City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 4, 2000

Kevin Patton, PE
Bohannan Huston, Inc
7500 Jefferson NE
Albuquerque, NM 87109

Re: West Highlands Subdivision Amended Grading Plan
Engineer Stamp dated 9-25-00 (E23/D9)

Dear Mr. Patton,

Based upon the information provided in your resubmittal dated 10-3-00, the above referenced plan is approved.

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

Sincerely,

Bradley L. Bingham

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

C: file

City of Albuquerque

August 16, 2000

Kevin Patton, P.E.
Bohannan-Huston, Inc.
7500 Jefferson NE
Albuquerque, New Mexico 87109

RE: Drainage Report and Grading and Drainage Plan for Blue Grama/West Highlands at High Desert, Tract 15D-1B-1, 4C-1 (E23/D9) Engineer's Stamp Dated 7/14/00.

Dear Mr. Patton:

Based on the information provided, the above referenced Report and Grading Plan dated July 14, 2000 for Blue Grama and West Highlands Subdivision at High Desert are approved for Preliminary Plat action.

The above referenced plan is also approved for Rough Grading provided that a topsoil disturbance permit is obtained before any grading occurs on this site.

The analysis provided in the above referenced report is also approved for the paving of Blue Grama Road. The construction drawings for this road must go through the Work Order process.

As you are aware, the Subdivision Improvements Agreement (SIA) must be in place prior to Final Plat sign-off.

If you have any questions, or if I may be of further assistance to you, please call me at 924-3982.

Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Whitney Reierson, City Hydrology
Jack Eichorn, High Desert Investment Corp.
File

West Highlands and Blue Grama Road

8.14.00

Existing Inlets along south side of Simms Park Road

ANALYSIS OF AN INLET IN A SUMP CONDITION - Simms Park Road

INLET TYPE: Drop Inlet.

Q=C*L*H^1.5

Grate opeining

C=3.0

L=14 ft

Q=3.0(14)H^1.5=42*H^1.5

ORIFICE: Q=C*A*(2*G*H)^0.5

Grate opening

C=0.6

A=11.02 sf

Q=6.6*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR GRATE	Q (CFS) ORIFICE GRATE	TOTAL Q (CFS)	COMMENTS:
FL @ INLET	0.00	0.00	0.00	0.00	0.00	Simms Park Road has no curb and gutter
	0.05	0.05	0.47	11.86	0.47	inlets sit in swales 8"-12" below roadway
	0.10	0.10	1.33	16.78	1.33	
	0.15	0.15	2.44	20.55	2.44	
	0.20	0.20	3.76	23.73	3.76	
	0.25	0.25	5.25	26.53	5.25	
	0.30	0.30	6.90	29.06	6.90	
	0.35	0.35	8.70	31.39	8.70	
	0.40	0.40	10.63	33.56	10.63	
	0.45	0.45	12.68	35.59	12.68	
	0.50	0.50	14.85	37.52	14.85	
	0.55	0.55	17.13	39.35	17.13	
	0.60	0.60	19.52	41.10	19.52	
	0.65	0.65	22.01	42.78	22.01	
	0.70	0.70	24.60	44.39	24.60	
EX ROADWAY	0.75	0.75	27.28	45.95	27.28	
	0.80	0.80	30.05	47.46	30.05	
	0.85	0.85	32.91	48.92	32.91	
	0.90	0.90	35.86	50.34	35.86	

RECEIVED
AUG 15 2000
HYDROLOGY SECTION

Simms Road Basins:

Basin B Q_{100} = 11.3 cfs

Basin C Q_{100} = 6.81 cfs

Basin D Q_{100} = 1.96 cfs

Basin I Q_{100} = 14.91 cfs

NOTE:

Existing Inlets are located approximately 8" below edge of pavement. Q_i (inlet capacity) = 27.28 cfs

DRAINAGE REPORT
FOR
HIGH DESERT
(THE WEST HIGHLANDS AND THE EXTENSION OF BLUE GRAMA ROAD)

JULY 14, 2000

PREPARED BY:

BOHANNAN HUSTON, INC.
COURTYARD I
7500 JEFFERSON STREET N.E.
ALBUQUERQUE, NM 87109

PREPARED FOR:

HIGH DESERT INVESTMENT CORPORATION
13000 ACADEMY ROAD NE
ALBUQUERQUE, NM. 87111

PREPARED BY:

Michael Ramirez, E.I. — Date 7/14/00

UNDER THE SUPERVISION OF:

Kevin Patton, P.E. — Date 7/14/00

KEVIN G. PATTON
NEW MEXICO
13685
REGISTERED PROFESSIONAL ENGINEER

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I. INTRODUCTION

This report pertains to the construction of Blue Grama Road and the development of Tracts 15D-1B-1A and 4C-1. Tracts 15D-1B-1A and 4C-1 are a combined 28.9 acres located south of Sims Park Road and east of Tramway Boulevard. Blue Grama Road is 16.6 acres and begins at existing Imperata Street and ends at existing Cortadaria Street. Chamisa Trail, Sunset Ridge, and Chaco Ridge Subdivisions are located to the south of the West Highlands. Blue Grama is separated from the Chaco Ridge and Sunset Ridge subdivisions by Tract 9D. Currently Tract 9-D is a dry arroyo and is designated as High Desert Open Space.

Blue Grama will be constructed with standard curb and gutter. Inlets in Blue Grama will discharge the 10-year flows into Tract 9D for water harvesting. The 10-year flows discharged from the inlests will drain into cobble-lined swales that usher flows to a proposed ponding area. The ponding area will drop out any sediment that has accompanied the flow and direct the storm water into the South Pino Tributary Storm Drain. Flows exceeding the 10-year storm will be channeled directly into the South Pino Tributary Storm Drain with out reaching the ponding area.

The High Desert Development is bound by a Sector Development Plan within the City of Albuquerque and Bernalillo County. Tract 15D-1B-1A is zoned SU-2 HD/R-1 and Tract 4C-1 is zoned SU-2HD/RT.

Tracts 15D-1B-1A and 4C-1 will be developed in a manner similar to the Overlook at High Desert Subdivision. The development will consist of building envelopes located on the existing terrain. Private cross-lot drainage easements, outside of the building envelopes, will allow storm water to take its natural course across the existing topography.

The roadways, which will serve the internal lots, will be cut into the natural topography in order to capture the storm water runoff. Similar to the Overlook development, the roadways within the West Highlands will provide standard curb and gutters that will carry the storm water runoff to downstream inlets. The inlets will then carry flows into the South Pino Tributary storm drain.

Each lot owner will be required to provide a separate individual grading and drainage plan for each lot, stamped and certified by a New Mexico Professional Engineer. The individual lot grading and drainage plan submitted by each lot owner will be reviewed by the High Desert Residential Owners Association New Construction Committee. Upon completion of development within the Highlands, High Desert Investment Corporation has agreed to provide an "as-built" plan for the estate-type lots.

Blue Grama will be constructed concurrently with Tracts 15D-1B-1A and 4C-1. Tract 15D-1B-1A will consist of 33 lots and Tract 4C-1 will consist of 2 lots.

II. PURPOSE OF REPORT

The purpose of this report is to provide site-specific drainage analysis for existing and ultimate conditions for Blue Grama Road and the residential development, referred to as The West Highlands at High Desert (Tracts 15D-1B-1Aand 4C-1). This plan is prepared and submitted to support rough grading, infrastructure design, preliminary and final plat approvals.

III. METHODOLOGIES AND REFERENCES

Site conditions are analyzed for a 100-year, 6-hour storm event in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM), Volume 2, Design Criteria, Section 22.2, Hydrology for the City of Albuquerque, January 1993.

Blue Grama Road, as describe in the "Site Location and Characteristics" section below, is approximately 17 acres and the West Highlands is approximately 29 acres. Therefore, Part A of the DPM, Section 22.2, which provides a simplified procedure for projects with sub-basins smaller than 40 acres was used.

