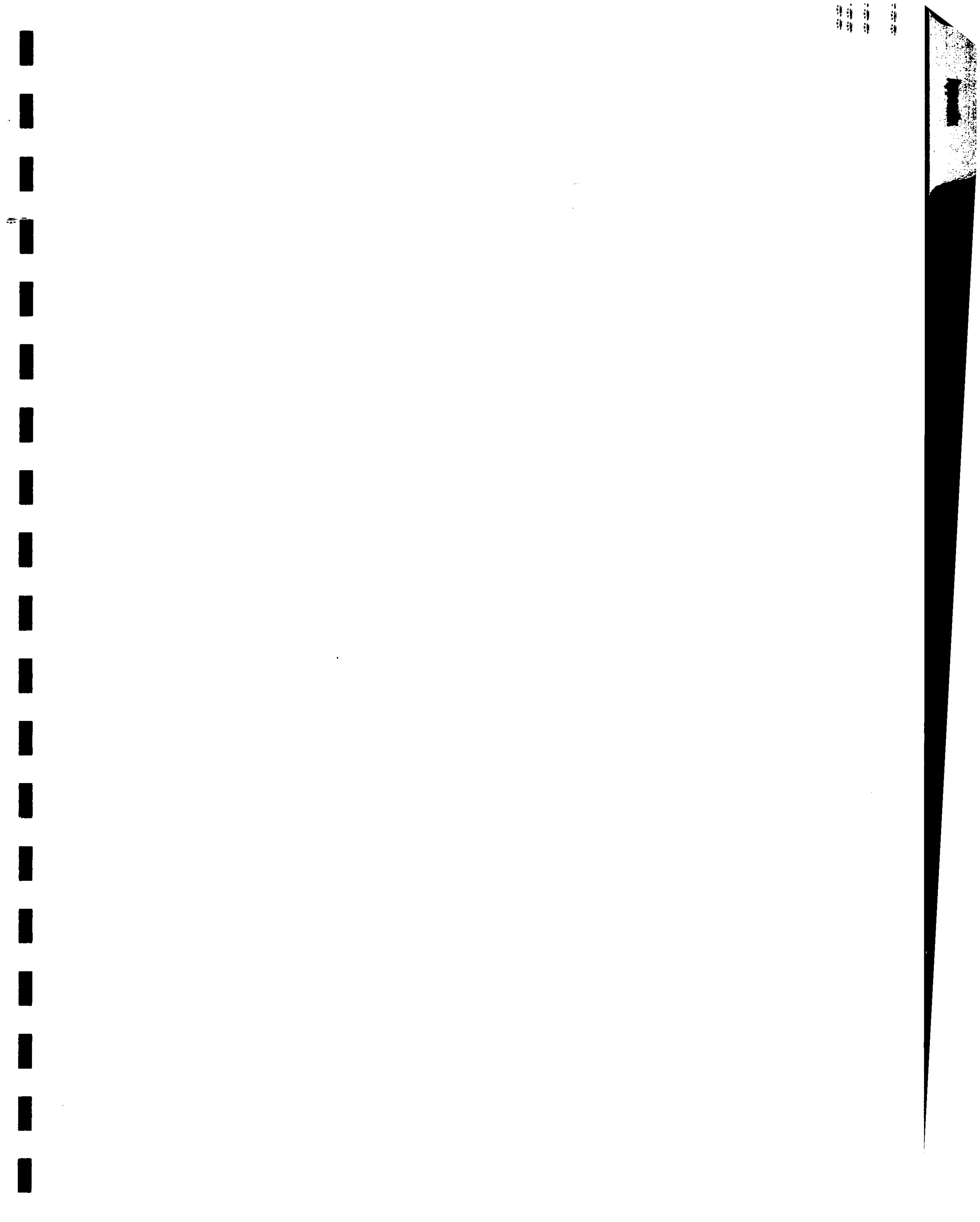
The second proposed basin (P-2) is similar to Basin E-2, which is made up of several undeveloped government properties that slope at roughly 20:1 towards the intersection of Ridgecrest Drive and San Pedro Boulevard. A berm has been constructed along the northern boundary of these properties to intercept and route flows. Now, part of the existing E-3 basin makes up the proposed additional parking lot, and the upstream flows are routed around the new parking lot. The area of basin P-2 is approximately 14.49 acres with a 100-year flow of 43.84 cfs.

Proposed basin P-3 is made up of the two new proposed parking lots and surrounding area at the San Pedro turn-about. The approximate area for P-2 is 14.49 acres with a 100-year flow of 46.55 cfs. Basin P-3 will drain into San Pedro and the Gibson storm drain system.

The fourth basin (P-4) is made up of existing undeveloped land, existing softball, soccer and football fields, and a parking lot. It can be compared to the existing basin E-4. This basin is directed towards an existing pond at the western property line. Proposed conditions (additional parking that directs more flows to the Gibson storm drain system) reduce the basin size and flows from 48.89 acres and 118.17 cfs to 41.94 acres and 98.8 cfs into this pond .

VI. CONCLUSION

The drainage management plan presented in this report for Bullhead Park provides a workable solution to the drainage issues created by the latest development of this property. It also provides a comprehensive analysis of the drainage conditions for the Park. It is recommended that this plan be approved for the grading and infrastructure plans.



APPENDICES

APPENDIX 1 - LOCATION MAP

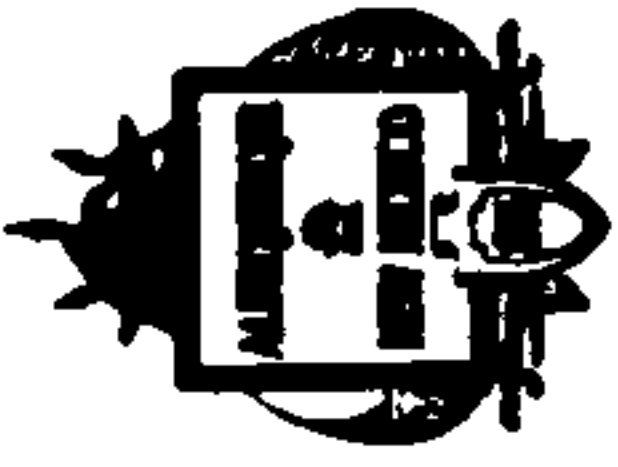
APPENDIX 2 - EXISTING BASIN CALCULATIONS

APPENDIX 3 - CONTRIBUTING BASIN ANALYSIS

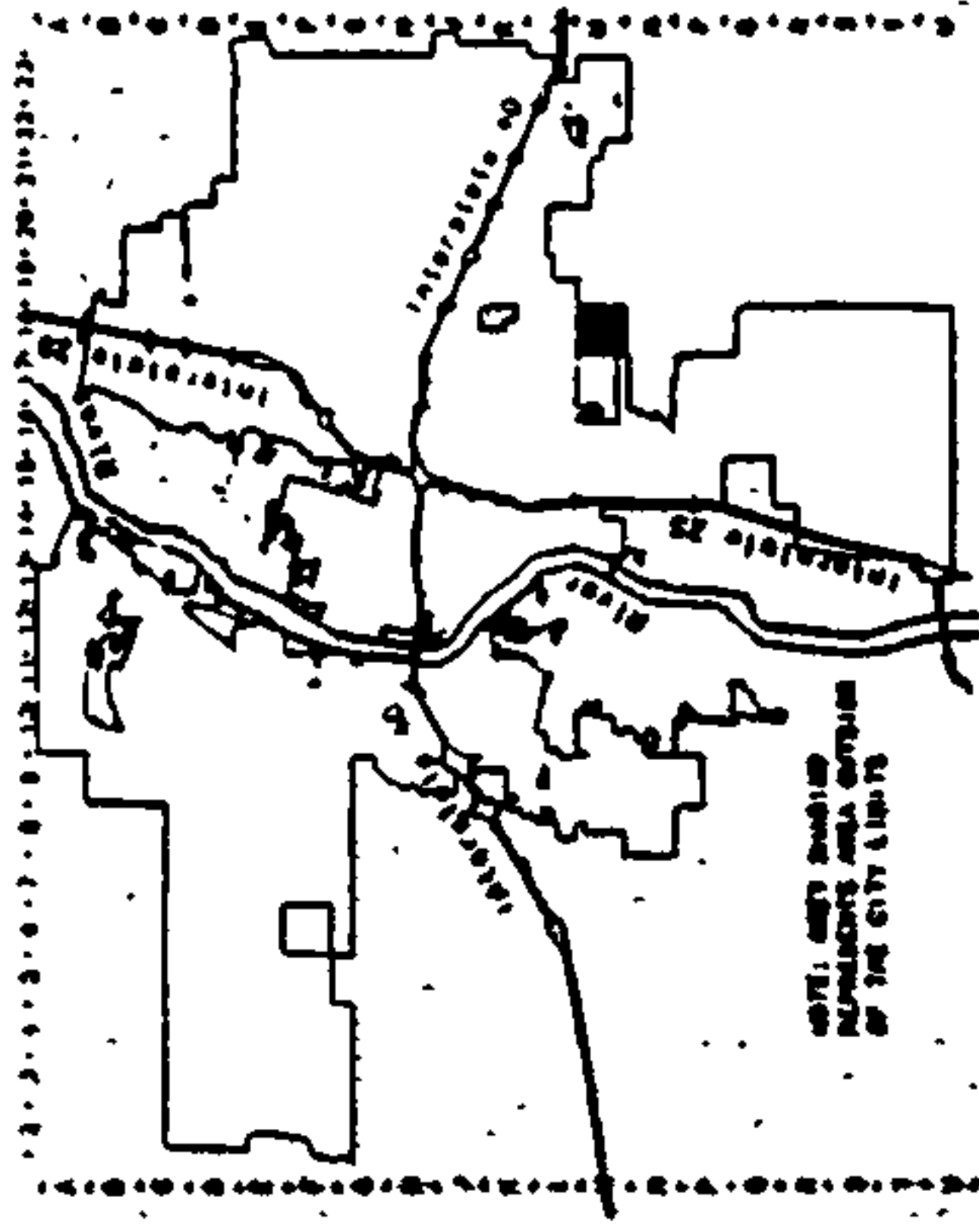
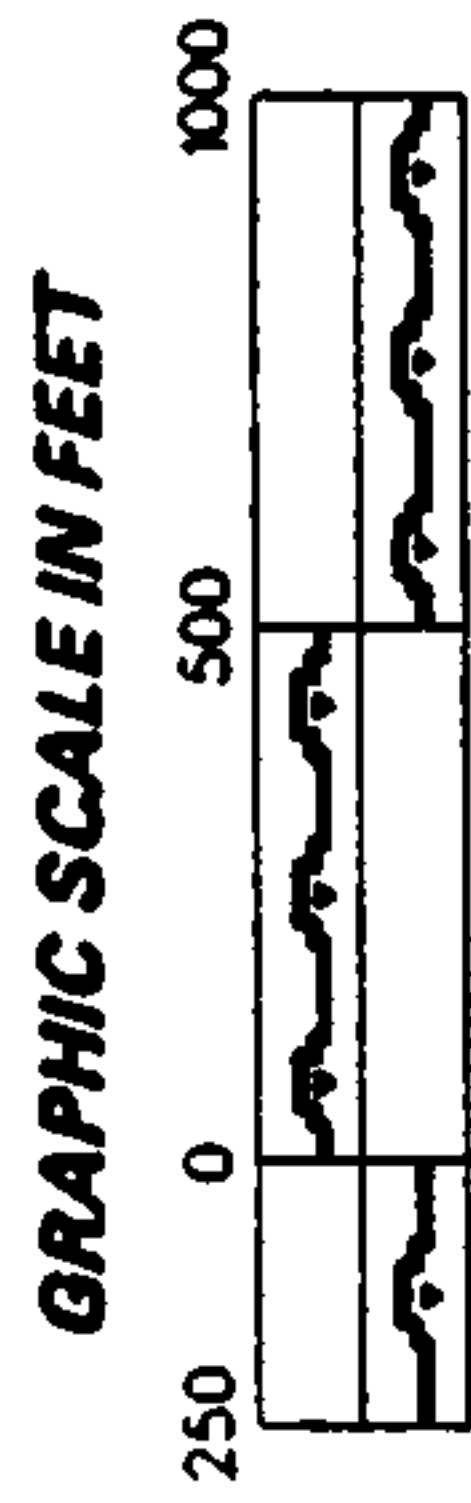
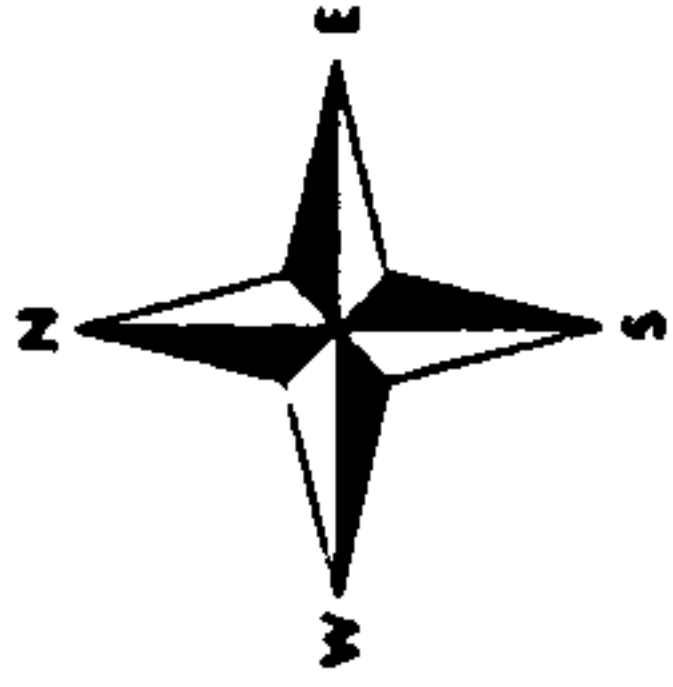
APPENDIX 4 - PROPOSED BASIN CALCULATIONS

APPENDIX 1

LOCATION MAP

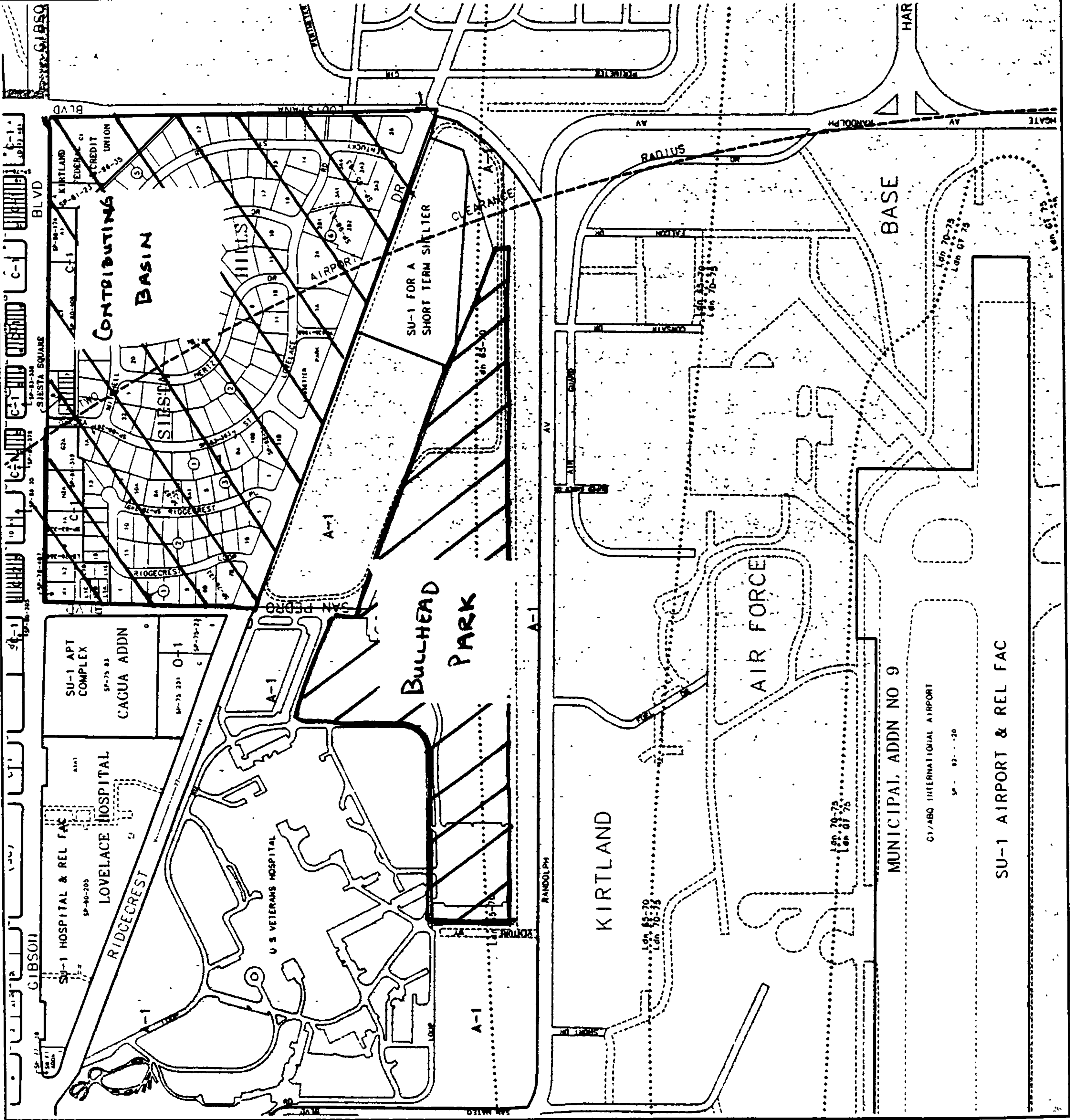


CITY OF
ALBUQUERQUE
ANNEX G-1
PLANNING DEPARTMENT
© Copyright 1998



Zone Atlas Page M-18-Z

Map Amended through
December 03, 1998



A-1/1

APPENDIX 2

EXISTING BASIN CALCULATIONS

BULLHEAD PARK

Existing Conditions Basin Data Table

This table is based on the DPM Section 22.2, Zone: 3

BASIN	Area (SQ. FT)	Area (AC.)	Land Treatment Percentages				Q(100) (cfs/ac.)	Q(100) (CFS)
			A	B	C	D		
E-1	207229	4.76	0.0%	50.0%	50.0%	0.0%	3.03	14.39
E-2	191734	4.40	0.0%	0.0%	25.0%	75.0%	4.63	20.37
E-3	641433	14.73	0.0%	40.0%	60.0%	0.0%	3.11	45.80
E-4	2129476	48.89	10.0%	55.0%	20.0%	5.0%	2.42*	118.17*