This drainage report is consistent with a number of approved drainage reports that exist in and around this development. The following City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) approved studies prepared for the High Desert Development may be referenced throughout this report:

- ***High Desert Drainage Management Master Plan***, dated December 1993
- ***High Desert - Phase II Prudent Line Analysis***, dated August 1995.
- ***Drainage Report for Chamisa Ridge at High Desert***, dated July 1996
- ***Drainage Report for Sunset Ridge at High Desert***, dated April 1997
- ***Drainage Report for High Desert –Tract 15D-1A Unit 4 of the Highlands***, dated January 1998
- ***Drainage Report for Chaco Ridge at High Desert***, dated February 1998

The above referenced reports are associated with the development of the West Highlands and Blue Grama Road in some manner. Additional information of the above mentioned reports can be found summarized in the following paragraphs.

The *High Desert Drainage Management Master Plan*, dated December 1993, was prepared to support future drainage plans submitted for the development of individual land parcels within High Desert. This report also provided design guidance for the design of primary drainage infrastructure to be constructed by High Desert in advance of or simultaneously with individual parcel development. In addition, it provides fully developed flow rates for basins that influence Blue Grama Road and the West Highlands Subdivision in the High Desert development.

The *High Desert - Phase II Prudent Line Analysis*, dated August 1995, was prepared to establish the prudent lines, (AMAFCA easements within the natural arroyos) for the proposed High

Desert development. The report establishes prudent lines from fully developed flow rates of the basins influencing the West Highlands Subdivision in the High Desert development. There are existing AMAFCA easements within the natural arroyos that separate Tract 15D-1B-1A from the future North Highlands Subdivisions (Tract 15D-1B-1B).

The concept of the "prudent line" was established by AMAFCA. The prudent line represents the minimum setback necessary to provide protection for development from an active arroyo. The prudent line concept encompasses not only the flood plain necessary to pass the 100-year storm, but also represents the potential for natural arroyos to move laterally and degrade over time. The long-term effects are based on potential erosion associated with "representative" storm events occurring for a 30-year period.

The Grading and Drainage Plan enclosed contains the prudent lines calculated in the above mentioned report. The prudent lines within Tract 15D-1B were granted as drainage easements to AMAFCA on July 1, 1996, under Document No. 96073621, Book 96-18, Pages 3732-3779. The building envelopes in Tract 15D-1B are not located within the prudent lines.

The *Drainage Report for Chamisa Trail at High Desert*, dated July 1996, was prepared to support the development of the Chamisa Trail Subdivision. This infrastructure now exists and was approved and accepted by the City of Albuquerque under COA Project #553481. The only flows that pertain to this report are the flows generated down Cortaderia Street and small back yard flow adjacent to Tract 4C-1. The flow down Cortaderia is 1.8 cfs and the combined back yard flow from lots 8-13, into Tract 4C-1 is 0.5 cfs.

The *Drainage Report for Sunset Ridge at High Desert*, dated April 1997, was prepared to support the development of the Sunset Ridge Subdivision. This infrastructure now exists and was approved and accepted by the City of Albuquerque under COA Project #571281. A portion of the existing subdivision drains into Cortaderia Street, discharging 11.9 cfs into proposed Blue Grama Road.

The *Drainage Report for High Desert - Tract 15D-1A Unit 4 of the Highlands* also known as Desert Highlands Unit 1, dated January 1998, was prepared to support rough grading, infrastructure design, preliminary and final plat approvals for the residential development of Unit 4 of the Highlands. This infrastructure now exists and was accepted by the City of Albuquerque under COA Project #571283. A portion of this existing subdivision drains into Imperata Street, discharging 6.6 cfs into proposed Blue Grama Road.

The *Drainage Report for Chaco Ridge at High Desert*, dated February 1997, was prepared to support the development of the Chaco Ridge Subdivision. This infrastructure now exists and was approved and accepted by the City of Albuquerque under COA Project #571284. This subdivision is adjacent to Tract 9D and does not discharge any significant flows into Tract 9D.

IV. SUMMARY OF THE RELATED PLATTING AND EASEMENTS

Please refer to the proposed Bulk Land Plat for Tract 15D-1B-1 and Preliminary Plat for the West Highlands enclosed in the Exhibit section of this report.

The proposed Bulk Land Plat will subdivide Tract 15D-1B-1 into three tracts. Tract 15D-1B-1A (Proposed West Highlands), Tract 15D-1B-1B (Future North Highlands Unit 1) and Tract 15D-1B-1C (Future North Highlands Unit 2). This plat has been submitted to the Development Review Board under a separate application.

The Preliminary Plat for the West Highlands is created from two tracts; Tract 15D-1B-1A (from the above Bulk Land Plat) and the existing Tract 4C-1. Tract 15D-1B-1A will be subdivided into 33 lots and Tract 4C-1 will be subdivided in two lots and one open space Tract; Tract 4C-1A.

There is an existing AMAFCA and HDIC easement along the boundary of Tracts 15D-1B-1A (proposed West Highlands) and 15D-1B-1B (future North Highlands Unit 1). The construction of Blue Grama Road will require that a desiltation pond be constructed within this easement and direct storm water into the existing South Pino Storm Drain. The construction of

Blue Grama will also require and desiltation pond at the west end of Tract 9D (High Desert Open Space). The necessary maintenance responsibilities for the desiltation ponds have already been established by existing agreements.

The proposed bulk land and preliminary plat submittals have requested the vacation of a portion of the existing South Pino Tributary easement within Tracts 15D-1B-1A and 4C-1. The existing easement was granted with the overall bulk land plat recorded in 1993. The easement was created over an existing FEMA Floodplain. Since then, additional platting has relocated the Blue Grama Right-of-Way further south, dividing a portion of this easements and the FEMA Floodplain is currently being removed from this area due to the construction of the South Pino Storm Drain. The vacation is requested in order to confine the easement to the High Desert Open Space and dry arroyo area.

AMAFCA has already been provided with the necessary arroyo and tributary easements for this project. The maintenance agreement associated with the existing AMAFCA easements mentioned above, defining the different responsibilities required by AMAFCA and the residential Owners Association has already been recorded. The final plat will clearly identify all maintenance responsibilities for all arroyo and tributary easements.

V. SITE LOCATION AND CHARACTERISTICS

For location of the site, please refer to the vicinity map on the grading and drainage plan enclosed with this report.

Vegetation consists primarily of prairie grasses and a few juniper trees. Slopes in the project site range from 2% to 15%, with the majority of the project sloping at 2% to 8%. The Soil Conservation Service has classified the soils on this site as Embudo-Tijeras complex, Embudo gravely fine sandy loam and Tijeras gravely fine sandy loam, all of which correspond to a common hydrological soil group classification B.

VI. EXISTING HYDROLOGIC AND SITE DRAINAGE CONDITIONS

The existing drainage basins and patterns are shown graphically on the Existing Drainage Conditions Map located in the Plates section of this report. For additional information and comparison please refer to the *High Desert Drainage Management Master Plan*, dated December 1993.

The existing site consists of four drainage basins, labeled Basins 38, 39, 41 and OS-1B reflective of *High Desert Drainage Management Master Plan*, dated December 1993. Basin 38 (29.4 acres, Q_{100}=84 cfs) is located to the east of Tract 15D-1B-1A. An existing arroyo separates the Basin 38 from Tract 15D-1B-1A. This arroyo contains an existing AMAFCA easement, which was mentioned previously within this report. Flows from Basin 38 drain into the South Pino Tributary Arroyo and continue to the southwest.

Basin 39 (17.3 acres, Q_{100}=47 cfs) is to the south of Tract 15D-1B-1A. Flows from this basin are carried west to Basin 41. Basin 41 (19.2 acres, Q_{100}=51 cfs) encompasses Tracts 15D-1B-1A and 4C-1. Basin 41 drains to the west into the South Pino Tributary storm drain at Tramway Boulevard.

Basin OS-1B (9.37 acres, Q_{100}=33.12 cfs) was modified from the *High Desert Drainage Management Master Plan*, dated December 1993 due to existing Simms Park Road. Basin OS-1B drains to the southwest into the South Pino Tributary storm drain.