* calculated with AHYMO, Basin > 40 acres. See next sheet for analysis

A2-1

**BULLHEAD PARK
ANALYSIS OF EXISTING BASIN E-4**

AREA = 48.89 ACRES

TREATMENT TYPES

A = 10%
B = 55%
C = 20%
D = 5%

TIME TO PEAK = 0.155 HR. (CALCULATED W/ DPM, SEE ATTTACHED)

ZONE 3

CH SLP=0.005 N=0.3 DIST=4600 FT

DIST	ELEV	DIST	ELEV	DIST	ELEV
0	.5	150	0	350	0.5

RAIN ONE HR. =2.05 RAIN SIX HR. =2.5 RAIN 1 DAY=2.9

OUTPUT:

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994	RUN DATE (MON/DAY/YR) =02/16/2000
INPUT FILE = COLLEEN.TXT	USER NO.= BOHN_HNM.STE

PAGE = 1

HYDROGRAPH COMMAND	IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME=.00 RAINFALL TYPE= 1 RAIN6= 2.500 PER IMP= 5.88
COMPUTE NM HYD FINISH		E-4-	1	.07639	118.17	4.002	.98235	1.550	2.417	

CALCULATIONS OF T_p FOR BASIN E-4 > 40 ACRES

DPM SECTION 22

$$t_p = \frac{2}{3} t_c$$

$$t_c = \left(\frac{L_1}{V_1} + \frac{L_2}{V_2} \right)$$

$$L_1 = 1st\ 400'$$

$$V = K * \sqrt{S + 100}$$

$$= 10K(\sqrt{S}) \text{ where } S = 0.5\% \text{ overall, } 0.9\% \text{ 1st } 400'$$

$$K = 0.7$$

$$t_c = \frac{L}{\frac{10K\sqrt{S}}{3600 \text{ sec/hr}}}$$

$$V = 10K\sqrt{S} (3600 \text{ sec})$$
$$= 17,819.1$$

$$t_c = \frac{L}{V} = \frac{4140}{17819.1}$$

$$t_c = 0.232$$

$$\underline{t_p = 0.155}$$

Bohannon & Huston



PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERS PLANNERS PHOTOGRAMMETRISTS
SURVEYORS SOFTWARE DEVELOPERS

A2-3/3

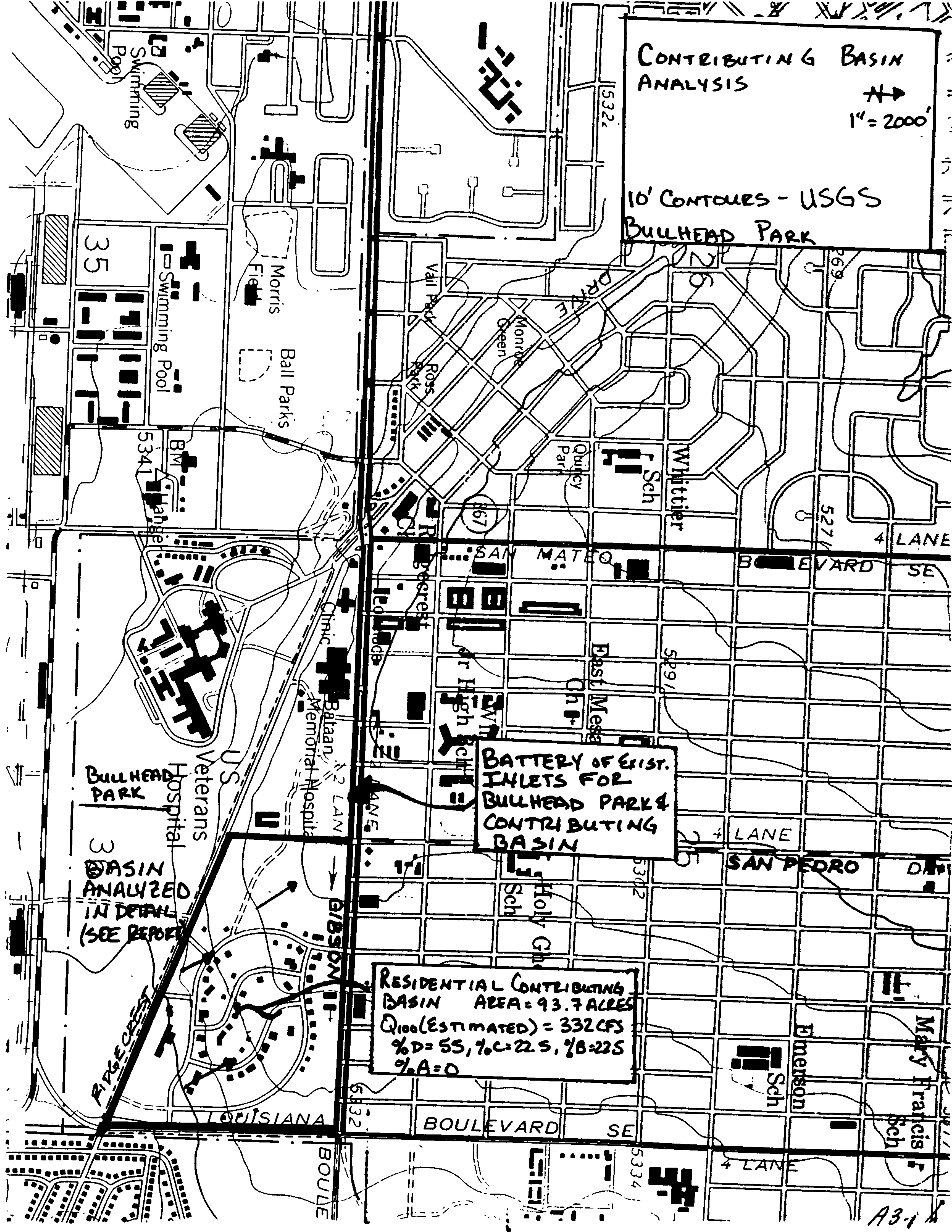
APPENDIX 3

CONTRIBUTING BASIN ANALYSIS

CONTRIBUTING BASIN
ANALYSIS

1" = 2000'

10' CONTOURS - USGS
BULLHEAD PARK



BATTERY OF EXIST.
INLETS FOR
BULLHEAD PARK &
CONTRIBUTING
BASIN

RESIDENTIAL CONTRIBUTING
BASIN AREA = 93.7 ACRES
 Q_{100} (ESTIMATED) = 332 CFS
%D = 55, %C = 22.5, %B = 22.5
%A = 0

BULLHEAD PARK
Veterans Hospital
BASIN ANALYZED
IN DETAIL
(SEE REPORT)

AHYMO ON CONTRIBUTING BASIN FOR HISTORICAL DATA
SOURCE = USGS ALBUQUERQUE EAST QUADRANGEL, 1972

AREA = 93.7 ACRES
LAND TREATMENT TYPE
%A = 0
%B = 22.5
%C = 22.5
%D = 55.0

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
=02/23/2000
INPUT FILE = COLLEEN.TXT
BOHN_HNM.STE
RUN DATE (MON/DAY/YR)
USER NO.=

		FROM	TO	AREA	PEAK	RUNOFF		TIME TO	CFS	PAGE =	1
COMMAND	HYDROGRAPH IDENTIFICATION	ID NO.	ID NO.		DISCHARGE (CFS)	VOLUME (AC-FT)	RUNOFF (INCHES)	PEAK (HOURS)	PER ACRE	NOTATION	
START										TIME=.00	
RAINFALL	TYPE= 1									RAIN6=2.500	
COMPUTE NM HYD CONTRIBUTING BASIN-			1	.14640	332.22	13.232	1.69470	.0185	3.546	PER IMP= 55.00	
FINISH											

P:\99430\cdp\hydro\99430CONTRIBUTING_BASINS.txt

CALCULATIONS OF TP FOR CONTRIBUTING BASINS > 40 ACRES

DPM SECTION 22

$$t_p = 2/3 t_c$$

$$t_c = \left(\frac{L_1}{V_1} \right)$$

$$L_1 = 7000'$$

$$V_1 = K * \sqrt{S + 100}$$

$$t_c = \frac{L}{\frac{10 K \sqrt{S}}{3600 \text{ sec/hr}}}$$

$$t_c = 0.278$$

$$\underline{t_p = 0.185}$$

Bohannon & Huston



PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERS PLANNERS PHOTOGRAMMETRISTS
SURVEYORS SOFTWARE DEVELOPERS

A3-3/3

APPENDIX 4

PROPOSED BASIN CALCULATIONS

BULLHEAD PARK

Proposed Conditions Basin Data Table

This table is based on the DPM Section 22.2, Zone: 3

BASIN	Area (SQ. FT)	Area (AC.)	Land Treatment Percentages				Q(100) (cfs/ac.)	Q(100) (CFS)
			A	B	C	D		
P-1	207229	4.76	0%	50%	50%	0%	3.03	14.39
P-2	631306	14.49	0%	50%	50%	0%	3.03	43.84
P-3	506916	11.64	0%	26%	26%	49%	4.00	46.55
P-4	1826757	41.94	10%	55%	20%	5%	2.36*	98.86*

*calculated with AHYMO, Basin > 40 acres. See next sheet for analysis.

A4-1

BULLHEAD PARK
ANALYSIS FOR PROPOSED BASIN P-4

INPUT:

AREA = 41.94 ACRES

TREATMENT TYPES

A = 10%
B = 55%
C = 20%
D = 5%

ZONE 3

CH SLP=0.005 N=0.3 DIST=4600 FT

DIST	ELEV	DIST	ELEV	DIST	ELEV
0	.5	150	0	350	0.5

RAIN ONE HR. =2.05 RAIN SIX HR. =2.5 RAIN 1 DAY=2.9

OUTPUT:

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
INPUT FILE = 99430p4.txt

RUN DATE (MON/DAY/YR) =02/24/2000
USER NO.= BOHN_HNM.STE

HYDROGRAPH COMMAND IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START RAINFALL									TIME= .00 TYPE= 1 RAIN6= 2.500 PER IMP= 5.56
COMPUTE NM HYD FINISH	E-4	- 1	.06550	98.86	3.344	.95718	1.550	2.358	

[REDACTED]

PLATES

PLATE 1 -EXISTING CONDITIONS MAP

PLATE 2 -PROPOSED CONDITIONS MAP

PLATE 3 -PROPOSED GRADING PLAN

PLATE 1

EXISTING CONDITIONS MAP

PLATE 2

PROPOSED CONDITIONS MAP

PLATE 3

PROPOSED GRADING PLAN

FILE COPY



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

KEN SCHULTZ
MAYOR

CLARENCE V. LITHGOW
CHIEF
ADMINISTRATIVE OFFICER

DAN WEAKS
DEPUTY CAO
PUBLIC SERVICES

FRED E. MONDRAGON
DEPUTY CAO
DEVELOPMENT & ENTERPRISE SERVICES

March 1, 1989

Gilbert Aldaz
Tierra Engineering Consultants, Inc.
105 Sixth Street, SW
Albuquerque, New Mexico 87102

RE: DRAINAGE PLAN FOR BULLHEAD ACCESS ROAD
RECEIVED JANUARY 26, 1989 (M-18/D12)

Dear Mr. Aldaz:

The above referenced plan is approved for a paving permit. Please be advised that the following items were not demonstrated in this report.

1. The roadway is not designed for the 100 year storm.
2. Off-site drainage basins were not shown.
3. Downstream capacity was not verified. However, we received approval from Mr. Ronald L. Richter, of the Veterans Administration, to allow the improvements to be made.

Should you have any questions regarding this project, please call me at 768-2650.

Cordially,

Carlos A. Montoya, P.E.
City/County Floodplain Administrator

xc: Dan Martinez

CAM/bsj
(WP+986)



January 31, 1997

Martin J. Chávez, Mayor

Robert E. Gurulé, Director

Jeff Mortensen
Jeff Mortensen & Assoc.
6010-B Midway Park Blvd. NE
Albuquerque, NM 87109

**RE: BULLHEAD PARK (M18-D012). GRADING AND DRAINAGE PLAN SUBMITTAL
FOR GRADING PERMIT APPROVAL.**

Dear Mr. Mortensen:

Based on the information provided on your January 23, 1997
submittal, the above referenced project is approved for grading
permit.

Please provide an Engineer's Certification upon project completion.

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

Sincerely,

Lisa Ann Manwill
Engineering Assoc./Hyd.

c: Andrew Garcia
File

Good for You, Albuquerque!

P.O. Box 1293, Albuquerque, New Mexico 87103



KIRTLAND VETERANS ADMINISTRATION
OUTPATIENT CLINIC REPLACEMENT

HYDROLOGIC/HYDRAULIC ANALYSIS
FEBRUARY, 1988

PREPARED BY BOHANNAN-HUSTON, INC.
* MODIFIED BY TIERRA ENGR.
TO INCLUDE BULLHEAD ACCESS ROAD

Page 1

STORM DRAINAGE MANAGEMENT

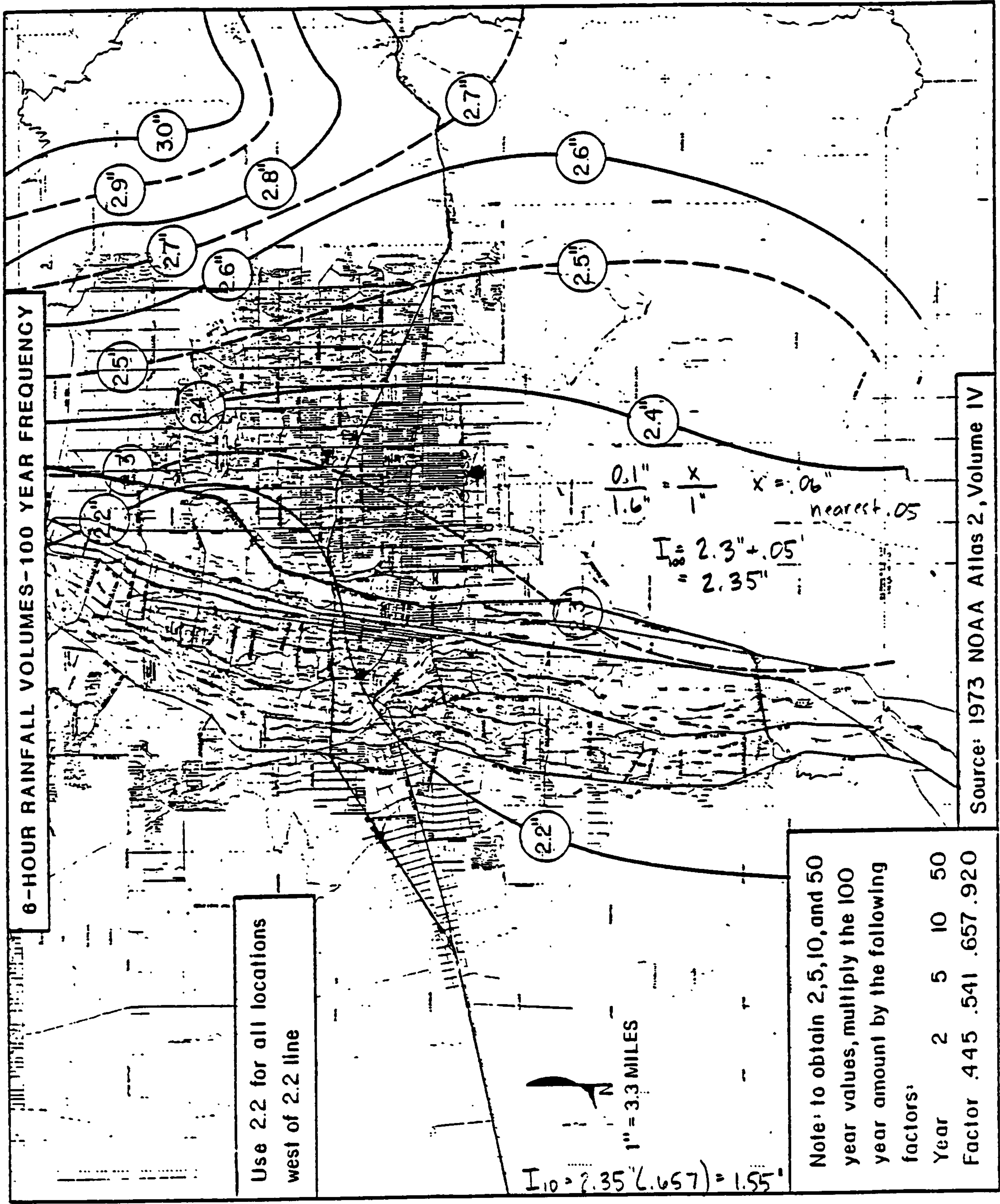
As directed by the RFP, Section 2.5.4, all computations contained herein are in conformance with AFM 88-5, Chapter 4, and Chapter 22 of the City of Albuquerque's Development Process Manual (DPM). As mentioned in the RFP, the design storm frequency for underground and surface drainage analysis will be 10 years.

The DPM recommends that peak rates of discharge be calculated by the rational method, whereas volumetric runoff computations should utilize the SCS method, with a composite hydrograph the result. The time of concentration will be calculated by the Kirpich equation as required by the DPM, but shall be between 10 and 20 minutes as directed by the RFP.

Chapter 22 of the DPM states that rainfall volumes for all analysis methods will be determined using Plate 22.2 D-1. For the 10-year frequency, the reduction factor 0.657, shown on that plate will be applied. The 6-hour point rainfall utilized will be 2.35". Rainfall intensities are derived from Plate 22.2 D-2 and we will assume uniformly distributed rainfall.

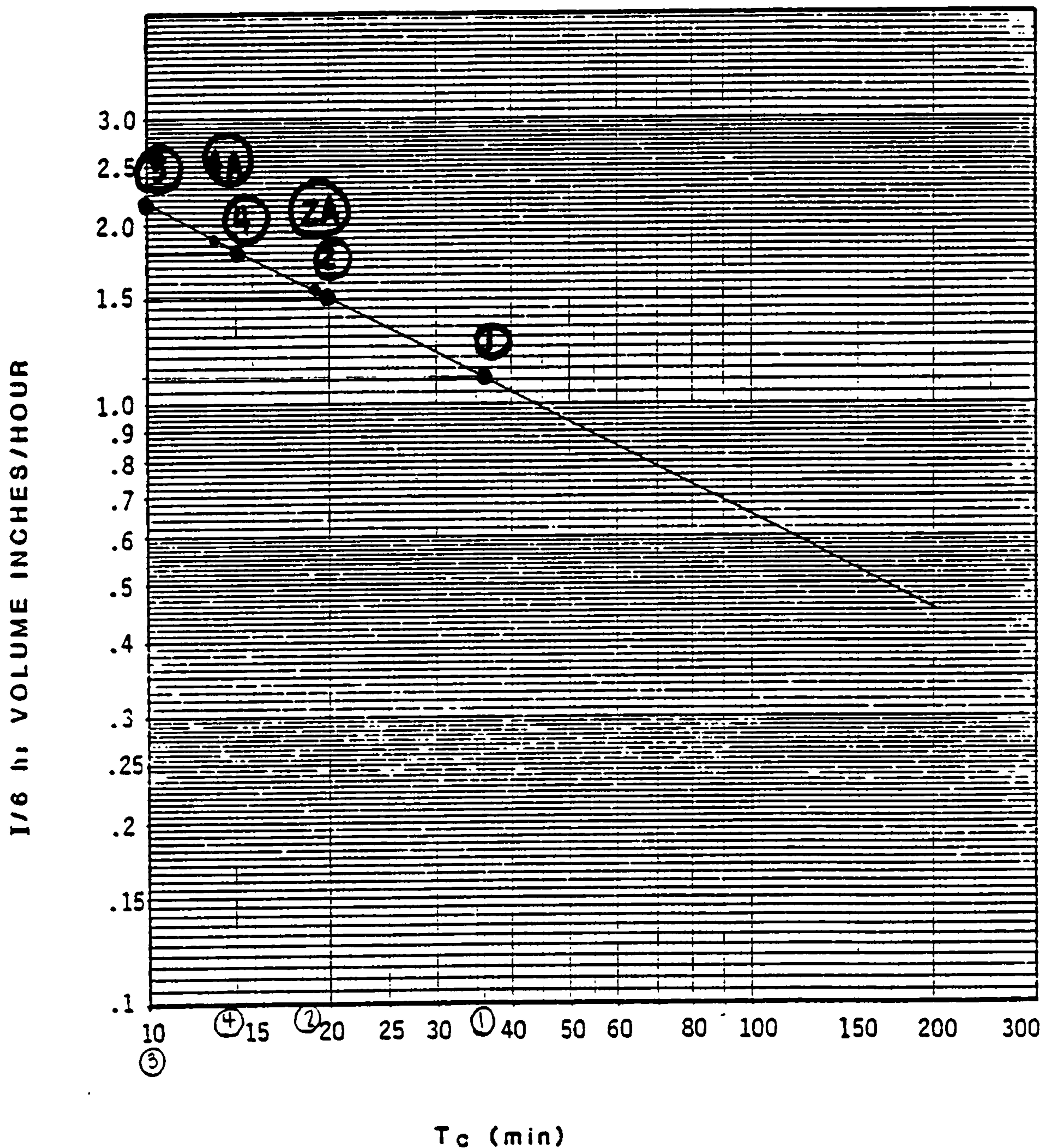
As required by the RFP, the outlet pipes will be sized using the orifice control equation. Developed runoff from the site will be equal to (or less than) existing undeveloped runoff.

A change from the RFP dictated by Joe Burwinkle of Kirtland Airforce Base is that the discharge from the pond was masterplanned to flow south into an existing ditch beside the east-west street that exists south of the facility. 15" RCP rather than 16" PVC pipes will be used, and the developed discharge from the pond is 16 cfs. This can be added to the 8.8 cfs from basin 1 (Bullhead Park) within the existing ditch south of the pond to arrive at the existing flow rate of approximately 24 cfs from these two basins.

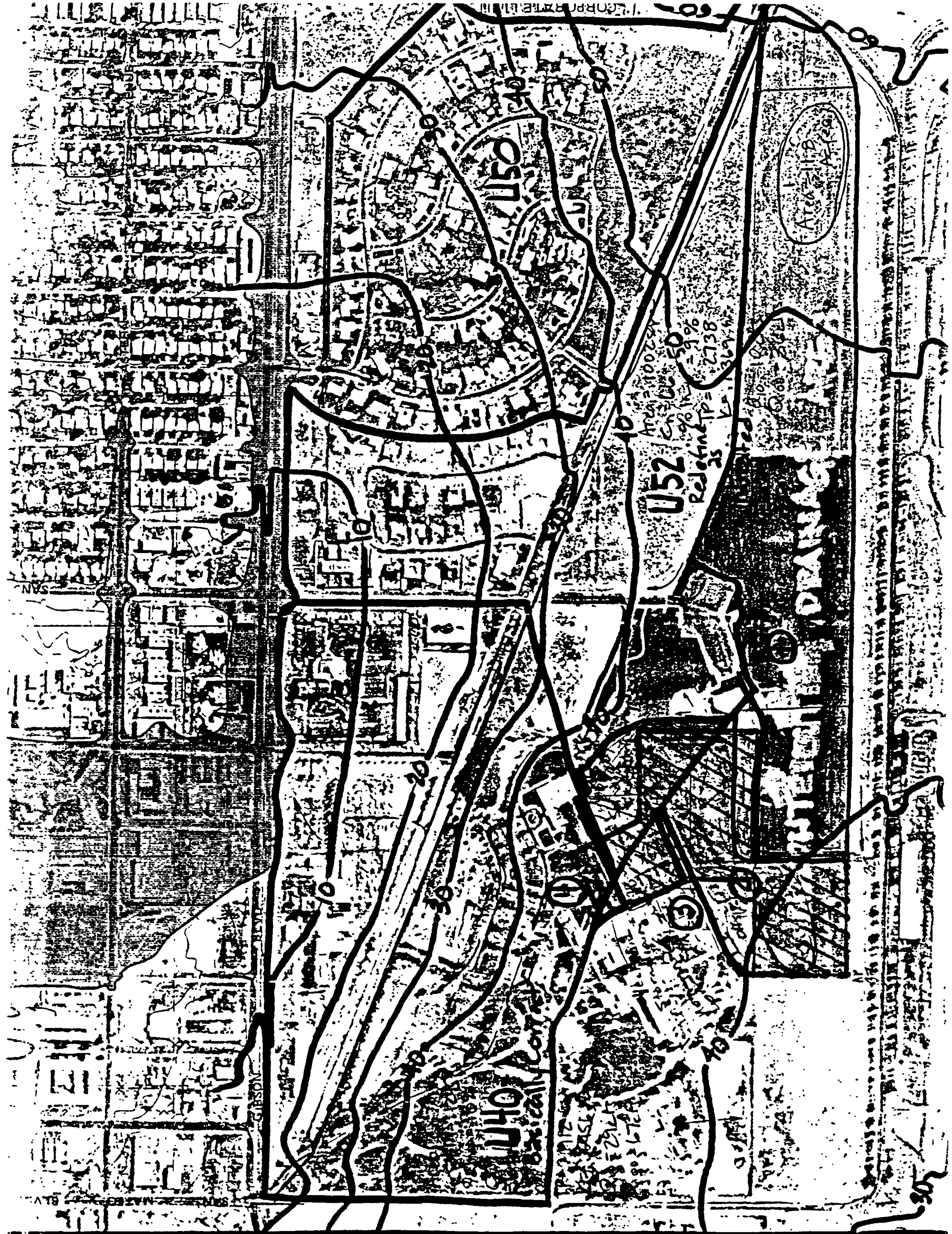


DIMENSIONLESS RAINFALL INTENSITIES

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



note: To get actual intensities, multiply rainfall volume from plate D-1 by value from curve. Use reduction factors on Plate D-1 for other than 100-yr.



U52
Area = 1002 sq ft
Cn = 66.50
Reloing % = 59%
Reloing TP = 2738

Area = 11.9

STREET LIGHT DRAWING

U52

29 May 1966

4

Sheet 3 of ; Date 10/14/87

Rainfall Intensity 1.55 inches/60 min

Frequency 10 year

Undeveloped Conditions

RUNOFF COMPUTATIONS

Developed Conditions

Drainage Section

Project Outpatient Clinic

Location Albuquerque, NM

Division Office

District Office

APPK IV-10

Drainage Area No.	Drainage area in Acres			L in feet	S average slope in percent	t _c in minutes (A)	I based on t _c (B)	F infil- tration in/hr	I-F	C	Q in C.F.S. C×I×A	NOTES
	Paved C=0.9 C=0.02	Turf C=0.4 C=0.10	Total									
1	0	11.8	11.8	4170	0.53	36.0	1.70			0.40	8.0	
2	8.0	8.5	16.5	2000	0.55	20.1	2.29			0.64	24.2	
3	0.20	0	0.20	330	0.61	4.8	3.28			0.90	0.6	Use t _c min = 10 minutes
4	0.40	0.50	0.90	320	1.56	3.3	2.70			2.62	1.6	Use t _c min = 14 minutes
1	1.0	10.8	11.8	4170	0.53	36.0	1.70			0.44	8.8	
2	13.2	3.3	16.5	2000	0.65	18.9	2.40			0.80	31.7	
3	Unchanged / 100% paved										0.6	
4	0.50	0.40	0.90	320	1.56	3.3	2.94			0.63	1.8	Use t _c min = 13 minutes
(A)	$t_c = (0.0078) \left[\frac{L^{0.77}}{S^{0.385}} \right]$											
(B)	$I = (1.55") (6.84) (t_c)^{-0.5}$											
(E)	0.6		0.6	600	0.50	1.4	3.28			0.90	1.8	Use t _c = 10 minute
TABLE <u> </u>												

* (E) BULLHEAD ACCESS ROAD

DETAILED ANALYSIS OF BASIN #2

TOTAL AREA = 16.5 ACRES, TOTAL Q = 31.7 CFS

SUB-BASIN A: PARKING AREAS A & C

B: BUILDING AND NORTH ROAD
COLLECTED BY STORM DRAINS

SUB-BASIN

	AREA (AC)	C	Q (CFS)	STRUCTURE
A-1	0.8	0.40	0.8	
A-2	2.1	0.85	4.3	
A-3	2.1	0.85	4.3	
A-4	1.3	0.80	2.5	
A-5	4.9	0.85	10.0	CULVERTS 1, 2, & 3
				$Q_{TOTAL} = 19.7 \text{ CFS}$
B-1	0.3	0.40	0.3	AREA INLET #1
B-2	0.5	0.85	1.0	CURB INLET #2
B-3	0.4	0.90	0.9	CURB INLET #3
B-4	0.9	0.90	1.9	BLDG DOWNSPOUTS
B-5	0.1	0.65	0.2	AREA INLET #5
B-6	1.9	0.65	3.0	CURB INLET #6
B-7	1.0	0.85	2.0	CURB INLET #7
B-8	0.2	0.85	0.4	CURB INLET #8
TOTAL	16.5 ✓		31.6 ✓	TOTAL FLOW IN STORM DRAIN LINE A = 9.7 CFS



BOHANNAN-HUSTON INC.

PROJECT NAME VA/OFC SHEET _____ OF _____
PROJECT NO 8732500 BY K. DAVIS DATE _____
SUBJECT HYDROLOGY CH'D _____ DATE _____