Three additional basins drain into future Blue Grama Road. Basin 24A2R (2.04 acres, Q_{100}=6.6 cfs) from the *Drainage Report for High Desert - Tract 15D-1A Unit 4 of the Highlands*, dated January 1998, drains to the west from Unit 4 into the existing Imperata Street. Basin 10 (0.4 acres, Q_{100}=1.8 cfs) from the *Drainage Report for Chamisa Trail at High Desert*, dated July 1996, drains to the east from the Chamisa Trail subdivision into the existing Cortaderia roadway. The backyards from lots 8-13 in the Chamisa Trail subdivision drain to the northwest producing only 0.5 cfs. Basin EX-F (2.72 acres, Q_{100}=11.92 cfs) from the *Drainage Report for Sunset Ridge at High*

Desert, dated April 1997, drains to the west from the Sunset Ridge into the existing Cortaderia roadway. A second drainage Basin, A-1 (1.1 acres, Q_{100}=3.6 cfs) drains from the Sunset Ridge subdivision to the northwest into Tract 9D.

VII. DEVELOPED HYDROLOGICAL AND HYDRAULIC CONDITIONS

A. Blue Grama

The proposed drainage basins and patterns for phase one are shown graphically on the Proposed Conditions Map for Phase One located in the Plates section of this report. For additional information and comparison, please refer to the *High Desert Drainage Management Master Plan*, dated December 1993.

Blue Grama will be constructed concurrently with the West Highlands, connecting Imperata Street and Cortaderia Street. Blue Grama Road will be built with a two percent cross slope and standard curb and gutter. (See Appendix E). Three proposed basins will encompass Blue Grama. Basins BG-1 (1.65 acres, Q_{100}=6.82 cfs), BG-2 (1.00 acres, Q_{100}=4.14 cfs), and BG-3 (1.37 acres, Q_{100}=5.67 cfs). Flow from the Desert Highlands Unit 1 originally refered to as Tract 15D-1A Unit 4 of the Highlands, Cortaderia Street and Sunset Ridge and the future North Highlands subdivision will be intercepted by Blue Grama Road

Blue Grama will receive 6.6 cfs from Basing 24A2R at connection with Imperata Street as described in the *Drainage Report for High Desert - Tract 15D-1A Unit 4 of the Highlands*. A set of inlets in Blue Grama Road at the future entrance into the North Highlands will intercept the flow from Basin 24A2R and a portion of Basin BG-3. A portion of Basin OS-3 from the future North Highlands will also be intercepted by Blue Grama. It was calculated that approximately 5 cfs would by-pass the future North Highlands inlets during fully developed conditions. During the interim conditions a temporary desiltation pond and 36" RCP stub out will accept the flow and carry it into the South Pino Storm drain. The first of two inlets in Blue Grama Road at the future entrance to the North Highlands will intercept 7.8 cfs and the second inlet will intercept 4.8 cfs and allow a residual of 1.8 cfs to flow into Blue Grama.

Inlets in Blue Grama will be used as a water-harvesting feature for the arroyo to the south of Blue Grama in Tract 9D. The inlets in Blue Grama Road will be designed to discharge the 10-year storm into a cobble-lined swale, which in turn drains into the arroyo. These inlets will be designed with a baffle in the inlet and a 6-12" pipe to discharge the 10-year flow into the arroyo. The 10-year flow will be discharge into a cobble lined swale before it reaches the arroyo. Any flow larger than the 10-year flow will be carried to the South Pino Tributary storm drain via proposed storm drain lines. A detail of the water-harvesting inlet and cobble lined swale can be seen in Appendix G.

Currently the arroyo in Basin OS-1 flows across the proposed Blue Grama right-of-way. This arroyo sits in an AMAFCA easement between the North Highlands and the West Highlands. A culvert and desiltation pond will be built to convey the flows form this arroyo across Blue Grama and into the South Pino Tributary storm drain. The culvert was sized to carry the 100-year flow underneath Blue Grama that draining into the South Pino Tributary storm drain.

Another set of inlets in Blue Grama Road will be located at the entrance to the West Highlands. These inlets will intercept the residual flow from the up-stream inlets as well flow from basins A and BG-2. The first of two inlets at this location will intercept 8.8 cfs, a second inlet will downstream of the will intercept 6 cfs with a by-pass of 3.2 cfs. At a point between this inlet and the inlets at the low spot in Blue Grama the energy head, but not the water surface level is greater that the height of the right-of-way. The energy grade line over is at 0.83' above the gutter, which is 0.03' above the right-of way. The water surface elevation at this point is only at 0.34' above the gutter, which is contained within the curb. Due to the fact that Blue Grama is adjacent to an arroyo we do not see this as a problem.

Three inlets will be placed in the low spot in Blue Grama. Two inlets will be built at the low side of the street. These inlets will intercept 26.7cfs form basins BG-1, 10, F and EX-F. As described in the *Drainage Report for Chamisa Trail at High Desert* 1.8 cfs is flowing into Cortaderia Street. An additional 11.9 cfs flows into Cortaderia Street from basin EX-F as per the *Drainage*

Report for Sunset Ridge at High Desert. The flows from these two basins plus a portion Basin BG-1 add up to 17.13 cfs from Cortaderia to the low spot in Blue Grama. The by-pass from the upstream inlets in Blue Grama, Basin F and the rest of Basin BG-1 tally to 9.57 cfs from the east into the low spot in Blue Grama. Both inlets on the low side of Blue Grama are capable of intercepting the entire 26.7 cfs. The inlet on the high side of the street was placed there to intercept nuisance flows only.

A second pond will be built at the western edge of Tract 9D at the low spot in Blue Grama. Flows from the inlet discharges and from proposed Basin BG-OS plus flows from the Sunset Ridge subdivision will drain into a desiltation pond. The pond will have a type double "D" inlet at the bottom of the pond. This inlet will carry the flows into the South Pino Tributary storm drain.

B. Tracts 15D-1B-1A and 4C-1- Ultimate Developed Conditions

A summary table has been provided in Appendix A of this report, which provides the calculated treatment types and the peak discharge for the 100-year, 6-hour storm event. The average building envelope in Tracts 15D-1B-1A and 4C-1 is 0.21 acres (9,042 sf) and the average lot size in Tracts 15D-1B-1A and 4C-1 is 0.61 acres or 26,586 sf (see Appendix B). This report has estimated that the treatment types within the average building envelope would consist of 75% Type D (impervious) and 25% Type B, while the area outside of the building envelope and within the lot would remain Type A.

Tract 15D-1B-1A makes up a major portion of the West Highlands. This Tract will consist of 33 lots. Tract 4C-1 will consist of a smaller portion with only 2 lots. The drainage associated with the development the West Highlands can be simplified into three main categories. Those basins that drain to Blue Grama, those basins that drain to the Sims Park Road and those basins that drain west across Tracts 15D-1B-1A and 4C-1 into the existing South Pino Tributary storm drain.

Basins A, and F drain to Blue Grama Road. Basins B, C, D, and I drain to the existing Simms Park Road. Basins E and H drain to inlets within the subdivision, which in turn out fall into the South Pino Tributary storm drain. Basins G and OS-4 drain through Tract 4C-1 and into the South Pino Tributary storm drain.

Basin A (3.05 acres, Q_{100}=9.2 cfs) consist primarily of lots 1-5 which lies in the south east corner of Tract 15D-1B-1A. This basin drains into Blue Grama and is intercepted by inlets within Blue Grama Road. Basin F (1.23 acres, Q_{100}=2.95 cfs) consists of the back of lots 29-35. Basin F drains into Blue Grama Road where the flow is intercepted by inlets in the roadway located at the low point in Blue Grama Road. Basin E (0.27 acres, Q_{100}=1.42 cfs) is the right-of-way for Blanket Flower Place. Inlets will be built at the bottom of Blanket Flower Place to intercept this flow as well as any nuisance flows.

Basin B (4.43 acres, Q_{100}=11.3 cfs) drains across lots 6-11 and into Simms Park Road. Basin C (2.16 acres, Q_{100}=6.81 cfs) encompasses portions of lots 9-13 and the northern third of Blanket Flower Place. Basin D (0.96 acres, Q_{100}=1.96 cfs) consists of portions of lots 14 and 15 and drains to the north into Sims Park Road. This basin also drains into Simms Park Road. Basin I (4.66 acres, Q_{100}=14.91 cfs) consists of portions of lots 15-26 and a segment South Pino Court and also drains into Simms Park Road. Currently there are two existing inlets on the south side of Simms Park Road that can accept flows from these basins. These inlets already accept flow from the existing basin. Due to the fact that the West Highlands Subdivision will not be mass graded the proposed basins flowing into Simms Park Road will not significantly add to the flows currently draining into these inlets.