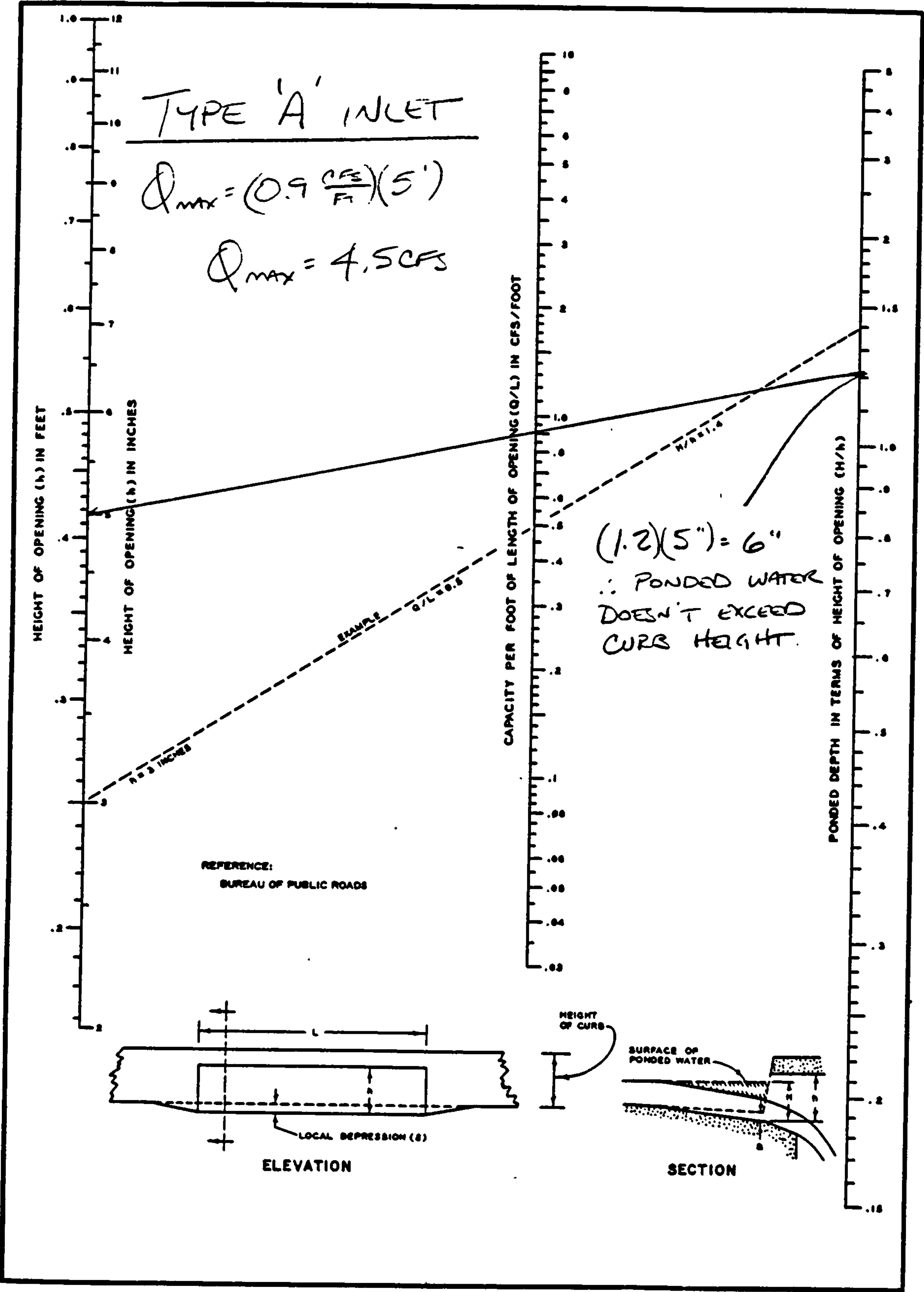
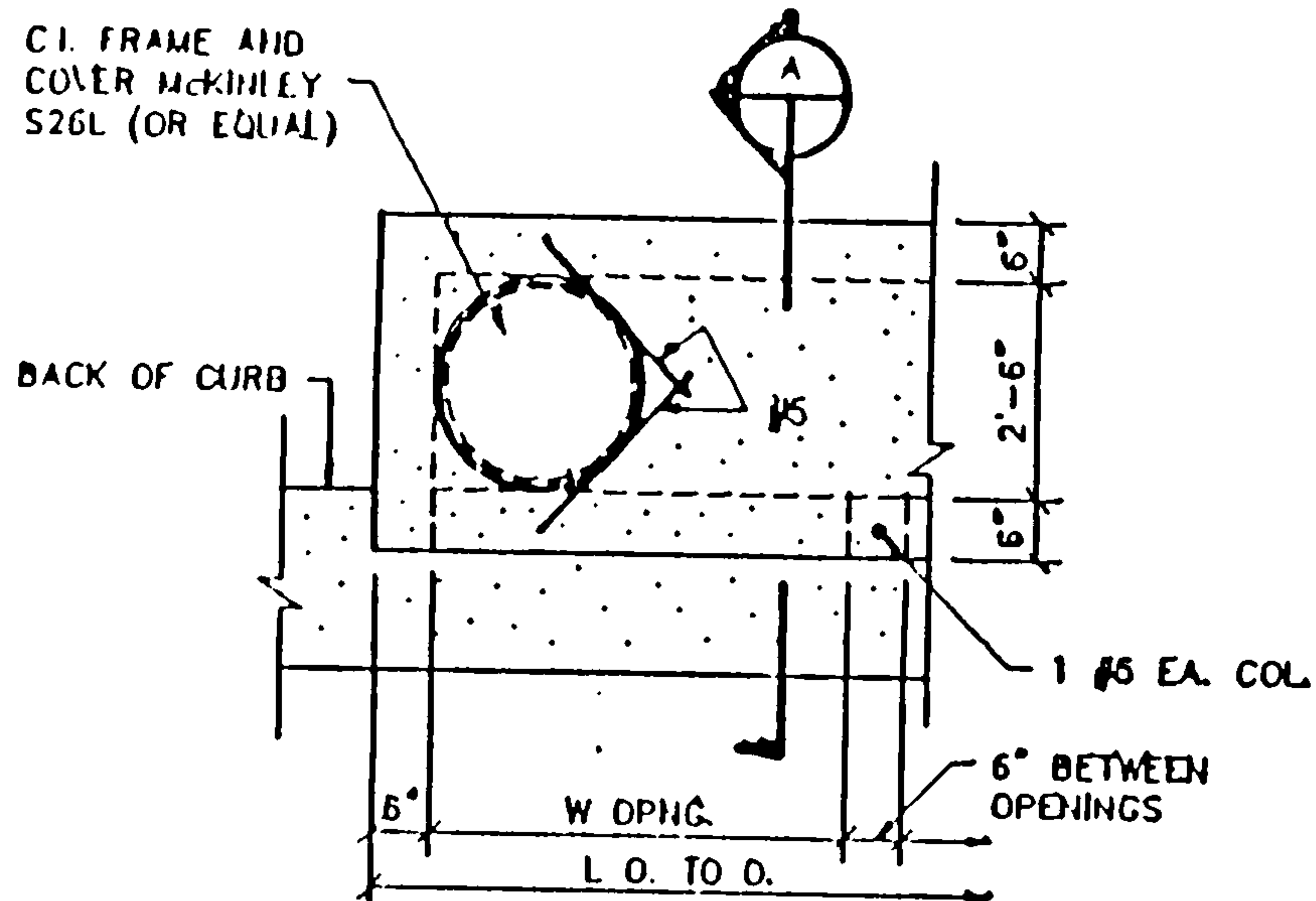
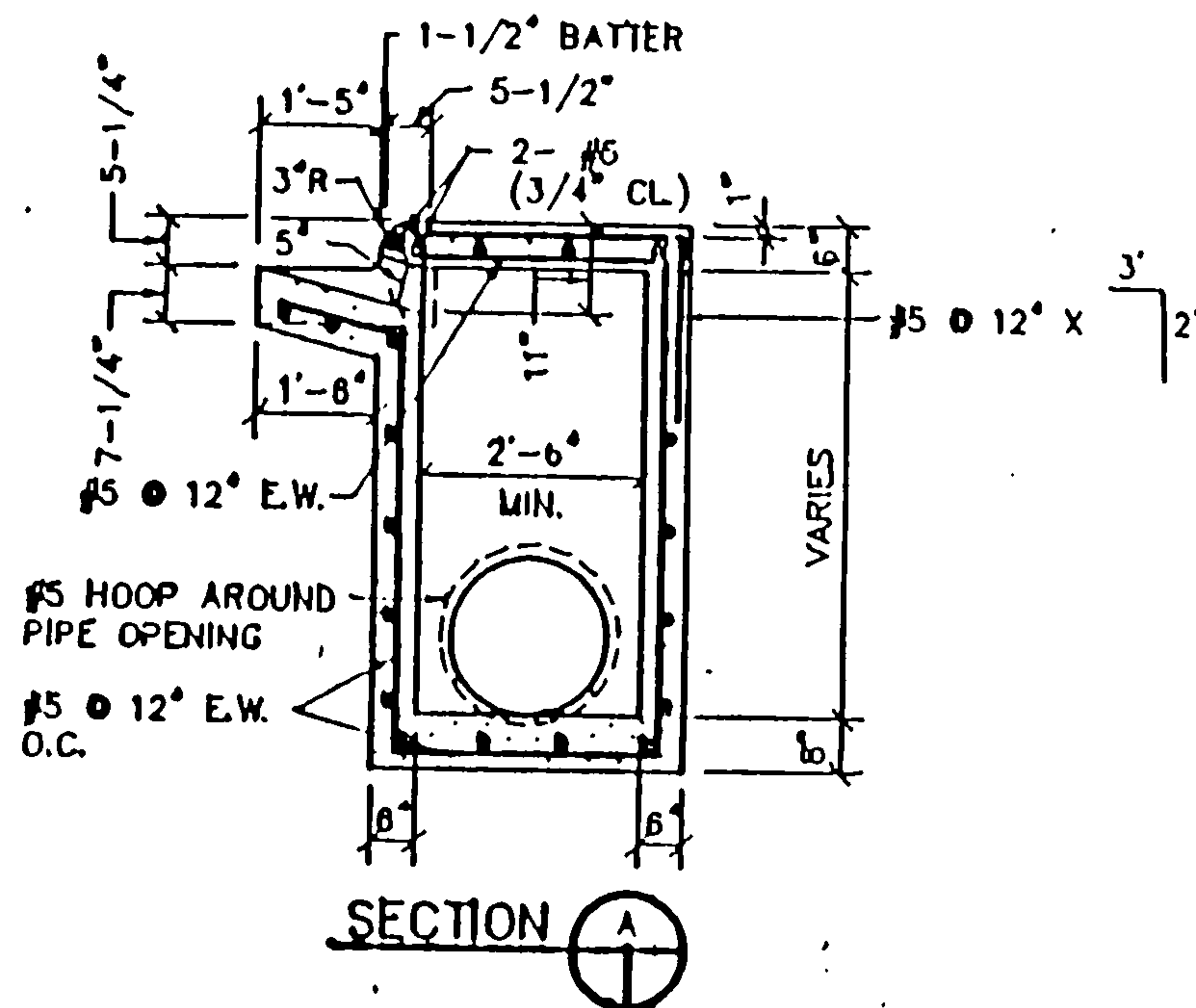


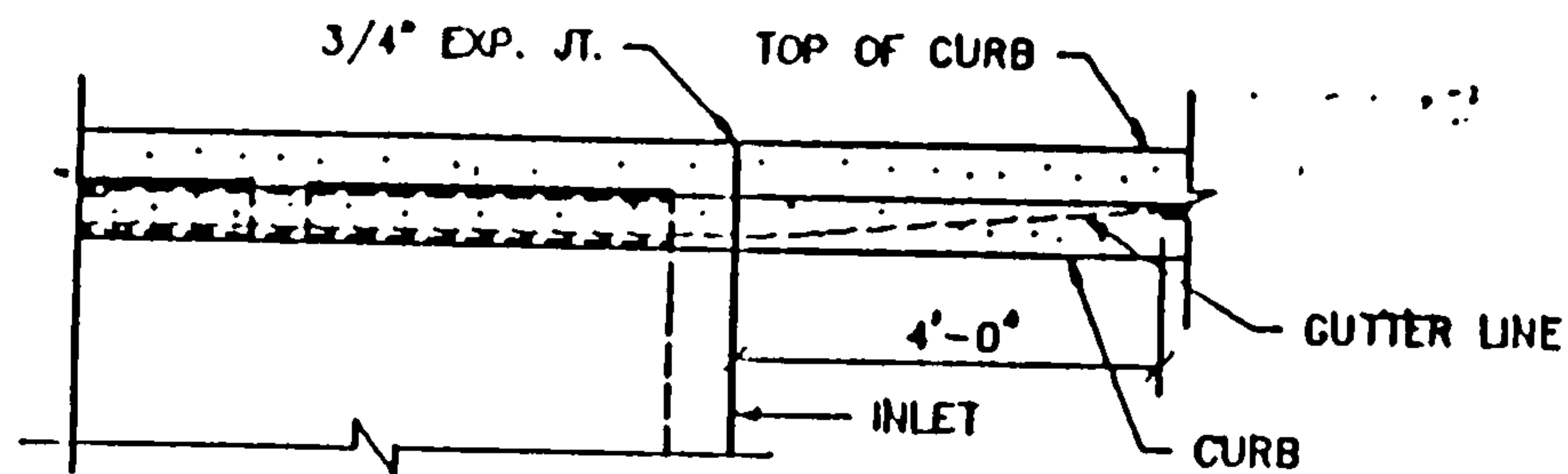
Figure 3-4. Capacity of curb opening inlet at low point in grade.



PLAN



SECTION A



PART FRONT ELEVATION

TYPE	NO. OPNG.	W	L
A	1	4'-0"	5'-0"
B	2	3'-3"	8'-0"
C	3	2'-8"	10'-0"
D	3	3'-4"	12'-0"

STANDARD CURB INLET DETAILS

(LIGHT DUTY)
N.T.S.

AREA INLET #1 -
STORM DRAIN LINE B

$$Q = 0.3 \text{ CFS}$$

$$H = \text{ON GRATE}$$

$$h = 2.3' \text{ ON } 12" \text{ STORM DRAIN (GRATE: 45.0, INV: 42.7)}$$

$$Q_{CAP} = CA\sqrt{2gh} = (0.6)(0.78)\sqrt{64.4(2.3)} = 5.7 \text{ CFS OK} \checkmark$$

CURB INLET #2
STORM DRAIN LINE A

$$Q = 1.0 \text{ CFS} \checkmark \quad Q_{max} = 4.5 \text{ CFS (TYPE 'A' INLET)} \text{ OK} \checkmark$$

$$Q_{COLLECTED \text{ IN STORM DRAIN LINE 'A'}} = 9.4 \text{ CFS}$$

$$TC = 44.5 \quad INV = 40.19 \quad h = 4.31'$$

$$Q_{CAP} (\text{INLET CONTROL}) = (0.6)(1.77)\sqrt{64.4(4.31')} = 17.7 \text{ CFS OK} \checkmark$$

CURB INLET #3
STORM DRAIN LINE A

$$Q = 0.9 \text{ CFS} \checkmark \quad Q_{max} = 4.5 \text{ CFS (TYPE 'A' INLET)} \text{ OK} \checkmark$$

$$Q_{COLLECTED \text{ IN STORM DRAIN LINE A}} = 8.4 \text{ CFS}$$

$$TC = 44.5 \quad INV. = 40.43 \quad h = 4.07'$$

$$Q_{CAP} (\text{INLET CONTROL}) = (0.6)(1.77)\sqrt{64.4(4.07')} = 17.2 \text{ CFS OK} \checkmark$$

AREA INLET #5
STORM DRAIN LINE D

$$Q = 0.2 \text{ CFS}$$

$$H = \text{ON GRATE}$$

$$h = 3.5' \text{ ON } 12" \text{ STORM DRAIN (GRATE: 46.5, INV: 43.0)}$$

$$Q_{CAP} = (0.6)(0.78)\sqrt{64.4(3.5')} = 7.0 \text{ CFS OK} \checkmark$$



BOHANNAN-HUSTON INC.

PROJECT NAME VA/OPC SHEET _____ OF _____

PROJECT NO 87325.00 BY _____ DATE _____

SUBJECT HYDRAULICS - STORM CH'D _____ DATE _____

CURB INLET # 6

STORM DRAIN LINE A

$$Q = 3.0 \text{ CFS} \quad Q_{\max} = 4.5 \text{ CFS (TYPE A INLET) OK✓}$$

$$Q_{\text{COLLECTED IN STORM DRAIN LINE A}} = 5.4 \text{ CFS}$$

$$TC = 44.5, \quad INV = 40.96 \quad h = 3.54'$$

$$Q_{\text{CAP}} = CA \sqrt{2gh} = (0.6)(0.78) \sqrt{64.4(3.54')} = 7.0 \text{ CFS OK✓}$$

CURB INLET # 7

STORM DRAIN LINE A

$$Q = 2.0 \text{ CFS} \quad Q_{\max} = 4.5 \text{ CFS (TYPE A INLET) OK✓}$$

$$Q_{\text{COLLECTED IN STORM DRAIN LINE A}} = 2.4 \text{ CFS}$$

$$TC = 44.5, \quad INV = 41.60 \quad h = 2.9'$$

$$Q_{\text{CAP}} = (0.6)(0.78) \sqrt{64.4(2.9')} = 6.4 \text{ CFS OK✓}$$

CURB INLET # 8

STORM DRAIN LINE A

$$Q = 0.4 \text{ CFS OK✓}$$

$$Q_{\text{COLLECTED}} = 0.4 \text{ CFS}$$

$$TC = 44.5, \quad INV = 41.88 \quad h = 2.62'$$

$$Q_{\text{CAP}} = (0.6)(0.78) \sqrt{64.4(2.62')} = 6.1 \text{ CFS OK✓}$$



BOHANNAN-HUSTON INC.

PROJECT NAME VA/OPC SHEET _____ OF _____
PROJECT NO. 87325.00 BY K. DAVIS DATE _____
SUBJECT HYDRAULICS - STORM CH'D _____ DATE _____

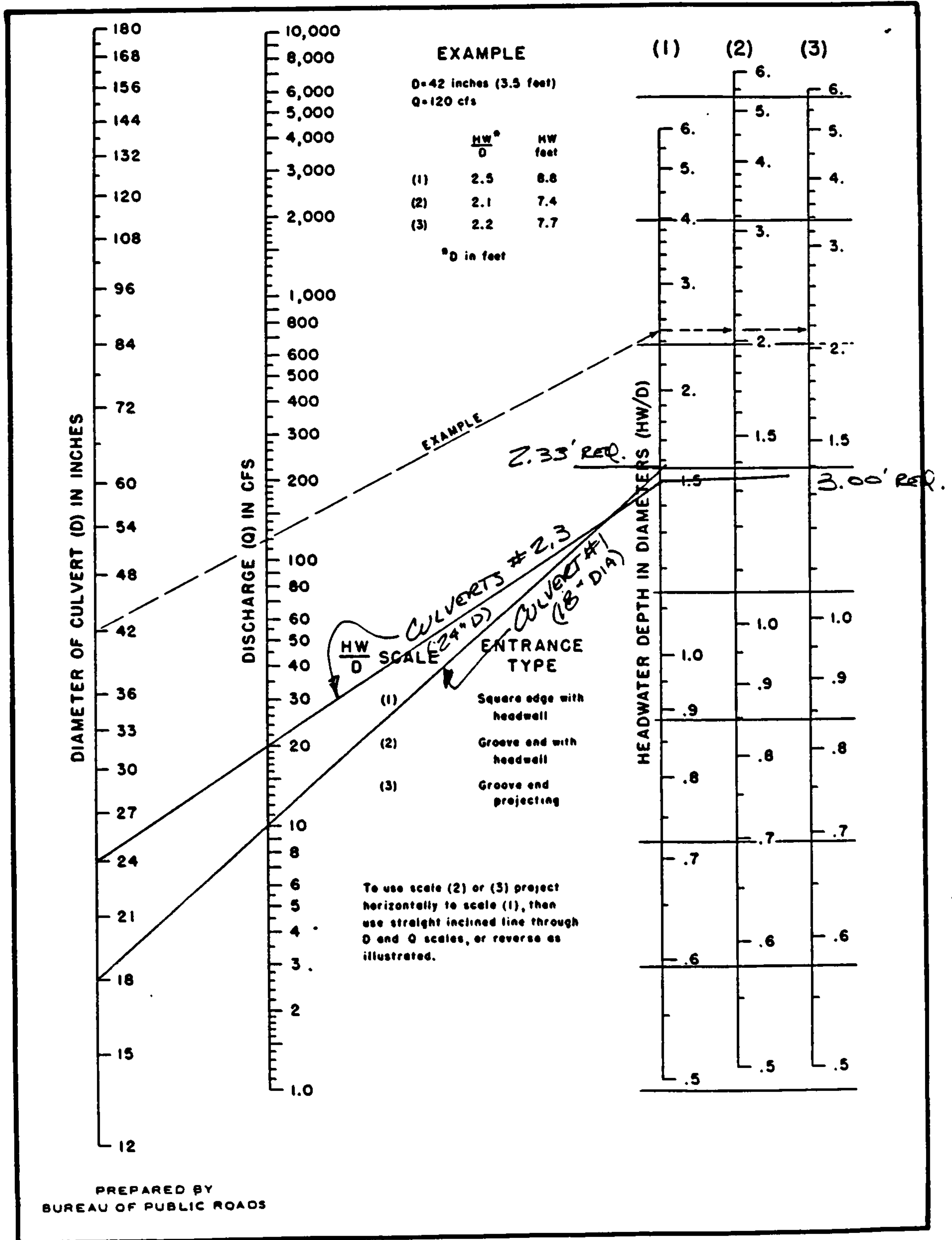


Figure B-2. Headwater depth for concrete pipe culverts with inlet control.

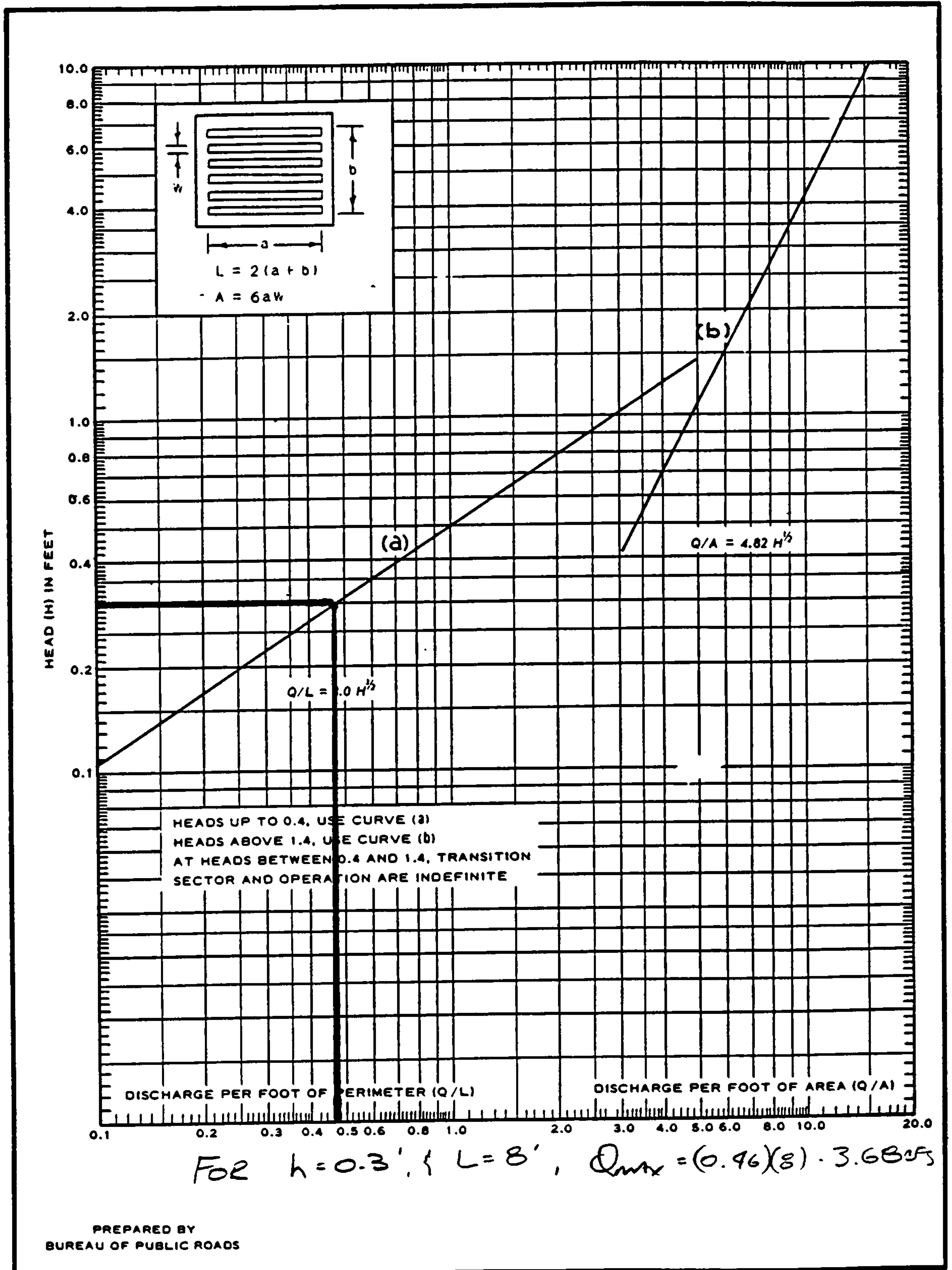
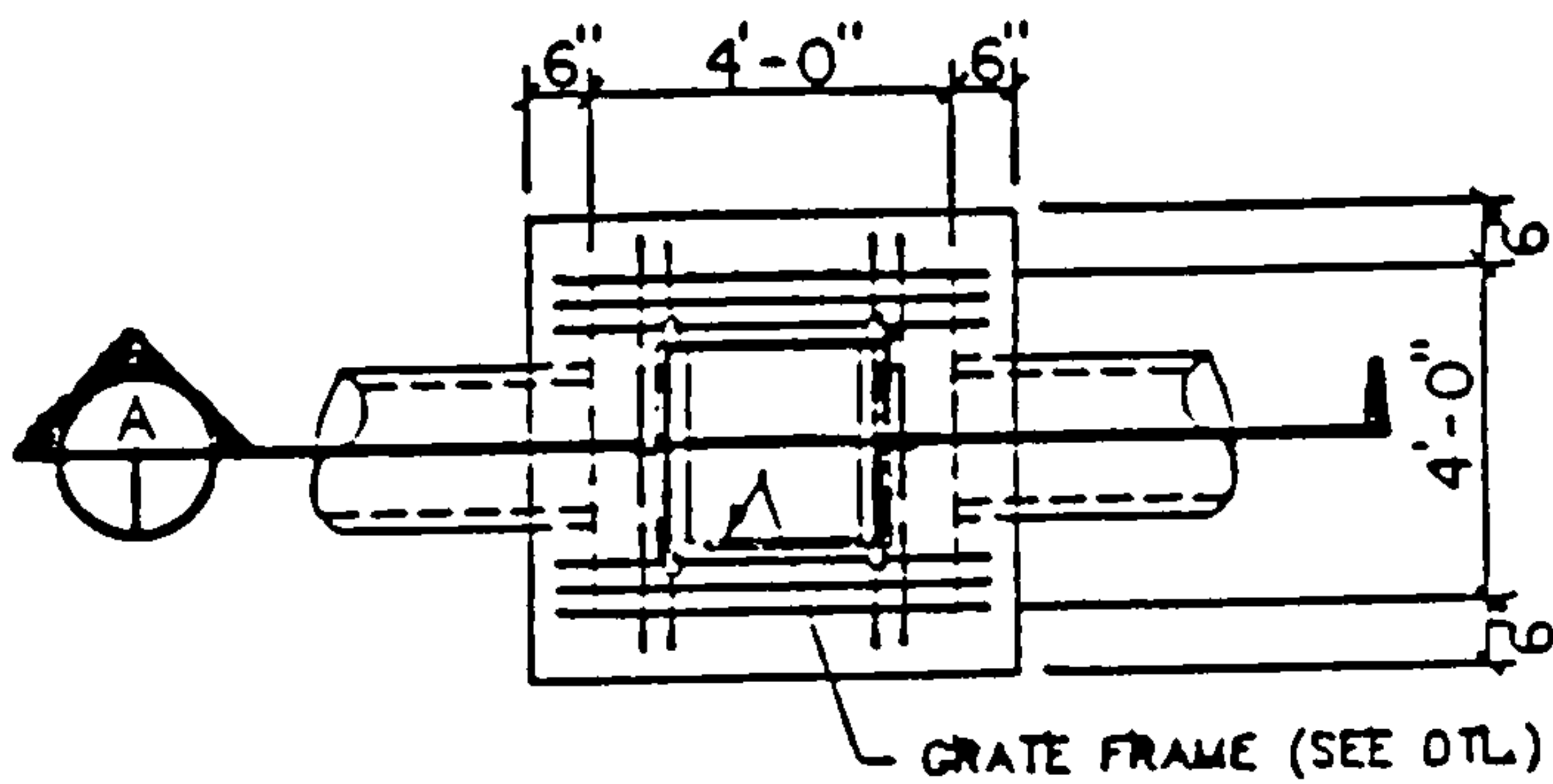


Figure 3-3. Capacity of grate inlet in sump water pond on grate.

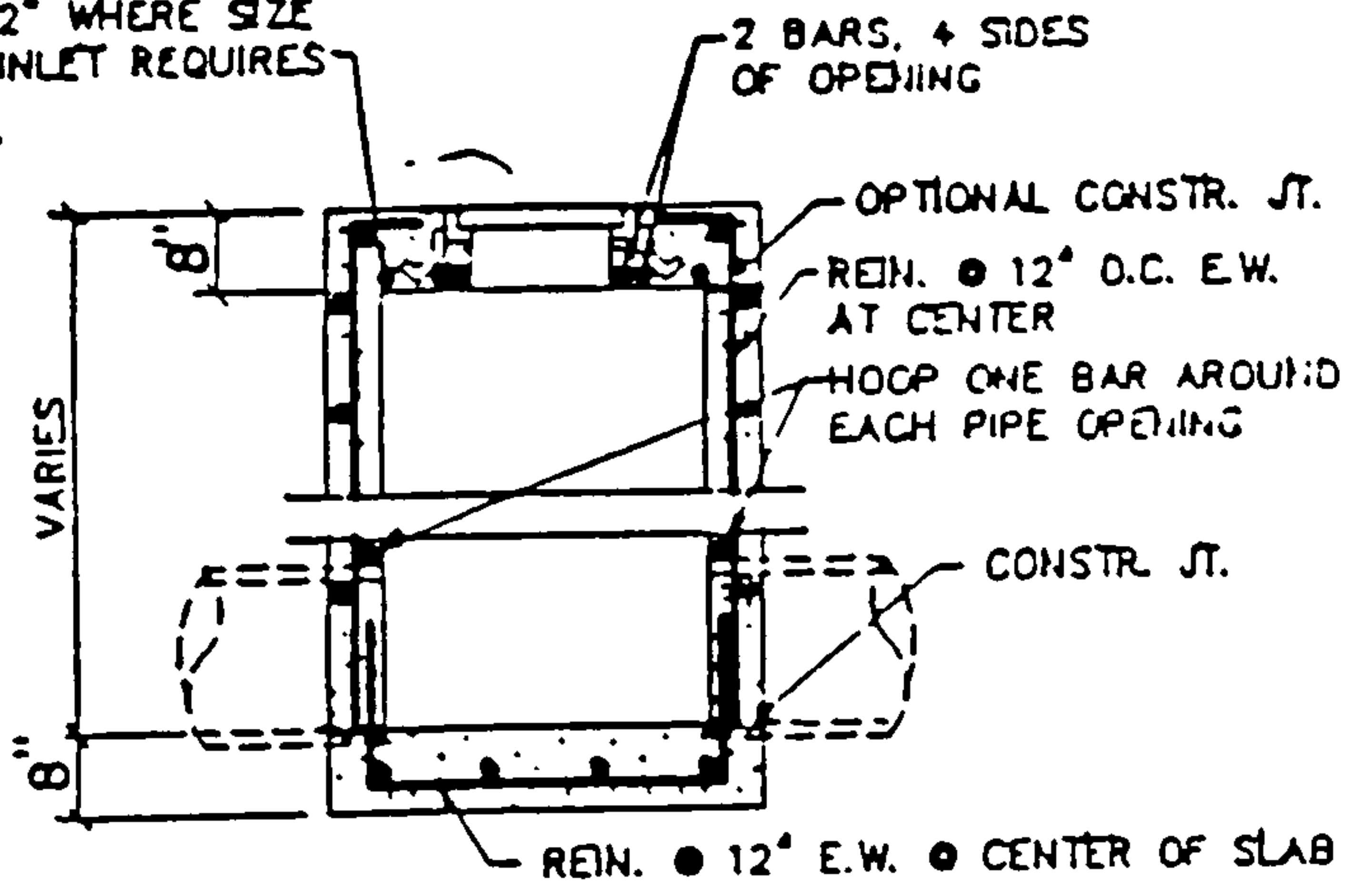


PLAN

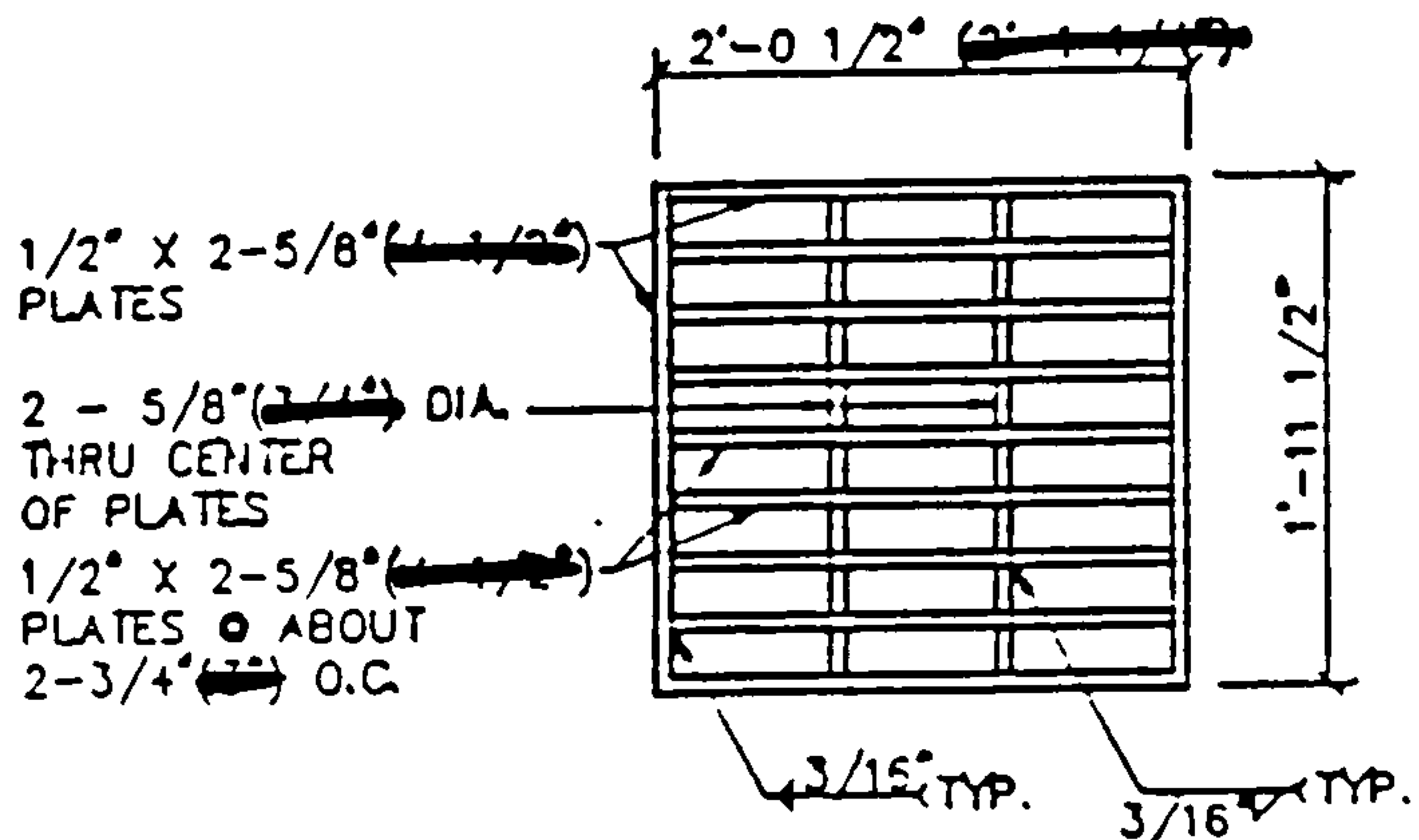
STANDARD SURFACE INLET

N.T.S.