Basin H (7.63 acres, Q_{100}=29.13 cfs) consists mostly of Black Grama Place and the lots adjacent to the roadway on the north side. The majority of the flow (23.81 cfs) is intercepted by three inlets in the Black Grama roadway. Two inlets will be located between lots 22 and 23 in Black Grama Place. The inlets were place there because this is the approximate location that the energy grade line over tops the right-of-way. The inlets will intercept 5.2 cfs each and allow a residual of 13.4 cfs to flow into Black Grama. The inlet at the bottom of the cul-de-sac in a sump

condition will accept the majority of the flow. This inlet was not analyzed for two times the 100-year storm. In the event that any of the inlets are clogged and water overtops the curb it will sheet flow to the south into Tract 4C-1. This will not be a problem because the majority of Tract 4C-1 is already designated as a drainage easement. The rest of the flow from Basin H will sheet flow across Tract 4C-1 and into the South Pino Tributary storm drain.

The storm water runoff from Basin G (5.31 acres, Q_{100}=16 cfs) sheet flows across Tract 4C-1 within the basin until it is intersected Basin OS-4. The runoff from Basin G combined with Basin OS-4 (3.55 acres, Q_{100}=7.81 cfs) drain to the South Pino Tributary storm drain adjacent to Tramway Boulevard where it is transported west via the existing culvert crossing.

VIII. CONCLUSION

The primary goal of this drainage plan for Blue Grama and the West Highlands, is to provide sound and innovative drainage management schemes that permit preservation of the natural terrain with the least possible impact. The utilization of drainage schemes outlined in this report accomplishes this goal in a safe and adequate manner. We recommend that this plan be approved as requested.

EXISTING CONDITIONS FOR BLUE GRAMA ROAD AND THE WEST HIGHLANDS TRACTS 15D-1B-1B AND 4C-1
Jul-00

BASIN ID	DISCHARGES TO	AREA (ACRES)	Q(100-YR) DEVELOPED (CFS)
38	Existing Arroyo	29.40	84.00
39	Existing Arroyo	17.30	47.00
41	Existing Arroyo	19.20	51.00
OS-1B	Blue Grama Rd	9.37	33.00
24A2R	Blue Grama Rd	1.70	6.60
A-1	Existing Arroyo	1.10	3.60
EX F	Blue Grama Rd	2.72	11.92
10	Blue Grama Rd	0.40	1.80
	TOTAL	81.19	238.92

NOTES:

1. Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, January, 1993
   * Table A-4
   ** Table A-9

ULTIMATE PROPOSED CONDITIONS FOR BLUE GRAMA ROAD AND THE WEST HIGHLANDS TRACTS 15D-1B-1B AND 4C-1
Jul-00

BASIN ID	DISCHARGES TO	AREA (ACRES)	Q(100-YR) DEVELOPED (CFS)
A	Blue Grama Road	3.05	9.20
B	Sims Park Road	4.43	11.30
C	Sims Park Road	2.16	6.81
D	Sims Park Road	0.96	1.96
E	Proposed Inlet	0.27	1.42
F	Blue Grama Road	1.23	2.95
G	South Pino Storm Drain	5.31	16.00
H	Proposed Culvert	7.83	29.13
I	Sims Park Road	4.66	14.91
BG-1	Proposed Inlet	1.65	6.82
BG-2	Proposed Inlet	1.00	4.14
BG-3	Proposed Inlet	1.37	6.67
	TOTALS	33.92	111.31
	OFFSITE BASINS		
OS-1	Proposed Culvert	18.50	45.36
OS-3	Proposed Pond	15.17	5.00
OS-4	South Pino Storm Drain	3.55	7.81
24A2R	Blue Grama	1.70	6.60
A-1	Proposed Pond	1.10	3.60
EX F	Blue Grama	2.72	11.92
10	Blue Grama	0.40	1.80
BG-0S	Proposed Pond	9.77	21.50
	TOTALS	52.91	103.59

NOTES:

1. Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, January, 1993
   * Table A-4
   ** Table A-9

A2/2

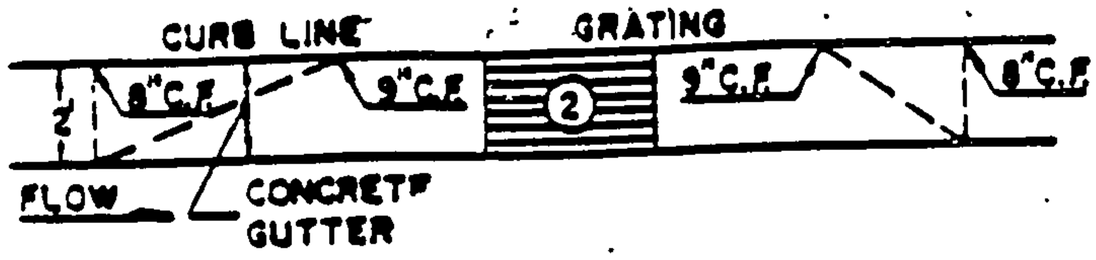
DEVELOPED CONDITIONS FOR EACH LOT

LOT #	AREA (ACRES)	% LAND TREATMENT* A	B	C	D	PEAK DISCHARGE - (CFS/ACRE)* A	B	C	D	Q(100-YR) DEVELOPED (CFS)
1	0.554	62.73	10.06	0.00	27.21	2.20	2.92	3.73	5.25	1.72
2	0.521	60.33	10.71	0.00	28.96	2.20	2.92	3.73	5.25	1.65
3	0.505	59.07	11.05	0.00	29.88	2.20	2.92	3.73	5.25	1.61
4	0.561	63.17	9.94	0.00	26.89	2.20	2.92	3.73	5.25	1.73
5	0.763	72.48	7.43	0.00	20.09	2.20	2.92	3.73	5.25	2.19
6	0.598	65.44	9.33	0.00	25.23	2.20	2.92	3.73	5.25	1.82
7	0.524	60.59	10.64	0.00	28.77	2.20	2.92	3.73	5.25	1.65
8	0.504	58.91	11.09	0.00	30.00	2.20	2.92	3.73	5.25	1.61
9	0.506	59.12	11.04	0.00	29.84	2.20	2.92	3.73	5.25	1.61
10	0.576	64.08	9.70	0.00	26.22	2.20	2.92	3.73	5.25	1.77
11	0.694	70.22	8.04	0.00	21.74	2.20	2.92	3.73	5.25	2.03
12	0.503	58.94	11.09	0.00	29.97	2.20	2.92	3.73	5.25	1.61
13	0.620	66.68	9.00	0.00	24.33	2.20	2.92	3.73	5.25	1.86
14	0.800	74.17	6.97	0.00	18.86	2.20	2.92	3.73	5.25	2.26
15	0.520	60.07	10.78	0.00	29.15	2.20	2.92	3.73	5.25	1.65
16	0.503	58.72	11.14	0.00	30.13	2.20	2.92	3.73	5.25	1.61
17	0.534	61.18	10.48	0.00	28.34	2.20	2.92	3.73	5.25	1.68
18	0.598	65.29	9.37	0.00	25.34	2.20	2.92	3.73	5.25	1.82
19	0.748	72.28	7.48	0.00	20.24	2.20	2.92	3.73	5.25	2.15
20	0.731	71.75	7.63	0.00	20.63	2.20	2.92	3.73	5.25	2.11
21	0.587	64.78	9.51	0.00	25.71	2.20	2.92	3.73	5.25	1.79
22	0.572	63.85	9.76	0.00	26.39	2.20	2.92	3.73	5.25	1.76
23	0.501	58.72	11.15	0.00	30.14	2.20	2.92	3.73	5.25	1.60
24	0.543	61.96	10.27	0.00	27.77	2.20	2.92	3.73	5.25	1.70
25	0.702	70.56	7.95	0.00	21.49	2.20	2.92	3.73	5.25	2.04
26	1.263	83.63	4.42	0.00	11.95	2.20	2.92	3.73	5.25	3.28
27	0.664	68.89	8.40	0.00	22.71	2.20	2.92	3.73	5.25	1.96
28	0.707	70.77	7.89	0.00	21.34	2.20	2.92	3.73	5.25	2.06
29	0.782	73.02	7.29	0.00	19.70	2.20	2.92	3.73	5.25	2.23
30	0.544	62.02	10.25	0.00	27.73	2.20	2.92	3.73	5.25	1.70
31	0.504	59.03	11.06	0.00	29.91	2.20	2.92	3.73	5.25	1.61
32	0.503	58.15	11.30	0.00	30.55	2.20	2.92	3.73	5.25	1.61
33	0.505	59.07	11.05	0.00	29.88	2.20	2.92	3.73	5.25	1.61
34	0.585	63.90	9.75	0.00	26.36	2.20	2.92	3.73	5.25	1.80
35	0.539	59.46	10.95	0.00	29.60	2.20	2.92	3.73	5.25	1.72
TOTAL	21.362									64.58