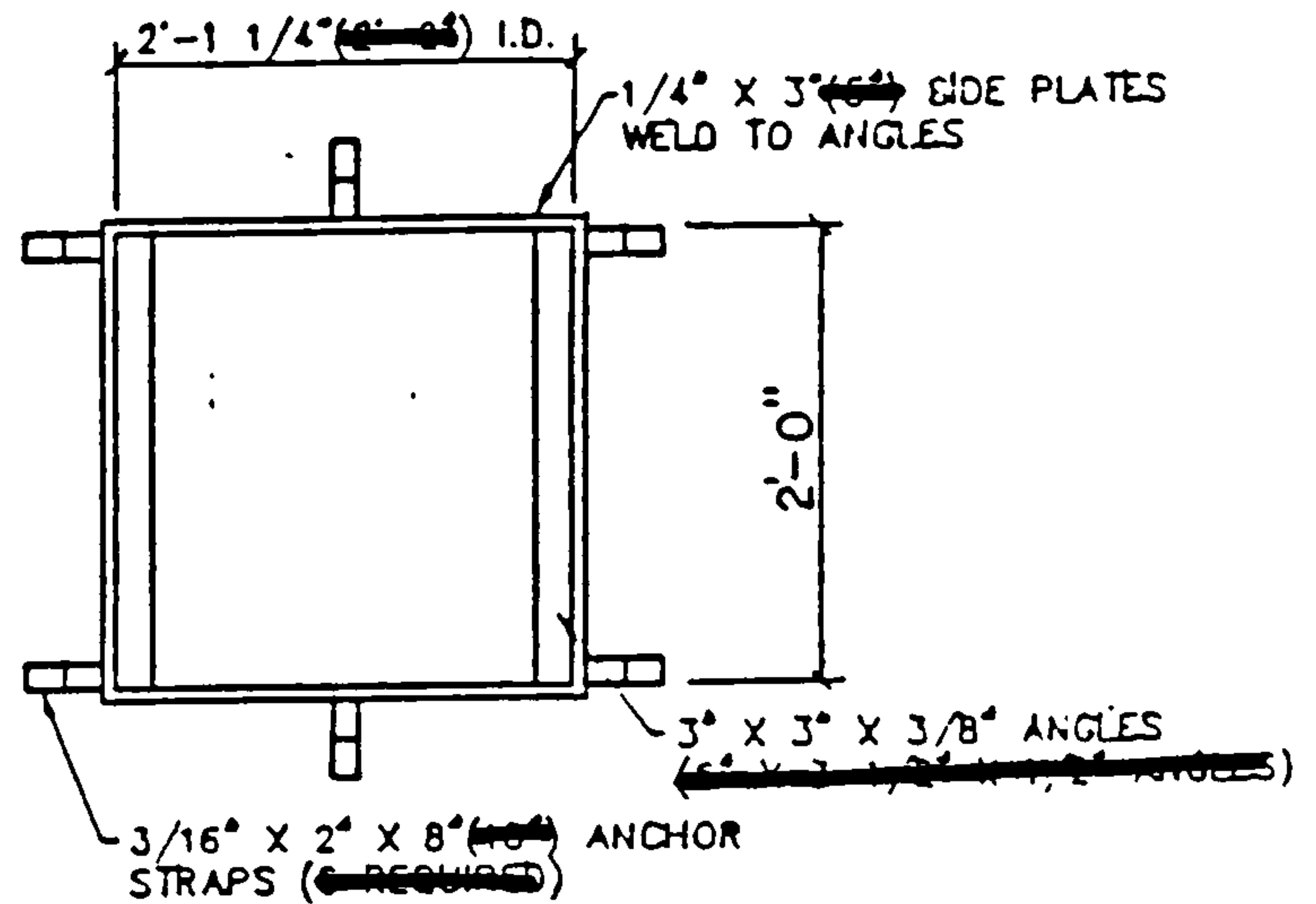
ADD REINFORCED
● 12" WHERE SIZE
OF INLET REQUIRES



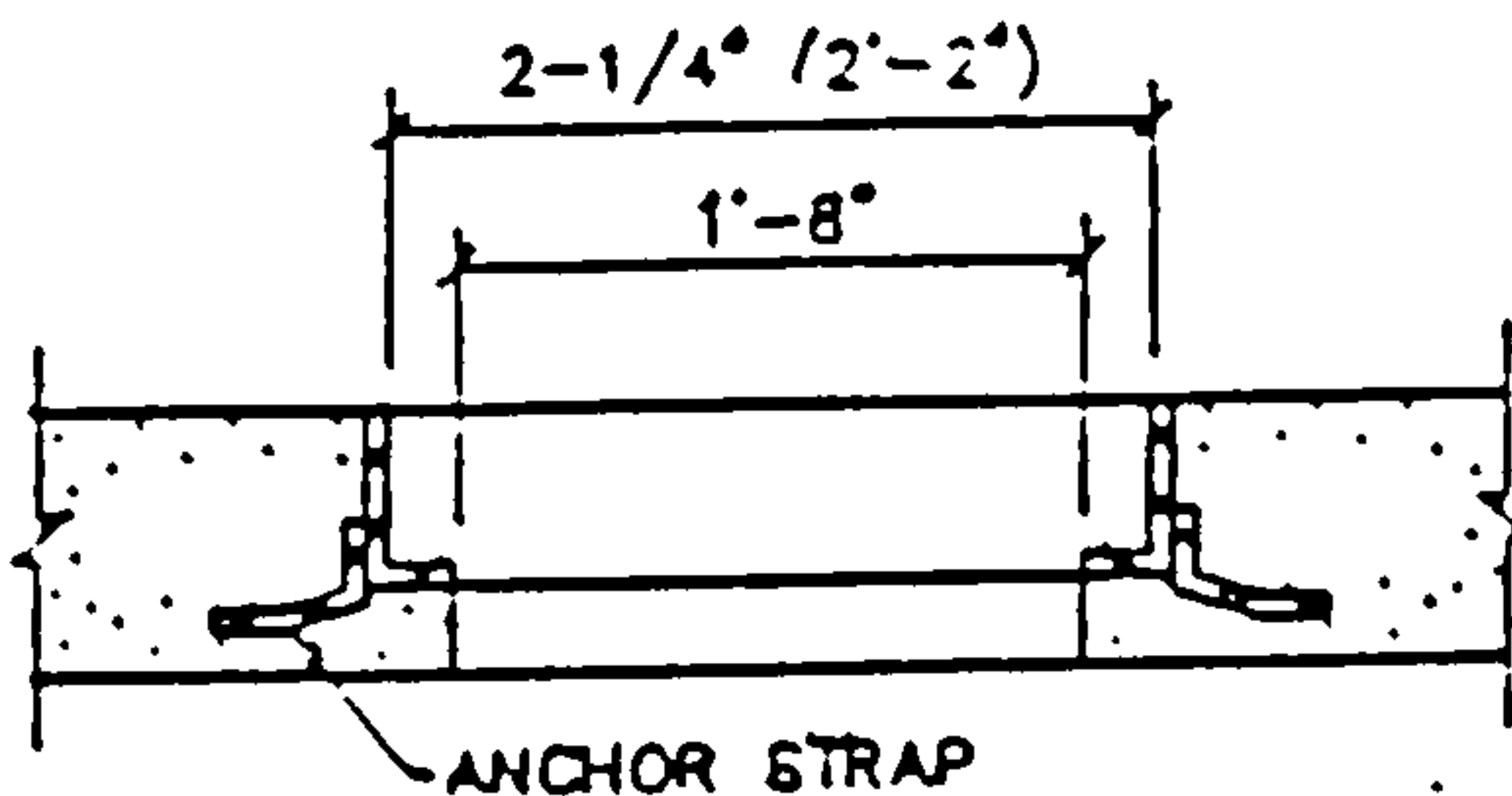
SECTION



GRATE PLAN



FRAME PLAN



SECTION THRU INSTALLED FRAME

SURFACE INLET GRATE AND FRAME

N.T.S.

HYDRAULIC STRUCTURES SUMMARY

STRUCTURES	Q (CFS)	Q _{max} (STRUCTURE) TELEV.	GIRATE OR TELEV.	1/4" ELEV.	L (FT)	Q _{max} (ORICE GATES)	Q _{downing}
#1- AREA INLET	0.3	< 3.7 ✓	45.0	42.68	2.32'	5.7	> 0.3 ✓
#2- CURB INLET	1.0	< 4.5 ✓	44.5	40.19	4.31'	17.7	> 9.4 ✓
#3- CURB INLET	0.9	< 4.5 ✓	44.5	40.43	4.07'	17.2	> 8.4 ✓
#4- ROOF DETN							
#5- AREA INLET	0.2	< 3.7 ✓	46.5	43.00	3.50'	7.0	> 0.2 ✓
#6- CURB INLET	3.0	< 4.5 ✓	44.5	40.96	3.54'	7.0	> 5.4 ✓
#7- CURB INLET	2.0	< 4.5 ✓	44.5	41.60	2.70'	6.4	> 2.4 ✓
#8- CURB INLET	0.4	< 4.5 ✓	44.5	41.88	2.62'	6.1	> 0.4 ✓
CULVERT #1			42.0	39.5	2.5'	13.5	> 10.0 <u>11.0 OK</u>
CULVERT #2			40.6	37.5	3.1'	26.6	> 19.1 <u>21.5 OK</u>
CULVERT #3			39.7	36.0	3.7'	29.1	> 19.1 <u>21.5 OK</u>

* NEW FRAUS w/ BUCHENO ACCESS ROAD

BOHANNAN-HUSTON INC.

PROJECT NAME VA/OPC SHEET _____ OF _____
 PROJECT NO. 87325.00 BY K. DAVIS DATE _____
 SUBJECT HYDRAULICS - STORM CH'D _____ DATE _____

SCS VOLUME ANALYSIS

ASSUME BASIN #2 ONLY WILL BE PONDED

BASIN 2 AREA 17.1 AC Q_p (PPT) 33.5 CFS CN 92 I_{scs} 1.51" VOLUME 90,441 ft^3

$$S = \frac{1000}{CN} - 10 = \frac{1000}{92} - 10 = 0.87$$

$$I_{scs} = \frac{(P - 0.2S)^2}{(P + 0.8S)} = \frac{[2.3 - 0.2(0.87)]^2}{[2.3 + 0.8(0.87)]} = 1.51"$$

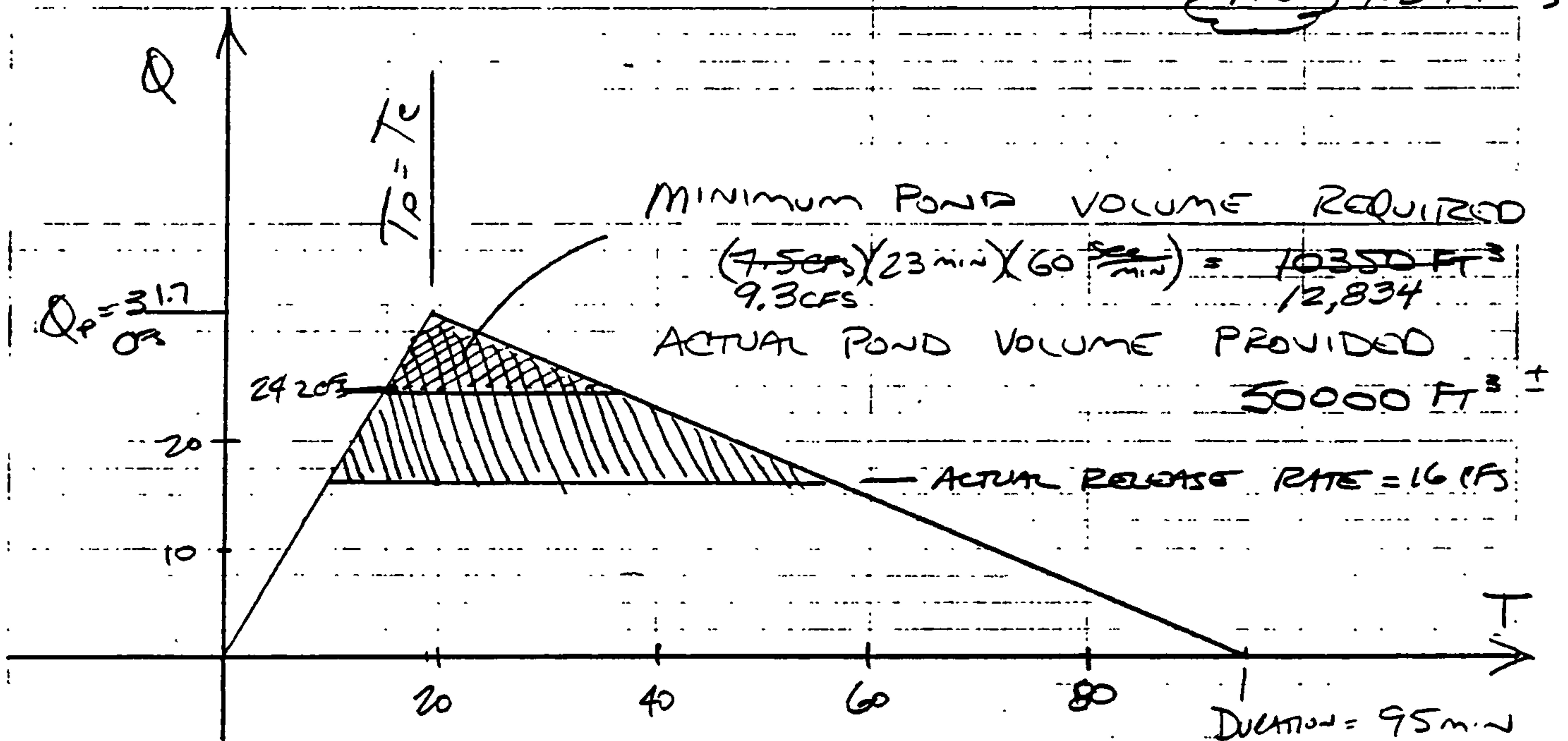
$$Vol = 93,730 \text{ } ft^3 = 2.15 \text{ AC-FT}$$

$$A = \frac{90,441}{93,730} = \frac{bq}{2} = \frac{b(33.5)}{2}$$

$$b = \text{DURATION} = 5596 \text{ sec}$$

$$T_c = T_p = 18.9 \text{ min}$$

$$93.3 \text{ min} = 1.55 \text{ hrs}$$



$$Q_{undeveloped} = 24.2 \text{ cfs}$$

$$\text{ACTUAL POND VOLUME PROVIDED} = 50,000 \text{ } ft^3 \pm$$

$$\text{ACTUAL RELEASE RATE 2-15" PIPES} = 16 \text{ CFS}$$

$$\text{ACTUAL POND REQUIRED FOR THAT RELEASE} = (16.7)(48)(60) = 48,096 \text{ OK}$$

$$*(33.5 - 16)(48.7)(60) = 51,135 \text{ CF} > 50,000 \text{ CF} \pm 2\% \text{ OVER OK SINCE RATIONAL METHOD USED (CONSERVATIVE)}$$

BOHANNAN-HUSTON INC.

* NEW VALUES TO REFLECT BULL HEAD ACCESS ROAD

PROJECT NAME

VA/OPC

SHEET

OF

PROJECT NO.

5732500

BY

K. DAVIS

DATE

SUBJECT

HYDRAULICS - STORM

CH'D

DATE

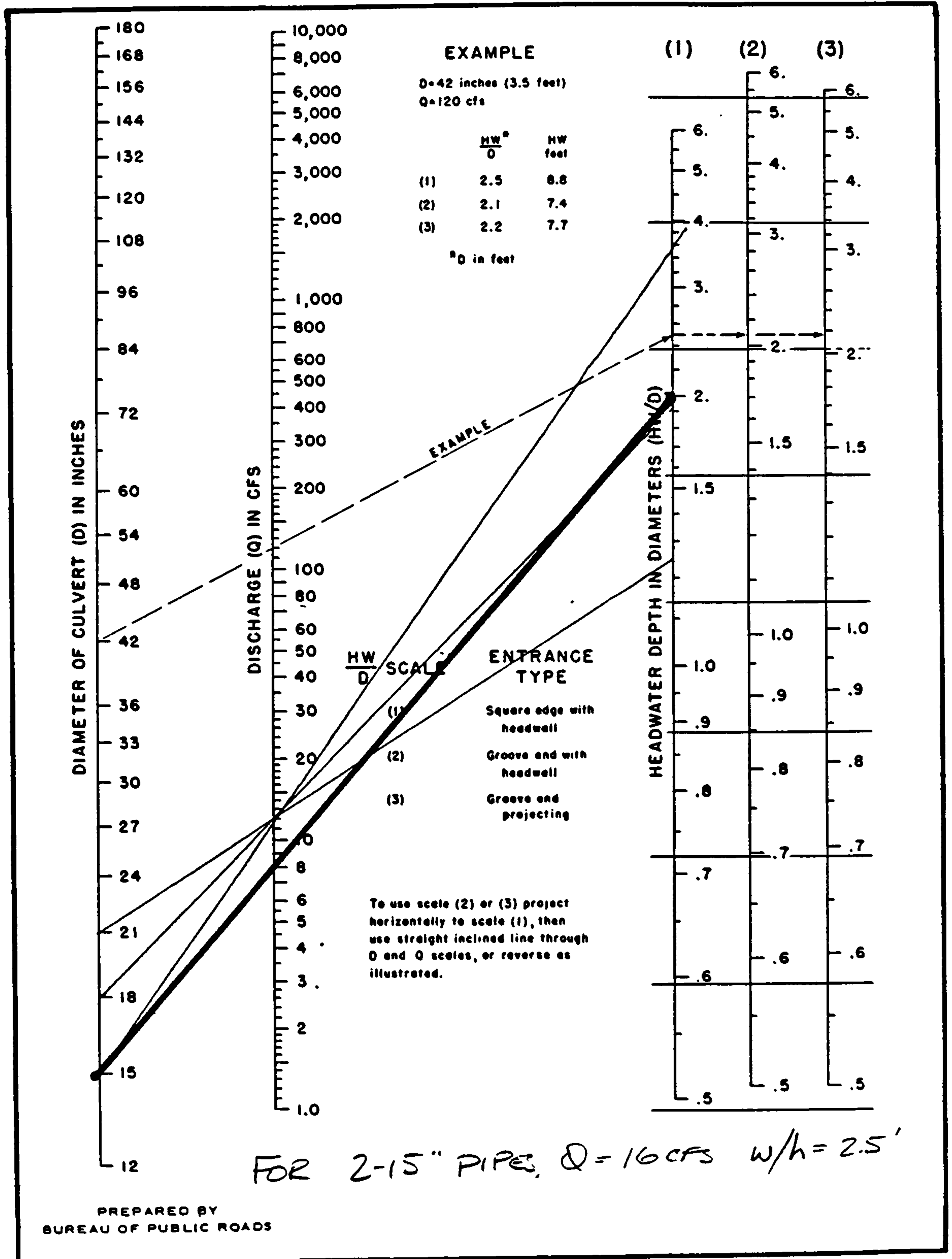
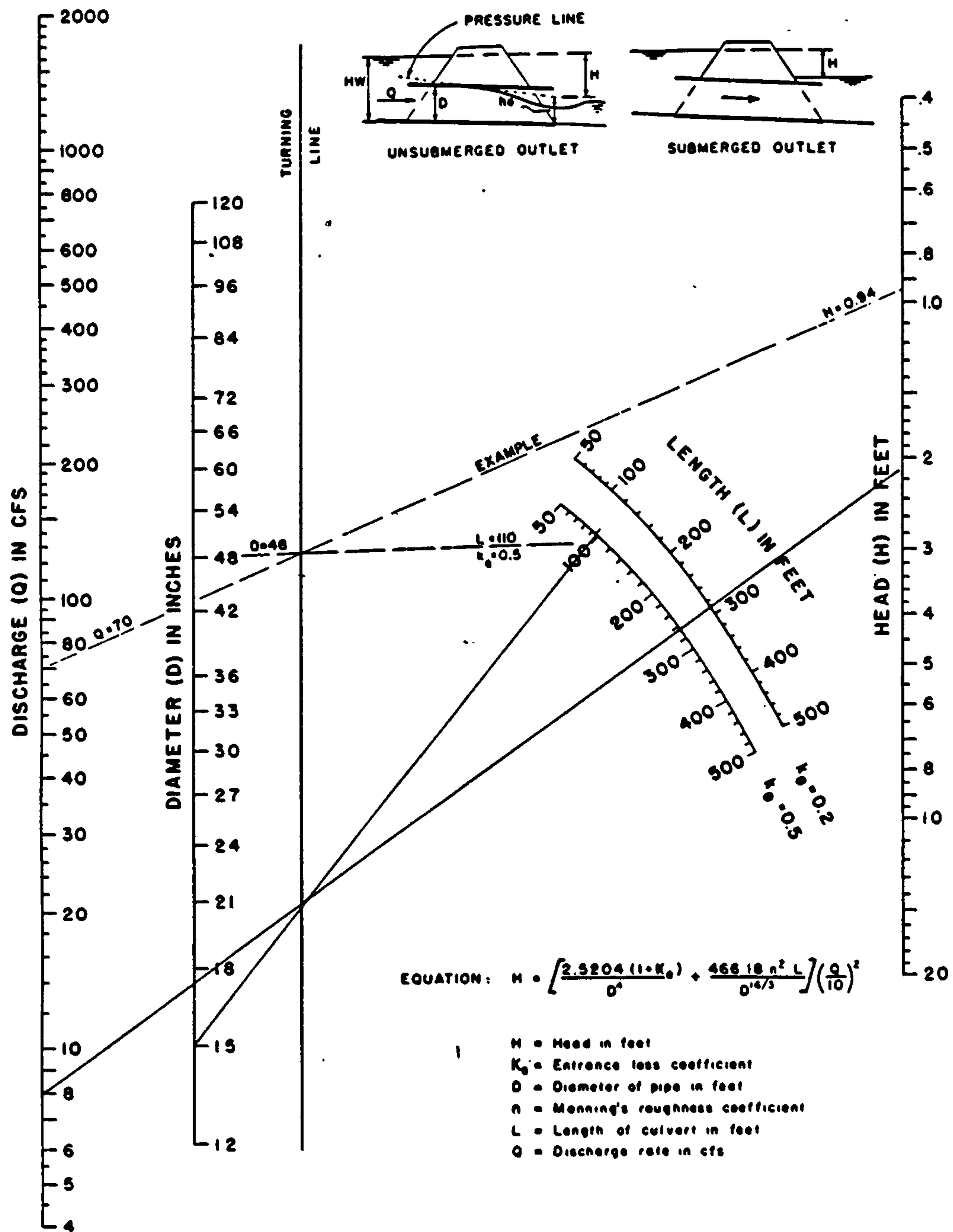