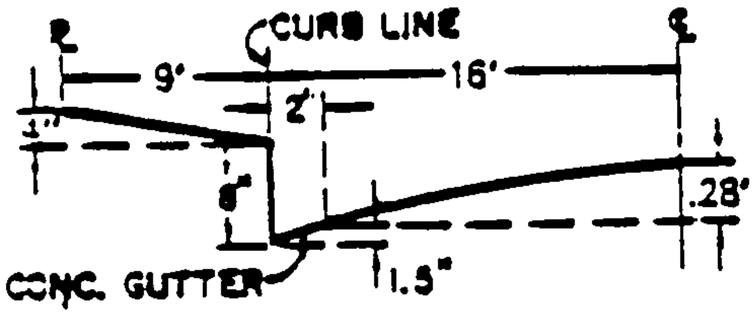
NOTES:
*Obtained from Section 22.2, Hydrology of the Development Process Manual, Vol. 2, Design Criteria for the City of Albuquerque, January, 1993
The lots Land Percentage Type was determined by assuming each building envelope to 73% impervious (Type D) and 27% natural (Type B)

8/1/1

GRATING CAPACITIES FOR TYPE "A", "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

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

ANALYSIS OF AN INLET IN A SUMP CONDITION - Blue Grama

INLET TYPE: Double Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5		ORIFICE: Q=C*A*(2*G*H)**0.5	
Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(double grate)=[2(2.67')+2(1.8')]=8.94 ft	A(double grate)=8.19 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(8.94)H^1.5=26.82*H^1.5	Q=4.194*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

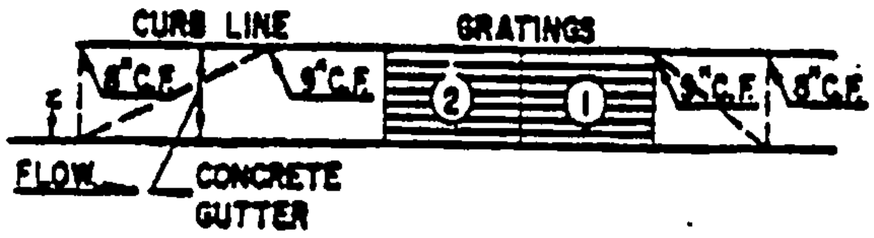
	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR "A" OPENING	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings
	0.05	0.05	0.13	0.30	8.82	0.57	Weir controls on grate analysis
	0.10	0.10	0.38	0.85	12.47	1.61	
	0.15	0.15	0.70	1.56	15.27	2.95	
	0.20	0.20	1.07	2.40	17.64	4.55	
	0.25	0.25	1.50	3.35	19.72	6.35	
	0.30	0.30	1.97	4.41	21.60	8.35	
TOP OF CURB	0.35	0.35	2.48	5.55	23.33	10.52	
	0.40	0.40	3.04	6.78	24.94	12.86	
	0.45	0.45	3.62	8.10	26.45	15.34	
	0.50	0.50	4.24	9.48	27.88	17.97	
	0.55	0.55	4.89	10.94	29.25	20.73	
	0.60	0.60	5.58	12.46	30.55	23.62	Q(100 yr) = 22.7 cfs is provided at this depth
	0.65	0.65	6.29	14.05	31.79	26.63	
	0.70	0.70	7.03	15.71	32.99	29.76	
	0.75	0.75	7.79	17.42	34.15	33.01	
	0.80	0.80	8.59	19.19	35.27	36.36	
	0.85	0.85	9.40	21.02	36.36	39.83	
ROW LIMIT	0.90	0.90	10.25	22.90	37.41	43.39	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 22.7 CFS at the sump condition

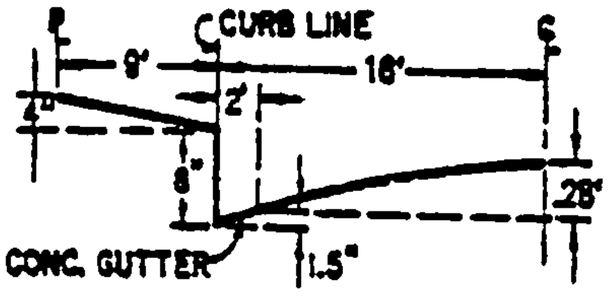
22

BG STA 14+00

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

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

6 cfs

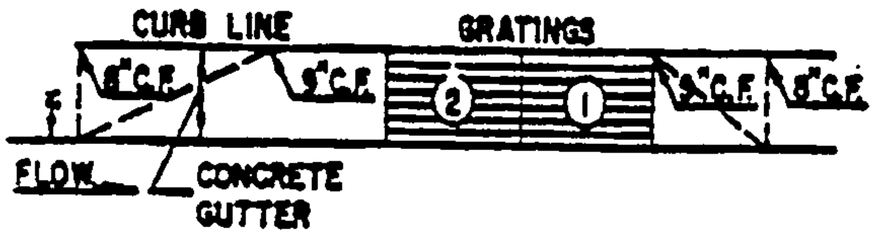
d = .36

PLATE 22.3 D-6

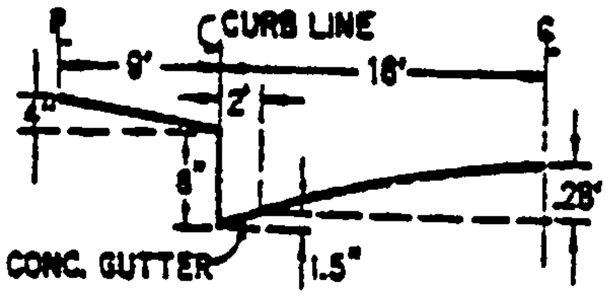
C3

BG 17+50

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

8.8

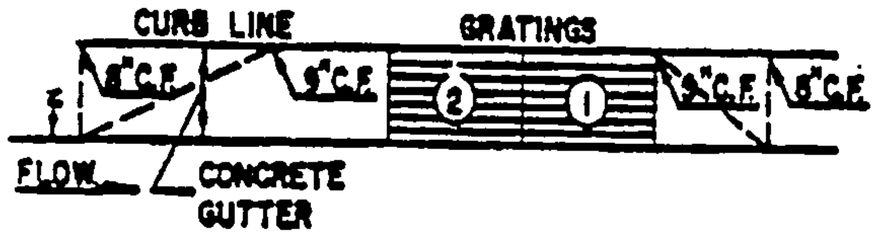
d = 0.44

PLATE 22.3 D-6

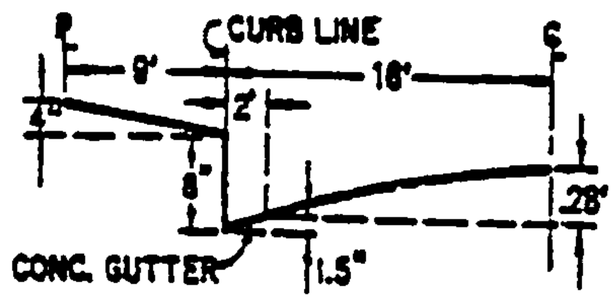
C4

BG STA 22+00

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

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

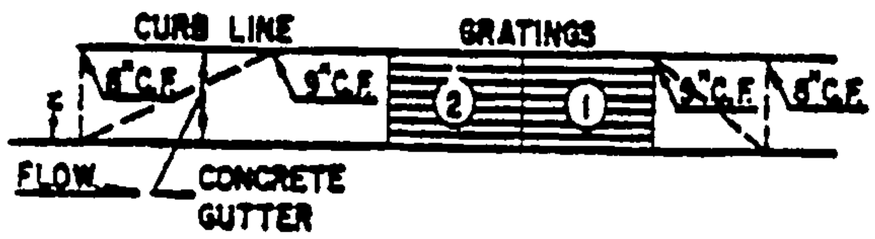
d = .33

PLATE 22.3 D-6

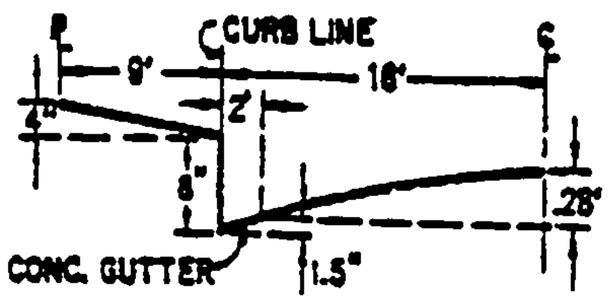
C5

BG STA 26+00

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

7.8

d = 0.4Z'

PLATE 22.3 D-6

C6

ANALYSIS OF AN INLET IN A SUMP CONDITION - BLUE GRAMA DESILTATION POND

INLET TYPE: Double Grate Type "D"

WEIR: Q=C*L*H^1.5

Grate opeining

C=3.0

L(double grate)=[2(2.67')+2(1.8')]=8.94 ft

Q=3.0(4.0')H**1.5= 12.0H**1.5

ORIFICE: Q=C*A*(2*G*H)**0.5

Grate opening

C=0.6

A(double grate)=8.19 sf

Q=4.194*(64.4*H)^0.5 Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	Flow at double "D" inlet
	0.10	0.10	0.85	12.47	0.85	Orifice controls on grate analysis
	0.20	0.20	2.40	17.64	2.40	
	0.30	0.30	4.41	21.60	4.41	
	0.40	0.40	6.78	24.94	6.78	
	0.50	0.50	9.48	27.88	9.48	
	0.60	0.60	12.46	30.55	12.46	
	0.70	0.70	15.71	32.99	15.71	
	0.80	0.80	19.19	35.27	19.19	
	0.90	0.90	22.90	37.41	22.90	
	1.00	1.00	26.82	39.43	26.82	
	1.10	1.10	30.94	41.36	30.94	
	1.20	1.20	35.26	43.20	35.26	
	1.30	1.30	39.75	44.96	39.75	
	1.40	1.40	44.43	46.66	44.43	
	1.50	1.50	49.27	48.30	48.30	
	1.60	1.60	54.28	49.88	49.88	
	1.70	1.70	59.45	51.42	51.42	Q(100 yr) = 64.36 cfs is provided at this depth
	1.80	1.80	64.77	52.91	52.91	
	1.90	1.90	70.24	54.36	54.36	
	2.00	2.00	75.86	55.77	55.77	
	2.10	2.10	81.62	57.15	57.15	
	2.20	2.20	87.52	58.49	58.49	
	2.30	2.30	93.55	59.81	59.81	
	2.40	2.40	99.72	61.09	61.09	
	2.50	2.50	106.02	62.35	62.35	
	2.60	2.60	112.44	63.59	63.59	
	2.70	2.70	118.99	64.80	64.80	
	2.80	2.80	125.66	65.99	65.99	
	2.90	2.90	132.45	67.15	67.15	
	3.00	3.00	139.36	68.30	68.30	
	3.10	3.10	146.39	69.43	69.43	
	3.20	3.20	153.53	70.54	70.54	
	3.30	3.30	160.78	71.64	71.64	
	3.40	3.40	168.14	72.71	72.71	
	3.50	3.50	175.61	73.78	73.78	
	3.60	3.60	183.19	74.82	74.82	
	3.70	3.70	190.88	75.85	75.85	
	3.80	3.80	198.67	76.87	76.87	
	3.90	3.90	206.56	77.88	77.88	
	4.00	4.00	214.56	78.87	78.87	

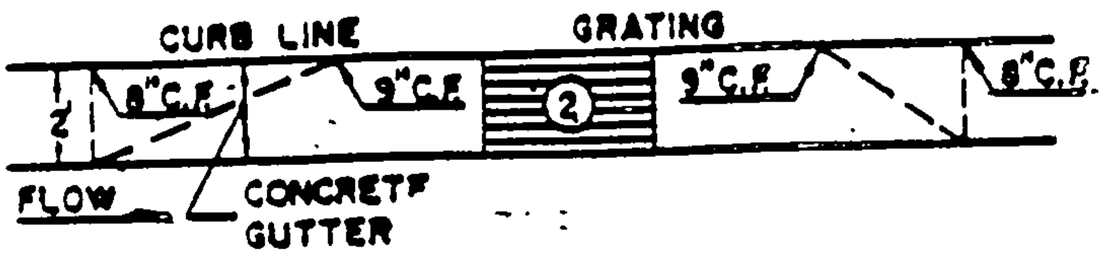
NOTE: The total runoff intercepted by the inlet at the low point is:

Qr(100) = (the lesser of the weir or orifice amount taken by the double grate).

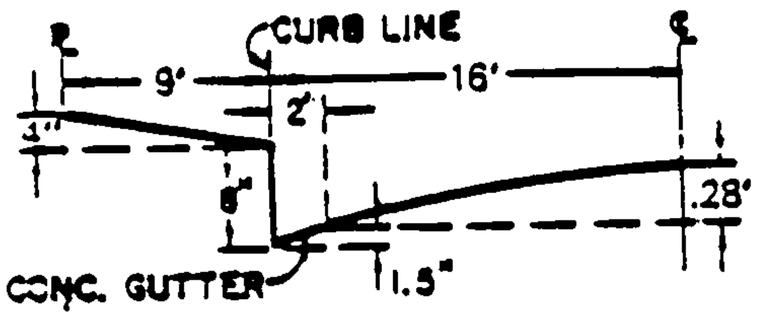
THE 100 YR STORM EVENT = 64.36 CFS at the sump condition

Black Groma

GRATING CAPACITIES FOR TYPE "A", "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

5.20±

.35

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

ANALYSIS OF AN INLET IN A SUMP CONDITION - BLACK GRAMA

INLET TYPE: Single Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5

Wing opening	Grate opeining
C= 3.0	C=3.0
L= 4.0 ft	L(single grate)=[(2.67')+2(1.8')]=6.27 ft
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(6.27)H^1.5=18.81*H^1.5

ORIFICE: Q=C*A*(2*G*H)**0.5

Grate opening	Wing opening
C=0.6	C=0.6
A(single grate)=4.09 sf	A=2.0 sf
Q=2.46*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR WING OPENING	Q (CFS) WEIR SINGLE GRATE	Q (CFS) ORIFICE SINGLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at single "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.59	6.24	1.35	Weir controls on grate analysis
	0.20	0.20	1.07	1.68	8.82	3.83	
	0.30	0.30	1.97	3.09	10.80	7.03	
	0.40	0.40	3.04	4.76	12.47	10.83	
	0.50	0.50	4.24	6.65	13.94	15.14	Q(100 yr) = 13.4 cfs is provided at this depth
	0.60	0.60	5.58	8.74	15.27	19.90	
TOP OF CURB	0.70	0.70	7.03	11.02	16.50	25.07	
	0.80	0.80	8.59	13.46	17.64	30.63	Q(2x100 yr) = 26.8 cfs is provided at this depth
	0.90	0.90	10.25	16.06	18.71	36.55	
ROW LIMIT	1.00	1.00	12.00	18.81	19.72	42.81	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Q(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 13.4 CFS at the sump condition
2 x 100 YR STORM EVENT = 26.8 CFS at the sump condition

6/62

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Drainage Structure Analyzer

Culvert Hydraulic Analysis

North Highlands Pond

Date: Wednesday, July 05, 2000 01:11:24 PM

==========

Input Data

Shape	Circular	
Material	RC C76-A	
Roughness	0.013000	
Entrance Edge	Square edge w/ headwall	
Number of Barrels	1	
Length	0.00	ft
Slope	0.00%	
Tailwater	0.00	ft
Size (W x T):	36.00 x 3.0000	
Flow Rate	50.00	cfs