Figure B-2. Headwater depth for concrete pipe culverts with inlet control.



PREPARED BY
BUREAU OF PUBLIC ROADS

$n = 0.012$

Figure B-11. Head for circular pipe culverts flowing full, $n = 0.012$.

BULLHEAD PARK ACCESS PARK

HYDROLOGIC/HYDRAULIC ANALYSIS
DECEMBER 9, 1988

PREPARED BY TIERRA ENGINEERING CONSULTANTS, INC.

STORM DRAINAGE MANAGEMENT

The purpose of this plan is to demonstrate the additional flows added by Bullhead Access Road into the Kirtland Veterans Administration Outpatient Clinic drainage system, which was prepared by Bohannon-Houston, has sufficient capacity.

Peak rates of discharge were calculated by the rational method using a design storm of 10 years, which are the same methods the Bohannon-Houston report utilized. Curb openings were sized from methods by "Drainage of Highway Pavements" U.S. Department of Transportation.

Portions of the Bohannon-Houston report were entered into this plan. Flows were adjusted to reflect the additional flows from Bullhead Park. As can be seen from the adjusted flows through the pipe culverts in the VA parking lot, sufficient capacity exist. The pond calculations demonstrate the additional flow increases the pond size from 50,000 to 51,135 cf. The increase in pond size if needed, should be decided by the City since conservative methods for drainage analysis were utilized.

BASINS DRAINING to VA

SIZE CURB CUTS

STA 4+10 to STA 7+38

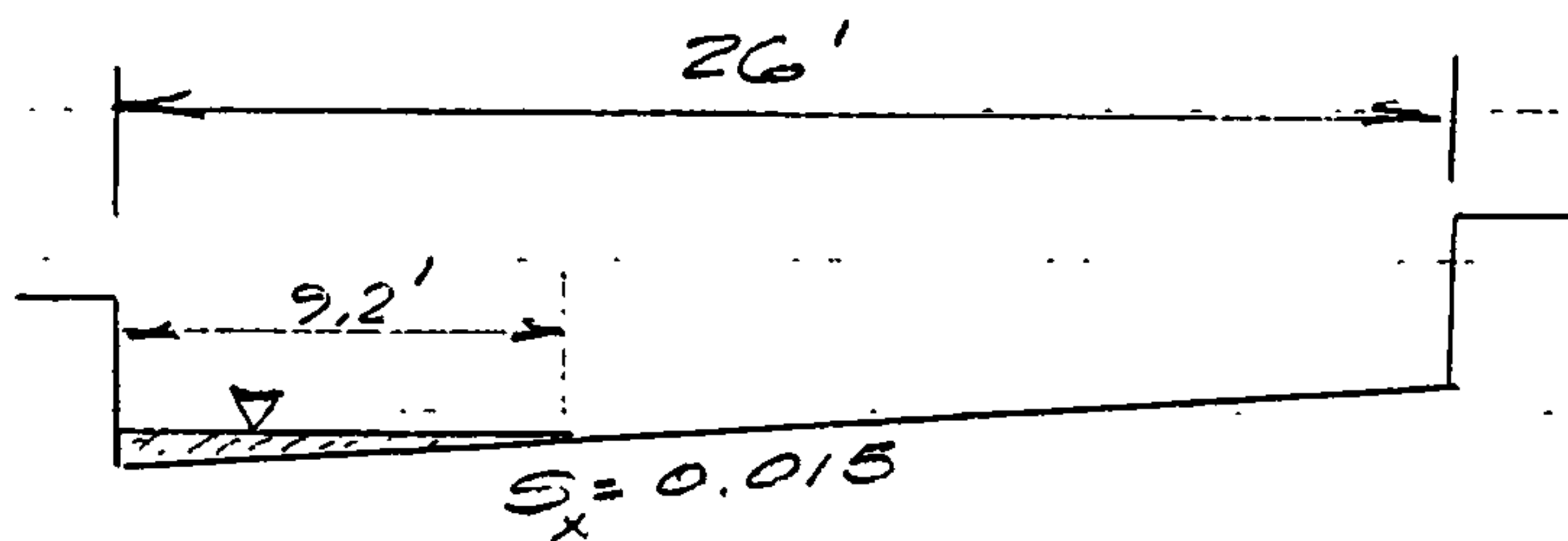
$$\text{PAVED AREA} = 0.3 \text{ AC}$$

$$t_c = 10 \text{ MIN.}$$

$$I = (1.55)(6.84)(10)^{-0.51} = 3.28$$

$$C = 0.9 \text{ PAVED}$$

$$Q = CIA = 0.9(3.28) 0.3 = 0.9 \text{ CFS}$$



$$S_y = 0.60\% \rightarrow \text{FLATE 74.3 D-2} \rightarrow V = 1.4 \text{ FPS}$$

$$A = \frac{0.9 \text{ CFS}}{1.4 \text{ FPS}} = 0.64 \text{ ft}^2$$

$$\frac{xy}{2} = A \quad y = xS_x \quad \frac{x(xS_x)}{2} = A$$

$$x = \left(\frac{2A}{S_x} \right)^{1/2} = \left(\frac{2(0.64)}{0.015} \right)^{1/2} = 9.2'$$

$$y = 9.2(0.015) = 0.14' \text{ DEEP}$$

Check x with PART 5. "DRAINAGE OF HIGHWAYS"
 $\rightarrow x = 9.5 \text{ feet. } \checkmark \text{ Check}$

Size CURB CUT STA 4+10 for 100% INTERCEPTION

CHART 4 - Ratio of frontal flow to Total
"GUTTER FLOW" DRAINAGE OF HIGH PAVTS

$$\frac{W}{T} = \frac{9.2}{2} = 0.22$$

$$\frac{S_w}{S_x} = \frac{0.0625}{0.015} = 4.2$$

CHART 4 $\rightarrow E_o = \frac{Q_o}{Q_c} = 0.64$

CHART 9 CURB DRAINAGE for TOTAL INTERCEPTION

$$S'_w = \frac{w}{2} = 0.0625 - 0.015 = 0.0475$$

$$S_c = S_x + S'_w E_o = 0.015 + 0.0475 (0.64) = 0.0454$$

Chart 9 $\rightarrow L_T = 9'$ say 2-4.5' CURB CUTS

1-@ SPEED BUMP STA 4+13

1-@ Gully STA 5+50

Size CURB CUTS For STA 2+25 EAST & WEST BASIN

$$\text{AREA} = \frac{0.3}{2} = 0.15 \text{ SF}$$

$$t_c = 10 \text{ Min}$$

$$I = 3.28$$

$$C = 0.9 \text{ PAVED AREA}$$

$$Q = CIA = 0.9(3.28)0.15 = 0.44 \text{ CFS}$$

$$S = 0.001$$

$$S_x = 0.015$$

$$Q_n = 0.44(0.17) = 0.07 \quad W = 2'$$

$$\frac{S_w}{S_x} = 4.2$$

$$S_x$$

$$\frac{\text{CHART}}{5} \rightarrow \text{Infinity}$$

Add 2-4' CURB CUTS.

1- @ SPEED BUMP WEST 2+10

1- @ CENTER 1+30

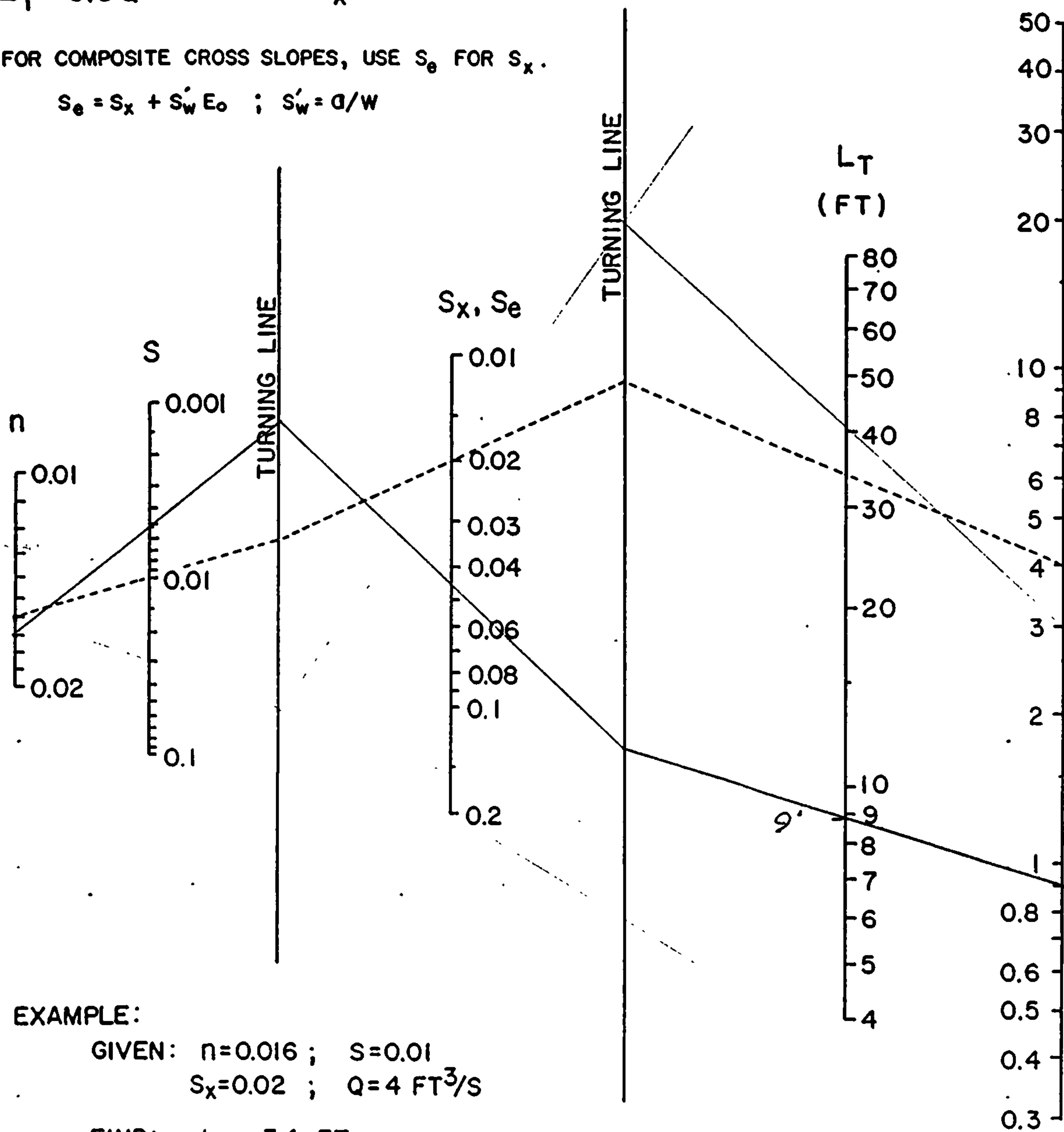
1- @ SPEED BUMP EAST 2+28

1- @ CENTER 3+10

$$L_T = 0.6Q^{0.42}S^{0.3}(1/nS_x)^{0.6}$$

FOR COMPOSITE CROSS SLOPES, USE S_e FOR S_x .

$$S_e = S_x + S'_w E_o ; S'_w = a/W$$

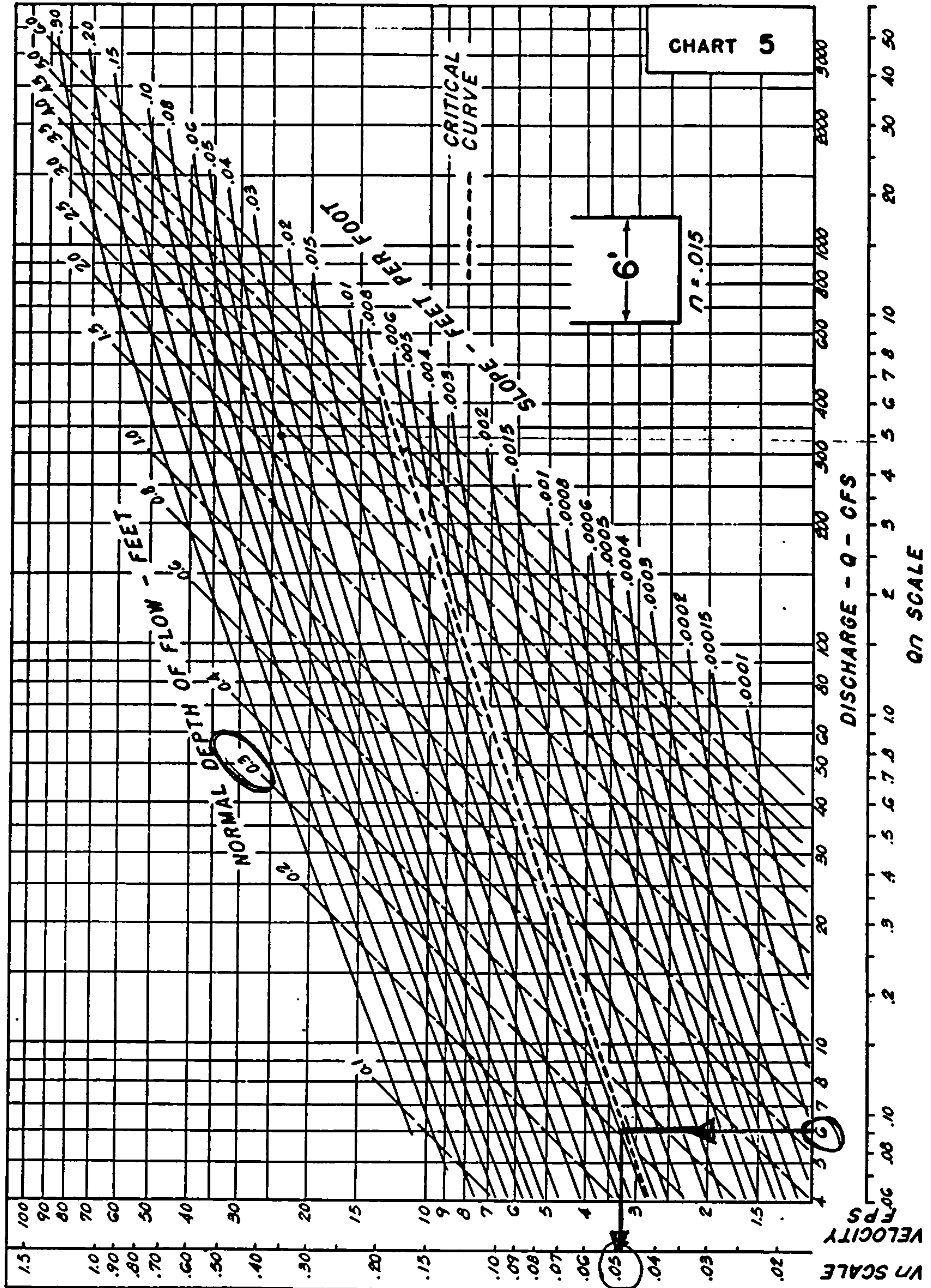


EXAMPLE:

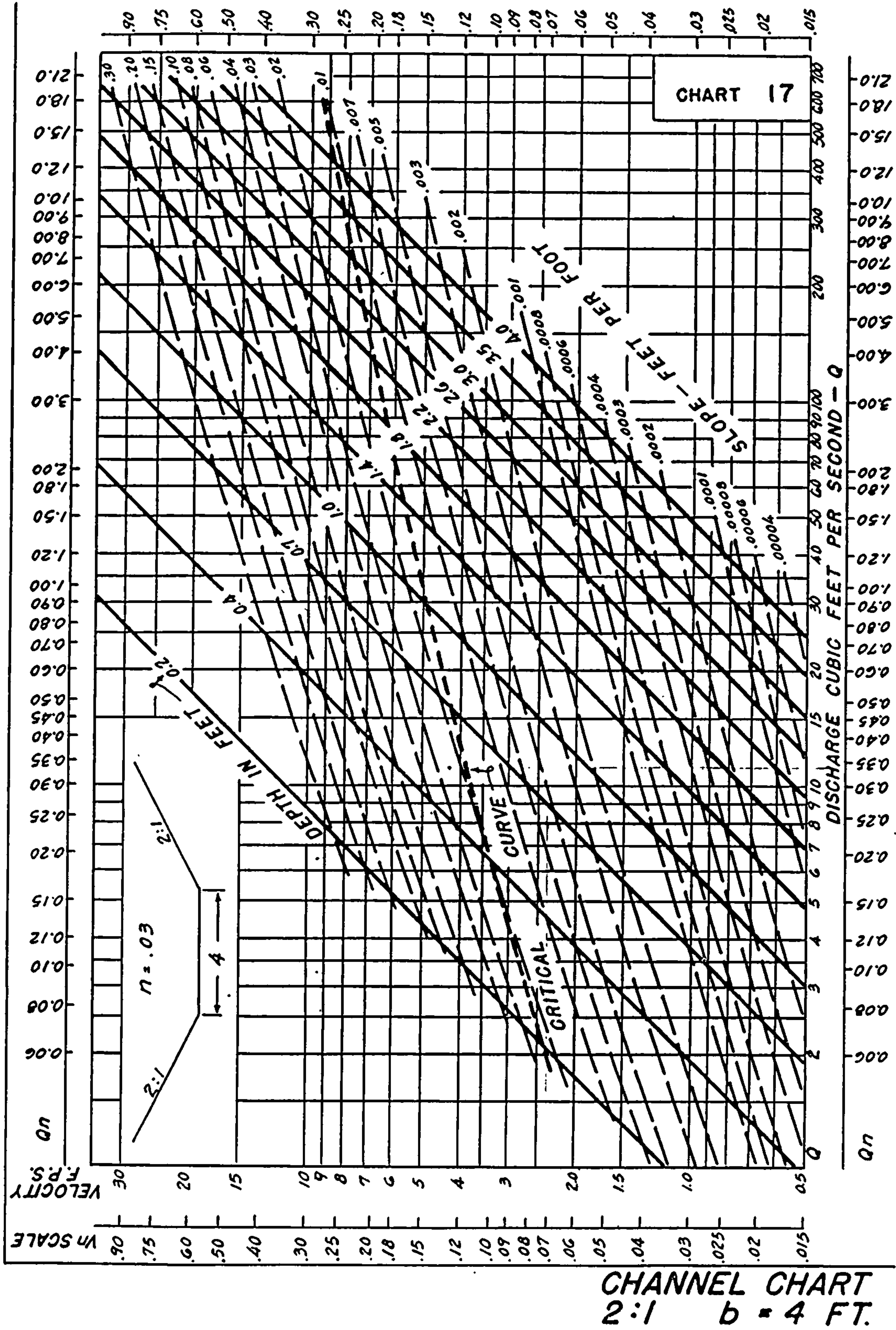
GIVEN: $n=0.016$; $S=0.01$
 $S_x=0.02$; $Q=4 \text{ FT}^3/\text{S}$

FIND: $L_T = 34 \text{ FT}$

CHART 9. Curb-opening and slotted drain inlet length for total interception.



Concrete Channel $Q = 6$ CFS, Normal Depth = 0.3' ≤ 1 Provic
 Sta 2+16 to Sta 4+26 OK



Prop Channel Between Sta 1+60 to Sta 2+16
 $Qn = (6 \times 0.04) = 0.24$ $S = 0.006$ $\rightarrow$ normal depth = 0.6'
 depth provided = 1.9' OK

KIRTLAND VETERANS ADMINISTRATION
OUTPATIENT CLINIC REPLACEMENT

HYDROLOGIC/HYDRAULIC ANALYSIS
FEBRUARY, 1988

PREPARED BY BOHANNAN-HUSTON, INC.

* MODIFIED BY TIERRA ENGR. - TO
INCLUDE BULLHEAD ACCESS ROAD

Page 1

STORM DRAINAGE MANAGEMENT

As directed by the RFP, Section 2.5.4, all computations contained herein are in conformance with AFM 88-5, Chapter 4, and Chapter 22 of the City of Albuquerque's Development Process Manual (DPM). As mentioned in the RFP, the design storm frequency for underground and surface drainage analysis will be 10 years.

The DPM recommends that peak rates of discharge be calculated by the rational method, whereas volumetric runoff computations should utilize the SCS method, with a composite hydrograph the result. The time of concentration will be calculated by the Kirpich equation as required by the DPM, but shall be between 10 and 20 minutes as directed by the RFP.

Chapter 22 of the DPM states that rainfall volumes for all analysis methods will be determined using Plate 22.2 D-1. For the 10-year frequency, the reduction factor 0.657, shown on that plate will be applied. The 6-hour point rainfall utilized will be 2.35". Rainfall intensities are derived from Plate 22.2 D-2 and we will assume uniformly distributed rainfall.

As required by the RFP, the outlet pipes will be sized using the orifice control equation. Developed runoff from the site will be equal to (or less than) existing undeveloped runoff.

A change from the RFP dictated by Joe Burwinkle of Kirtland Airforce Base is that the discharge from the pond was masterplanned to flow south into an existing ditch beside the east-west street that exists south of the facility. 15" RCP rather than 16" PVC pipes will be used, and the developed discharge from the pond is 16 cfs. This can be added to the 8.8 cfs from basin 1 (Bullhead Park) within the existing ditch south of the pond to arrive at the existing flow rate of approximately 24 cfs from these two basins.

Rainfall Intensity 1.55 inches/60 min

Frequency 10 year

RUNOFF COMPUTATIONS

Developed Conditions

Drainage Section

Project Outpatient Clinic

Location Albuquerque, NM

Division Office

District Office

TABLE

⑤ BULLHEAD ACCESS ROAD

Hydraulic Structures Summary

Structures	Q (cfs)	Q_{max} (Structures) Gate or Teelev.	$V_{V'}$ Elev.	L (ft)	Q_{max} (Gates/Gates)	$Q_{returning}$
#1 - Area Inlet	0.3	< 3.7 ✓	45.0	42.68	2.32'	5.7 > 0.3 ✓
#2 - Curb Inlet	1.0	< 4.5 ✓	44.5	40.19	4.31'	17.7 > 9.4 ✓
#3 - Curb Inlet	0.9	< 4.5 ✓	44.5	40.43	4.07'	17.2 > 8.4 ✓
4 - Roof Drain						
5 - Area Inlet	0.2	< 3.7 ✓	46.5	43.00	3.50'	7.0 > 0.2 ✓
6 - Curb Inlet	3.0	< 4.5 ✓	44.5	40.96	3.54'	7.0 > 5.4 ✓
7 - Curb Inlet	2.0	< 4.5 ✓	44.5	41.60	2.70'	6.4 > 2.4 ✓
8 - Curb Inlet	0.4	< 4.5 ✓	44.5	41.88	2.62'	6.1 > 0.4 ✓
CUVERT #1			42.0	39.5	2.5'	13.5 > 10.0 <u>11.8 OK</u>
CUVERT #2			40.6	37.5	3.1'	26.6 > 19.1 <u>21.5 OK</u>
CUVERT #3			39.7	36.0	3.7'	29.1 > 19.1 <u>21.5 OK</u>

* New Flows w/ Bullhead Access Road

BOHANNAN-HUSTON INC.

PROJECT NAME VA/OPC SHEET _____ OF _____
 PROJECT NO. 87325.00 BY K. Davis DATE _____
 SUBJECT HYDRAULICS - STORM CH'D _____ DATE _____

SCS VOLUME ANALYSIS

ASSUME BASIN #2 ONLY WILL BE PONDED

BASIN	AREA	Q_P (cfs)	CN	I_{scs}	VOLUME
2	17.1 16.5 AC	31.7 33.5	92	1.51"	90,441 FT^3

$S = \frac{1000}{CN} - 10 = \frac{1000}{92} - 10 = 0.87$

$$I_{scs} = \frac{(P - 0.2S)^2}{(P + 0.8S)} = \frac{[2.3 - 0.2(0.87)]^2}{[2.3 + 0.8(0.87)]} = 1.51"$$

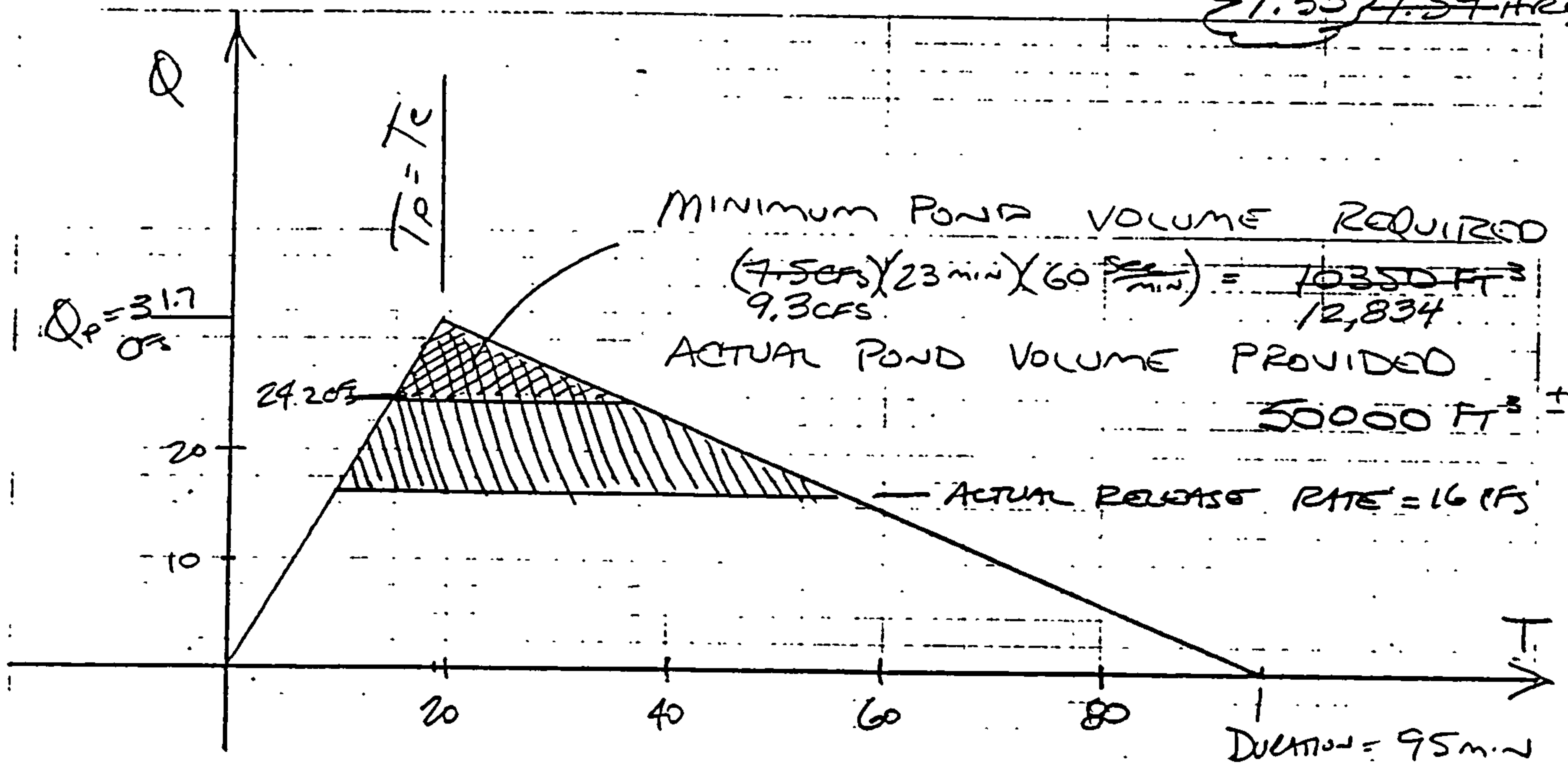
$Vol = 90,441 \text{ FT}^3 = 2.15 \text{ AC-FT}$

$A = \frac{90,441}{33.5} = \frac{bq}{2} = \frac{b(33.5)}{2}$

$b = \text{DURATION} = 5596 \text{ sec}$

$T_C = T_P = 18.9 \text{ min.}$

93.3 min
 1.55 hrs



$Q_{UNDEVELOPED} = 24.2 \text{ cfs}$

ACTUAL POND VOLUME PROVIDED = 50,000 $FT^3 \pm$

ACTUAL RELEASE RATE 2-15" PIPES = 16 CFS

ACTUAL POND REQUIRED FOR THAT RELEASE = $(16.7)(48)(60) = 48,096 \text{ OK}$

$(33.5 - 16)(48.7)(60) = 51,135 \text{ CF} > 50,000 \text{ CF} \pm 2\% \text{ OVER OK SINCE RATIONAL METHOD USED (CONSERVATIVE)}$

BOHANNAN-HUSTON INC.

* NEW VALUES TO REFLECT BULL HEAD ACCESS ROAD

PROJECT NAME

VA/OPC

SHEET

OF

PROJECT NO.

8732500

BY

K. DAVIS

DATE

SUBJECT

HYDRAULICS - STORM

CH'D

DATE

Flows From Existing BULLHEAD PARKING LOT
SIDEWALK CULVERT @ 13+31.91, 33.10' Lt.

$$\text{IMPERVIOUS AREA} = 0.63 \text{ AC} \quad C = 0.9$$

$$\text{PERVIOUS AREA} = 0.24 \text{ AC} \quad C = 0.4$$

$$L = 60' \rightarrow S = \frac{2.71}{60} = 0.045$$

$$L = 350' \rightarrow S = \frac{4.07}{350} = 0.012$$

$$t_c = (0.0078) \left[\frac{(60)^{0.77}}{(0.045)^{0.385}} + \frac{(350)^{0.77}}{(0.012)^{0.385}} \right] = 4.5 \text{ MIN} \rightarrow 10 \text{ MIN}$$

$$I = (1.55) 6.84 (10 \text{ min})^{-0.51} = 3.28$$

$$Q = CIA = \left[\frac{0.63(0.9) + 0.24(0.4)}{0.87} \right] 3.28 (0.87) = 2.2 \text{ CFS}$$

Size For NUISANCE FLOWS SINCE MAJOR
FLOWS WILL GO AROUND ISLAND.

USE 24" width to handle Gutter Flow

ADDITIONAL FLOWS TO EXISTING BULLHEAD PARK

WHICH DRAINS TO SAN PEDRO

ACCESS ROAD STA 7+38 to STA 8+66

$$\text{PAVED AREA} = (128' \times 39') / 43,560 = 0.11 \text{ AC}$$

$$I_c = 10 \text{ Minutes Minimum}$$
$$I = (1.55)(6.84)(10)^{-0.51} = 3.28$$

$$C = 0.9 \text{ PAVED AREA}$$

$$Q = CIA = 0.9(3.28)0.11 = 0.32 \text{ CFS}$$

ADDITIONAL FLOWING @ NORTH END OF EXISTING PARKING LOT

$$\text{PAVED AREA} = 0.20 \text{ AC}$$

$$I_c = 10 \text{ Minutes}$$

$$I = 3.28$$

$$C = 0.9 \text{ PAVED AREA}$$

$$Q = CIA = 0.9(3.28)0.20 = 0.59 \text{ CFS}$$



BOHANNAN HUSTON, INC.

Courtyard One

7500 JEFFERSON NE

Albuquerque

NM 87109-4335

voice 505.823.1000

fax 505.821.0892