Output Results

Flow Rate	50.00	cfs
Control	Inlet	
Capacity	0.00	cfs
Velocity	7.07	ft/s
Tailwater	0.00	ft
Headwater	3.65	ft
Critical Depth	2.30	ft
Normal Depth	3.00	ft
Size (W x T):	36.00 x 3.0000	

01

Detention Pond Volume Calculations

Low Spot in Blue Grama

NOTE: Blue shaded cells require user input, all other cells should not be edited.
ASSUMPTIONS:
1. Area less than 40 acres (simplified hydrograph method).
2. 100-year, 6-hour storm event

Peak Flow per Acre - DPM Section 22.2 Table A-9

Zone	A	B	C	D
1	1.29	2.03	2.87	4.37
2	1.56	2.28	3.14	4.7
3	1.87	2.6	3.45	5.02
4	2.2	2.92	3.73	5.25

Basin Name : DETENTION POND ON BLUE GRAMA
Choose Zone (1 - 4) 4
Basin Area = (acres) 18.5

Exist Conditions				Proposed Conditions			
Treatment	Percentage	Area	Q (cfs)	Treatment	Percentage	Area	Q (cfs)
A	100.0%	18.50	40.70	A	65.9%	12.20	26.83
B	0.0%	0.00	0.00	B	9.3%	1.72	5.02
C	0.0%	0.00	0.00	C	0.0%	0.00	0.00
D	0.0%	0.00	0.00	D	24.8%	4.59	24.09
		Q Peak - exist.=	**40.70**			Peak Q Developed=	**55.94**

Use my calculated exist cond. flow as the peak controlled discharge (1 = yes, or N) ?? N
If No, what is the maximum allowable discharge ?

Excess Precipitation - DPM Section 22.2 Table A-8

Zone	A	B	C	D
1	0.44	0.67	0.99	1.97
2	0.53	0.78	1.13	2.12
3	0.66	0.92	1.29	2.36
4	0.8	1.08	1.46	2.64

Determine Developed E (avg excess precipitation for the developed basin)

%A x E =	0.53
%B x E =	0.10
%C x E =	0.00
%D x E =	0.65
Avg E(in) =	1.28

Determine Tb (hours)

Tb = 0.832

Determine Tc (Note: Tc is assumed to be 0.2 hours, this should be checked using DPM 22.2.B.2)

Tc = 0.2

Determine Tp and Duration of Peak (hours)

Tp =	0.252667
Peak Duration =	0.062

Compute the required retention volume using the simple hydrograph, Figure A-3 in DPM Section 22.2

Time to Control Q (hrs) =	0.226
Time to end of Control Q (hrs)=	0.369567
Duration of Control Q (hrs)=	0.144

Required Detention Volume (CF) = 2199.79

D2

Culvert Crossing Blue Grama

```
==========================================================================
Drainage Structure Analyzer

Culvert Hydraulic Analysis

Date:  Wednesday, July 12, 2000 11:03:17 AM
==========================================================================

Input Data
----------
Shape                                  Circular
Material                               RC C76-A
Roughness                              0.013000
Entrance Edge            Square edge w/ headwall
Number of Barrels                               1
Length                                     0.00 ft
Slope                                     0.000%
Tailwater                                  0.00 ft
Size (W x T):                     36.00 x 3.0000
Flow Rate                                 45.3600 cfs

Output Results
--------------
Flow Rate                                 45.3600 cfs
Control                                    Outlet
Capacity                                  0.0000 cfs
Velocity                                     6.42 ft/s
Tailwater                                    0.00 ft
Headwater                                    3.36 ft
Critical Depth                               2.19 ft
Normal Depth                                 3.00 ft
Size (W x T):                     36.00 x 3.0000
```

03

Detention Pond Volume Calculations

desiltation pond
no. side of Blue
grama - east of
west Highlands

NOTE: Blue shaded cells require user input, all other cells should not be edited.
ASSUMPTIONS:
1. Area less than 40 acres (simplified hydrograph method).
2. 100-year, 6-hour storm event

Peak Flow per Acre - DPM Section 22.2 Table A-9

Zone	A	B	C	D
1	1.29	2.03	2.87	4.37
2	1.56	2.28	3.14	4.7
3	1.87	2.6	3.45	5.02
4	2.2	2.92	3.73	5.25

Basin Name : [redacted]
Choose Zone (1 - 4) [redacted]
Basin Area = (acres) [redacted]

Exist Conditions				Proposed Conditions			
Treatment	Percentage	Area	Q (cfs)	Treatment	Percentage	Area	Q (cfs)
A	[redacted]	15.00	33.00	A	[redacted]	9.89	21.75
B		0.00	0.00	B		1.40	4.07
C		0.00	0.00	C		0.00	0.00
D		0.00	0.00	D		3.72	19.53
	Q Peak - exist.=		**33.00**		Peak Q Developed=		**45.36**

Use my calculated exist cond. flow as the peak controlled discharge (1 = yes, or N) ?? [redacted]
If No, what is the maximum allowable discharge ?

Excess Precipitation - DPM Section 22.2 Table A-8

Zone	A	B	C	D
1	0.44	0.67	0.99	1.97
2	0.53	0.78	1.13	2.12
3	0.66	0.92	1.29	2.36
4	0.8	1.08	1.46	2.64

Determine Developed E (avg excess precipitation for the developed basin)

%A x E = 0.53
%B x E = 0.10
%C x E = 0.00
%D x E = 0.65
Avg E(in) = 1.28

Determine Tb (hours)

Tb = 0.832

Determine Tc (Note: Tc is assumed to be 0.2 hours, this should be checked using DPM 22.2.B.2)

Tc = [redacted]

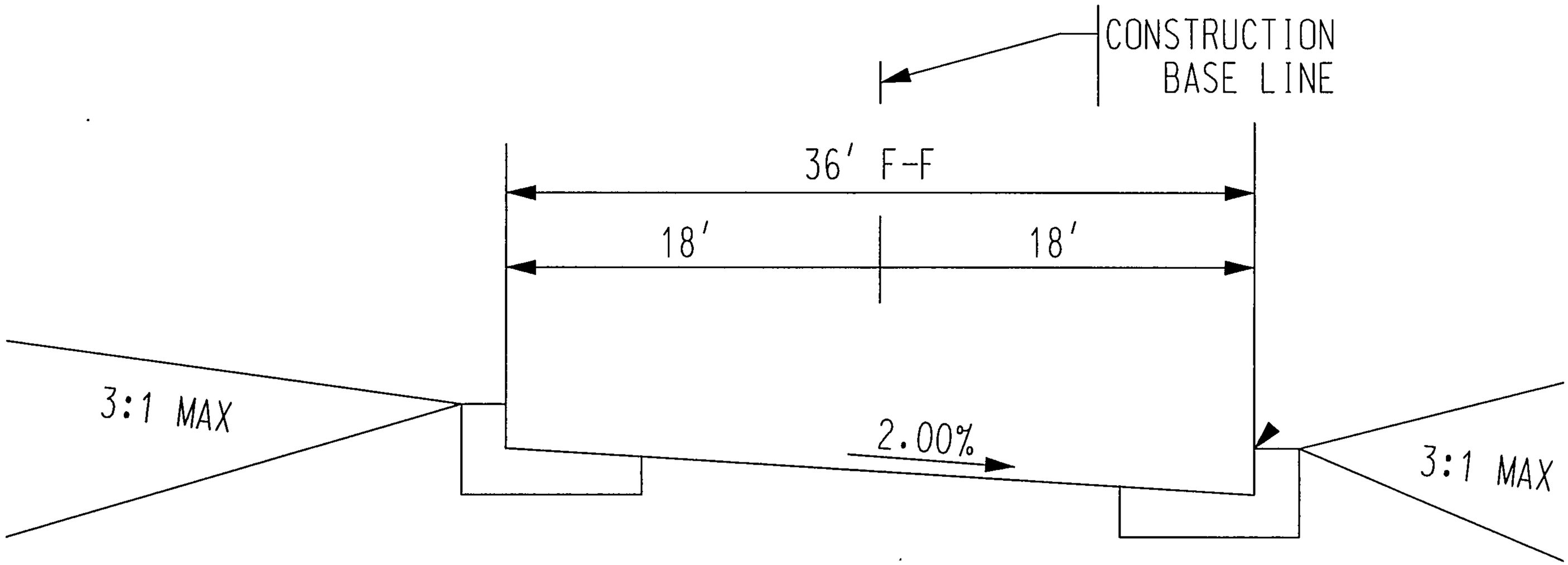
Determine Tp and Duration of Peak (hours)

Tp = 0.252667
Peak Duration = 0.062

Compute the required retention volume using the simple hydrograph, Figure A-3 in DPM Section 22.2

Time to Control Q (hrs) = 0.253
Time to end of Control Q (hrs)= 0.314667
Duration of Control Q (hrs)= 0.062

Required Detention Volume (CF) = 0.00



BLUE GRAMA

BG BOP

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

□ MANNING'S N= .017 SLOPE= .005

□POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.87	5	12.00	0.13	9	52.17	1.44
2	9.38	0.67	6	31.00	0.51	10	52.63	1.44
3	9.83	0.67	7	50.00	0.89	11	62.00	1.62
4	10.00	0.00	8	52.00	0.77	12	0.00	0.00

□ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.01	0.01	0.00	0.0	0.16	0.17	0.16	0.00	0.01
0.02	0.02	0.00	0.0	0.33	0.28	0.31	0.00	0.02
0.03	0.03	0.01	0.0	0.49	0.36	0.47	0.00	0.03
0.04	0.04	0.01	0.0	0.66	0.44	0.63	0.00	0.04
0.05	0.05	0.02	0.0	0.82	0.51	0.78	0.00	0.05
0.06	0.06	0.03	0.0	0.99	0.58	0.94	0.01	0.07
0.07	0.07	0.04	0.0	1.15	0.64	1.09	0.01	0.08
0.08	0.08	0.05	0.0	1.32	0.70	1.25	0.01	0.09
0.09	0.09	0.06	0.0	1.48	0.76	1.41	0.01	0.10
0.10	0.10	0.08	0.1	1.64	0.81	1.56	0.01	0.11
0.11	0.11	0.09	0.1	1.81	0.86	1.72	0.01	0.12
0.12	0.12	0.11	0.1	1.97	0.92	1.88	0.01	0.13
0.13	0.13	0.13	0.1	2.14	0.97	2.03	0.01	0.14
0.14	0.14	0.15	0.1	2.65	0.93	2.54	0.01	0.15
0.15	0.15	0.18	0.2	3.16	0.92	3.04	0.01	0.16
0.16	0.16	0.22	0.2	3.67	0.93	3.54	0.01	0.17
0.17	0.17	0.25	0.2	4.18	0.95	4.04	0.01	0.18
0.18	0.18	0.30	0.3	4.69	0.98	4.55	0.01	0.19
0.19	0.19	0.34	0.3	5.20	1.01	5.05	0.02	0.21
0.20	0.20	0.40	0.4	5.71	1.05	5.55	0.02	0.22
0.21	0.21	0.46	0.5	6.22	1.08	6.05	0.02	0.23
0.22	0.22	0.52	0.6	6.73	1.12	6.56	0.02	0.24
0.23	0.23	0.59	0.7	7.24	1.16	7.06	0.02	0.25
0.24	0.24	0.66	0.8	7.75	1.20	7.56	0.02	0.26
0.25	0.25	0.74	0.9	8.26	1.23	8.06	0.02	0.27
0.26	0.26	0.82	1.0	8.77	1.27	8.57	0.03	0.29
0.27	0.27	0.91	1.2	9.28	1.31	9.07	0.03	0.30
0.28	0.28	1.00	1.4	9.79	1.35	9.57	0.03	0.31
0.29	0.29	1.10	1.5	10.31	1.39	10.07	0.03	0.32
0.30	0.30	1.20	1.7	10.82	1.43	10.58	0.03	0.33
0.31	0.31	1.31	1.9	11.33	1.47	11.08	0.03	0.34
0.32	0.32	1.43	2.1	11.84	1.51	11.58	0.04	0.36
0.33	0.33	1.54	2.4	12.35	1.55	12.08	0.04	0.37
0.34	0.34	1.67	2.6	12.86	1.58	12.59	0.04	0.38
0.35	0.35	1.80	2.9	13.37	1.62	13.09	0.04	0.39
0.36	0.36	1.93	3.2	13.88	1.66	13.59	0.04	0.40
0.37	0.37	2.07	3.5	14.39	1.70	14.09	0.04	0.41
0.38	0.38	2.21	3.8	14.90	1.73	14.60	0.05	0.43
0.39	0.39	2.36	4.2	15.41	1.77	15.10	0.05	0.44
0.40	0.40	2.51	4.5	15.92	1.81	15.60	0.05	0.45
0.41	0.41	2.67	4.9	16.43	1.84	16.10	0.05	0.46
0.42	0.42	2.83	5.3	16.94	1.88	16.61	0.05	0.47
0.43	0.43	3.00	5.7	17.45	1.91	17.11	0.06	0.49

□ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.45	0.45	3.36	6.7	18.47	1.98	18.11	0.06	0.51
0.46	0.46	3.54	7.1	18.98	2.02	18.62	0.06	0.52
0.47	0.47	3.73	7.6	19.49	2.05	19.12	0.07	0.54
0.48	0.48	3.92	8.2	20.00	2.09	19.62	0.07	0.55
0.49	0.49	4.12	8.7	20.51	2.12	20.12	0.07	0.56
0.50	0.50	4.32	9.3	21.02	2.15	20.63	0.07	0.57
0.51	0.51	4.53	9.9	21.53	2.19	21.13	0.07	0.58

E2

0.52	0.52	4.75	10.5	22.04	2.22	21.63	0.08	0.60
0.53	0.53	4.97	11.2	22.56	2.25	22.13	0.08	0.61
0.54	0.54	5.19	11.9	23.07	2.29	22.64	0.08	0.62
0.55	0.55	5.42	12.6	23.58	2.32	23.14	0.08	0.63
0.56	0.56	5.65	13.3	24.09	2.35	23.64	0.09	0.65
0.57	0.57	5.89	14.0	24.60	2.38	24.14	0.09	0.66
0.58	0.58	6.14	14.8	25.11	2.42	24.65	0.09	0.67
0.59	0.59	6.38	15.6	25.62	2.45	25.15	0.09	0.68
0.60	0.60	6.64	16.5	26.13	2.48	25.65	0.10	0.70
0.61	0.61	6.90	17.3	26.64	2.51	26.15	0.10	0.71
0.62	0.62	7.16	18.2	27.15	2.54	26.66	0.10	0.72
0.63	0.63	7.43	19.1	27.66	2.57	27.16	0.10	0.73
0.64	0.64	7.70	20.1	28.17	2.60	27.66	0.11	0.75
0.65	0.65	7.98	21.0	28.68	2.64	28.16	0.11	0.76
0.66	0.66	8.27	22.0	29.19	2.67	28.67	0.11	0.77
0.67	0.67	8.56	23.1	29.70	2.70	29.17	0.11	0.78
0.68	0.68	8.85	23.9	30.67	2.70	30.59	0.11	0.79
0.69	0.69	9.16	24.8	31.64	2.70	31.56	0.11	0.80
0.70	0.70	9.49	25.5	33.06	2.69	32.53	0.11	0.81
0.71	0.71	9.82	26.5	34.03	2.70	33.50	0.11	0.82
0.72	0.72	10.16	27.5	35.00	2.71	34.46	0.11	0.83
0.73	0.73	10.51	28.6	35.97	2.72	35.43	0.12	0.85
0.74	0.74	10.87	29.7	36.94	2.73	36.40	0.12	0.86
0.75	0.75	11.24	30.9	37.90	2.75	37.37	0.12	0.87
0.76	0.76	11.62	32.1	38.87	2.76	38.34	0.12	0.88
0.77	0.77	12.00	33.3	39.84	2.78	39.31	0.12	0.89
0.78	0.78	12.40	34.5	40.99	2.79	40.45	0.12	0.90
0.79	0.79	12.81	35.8	42.14	2.79	41.59	0.12	0.91
0.80	0.80	13.23	37.1	43.28	2.81	42.72	0.12	0.92
0.81	0.81	13.67	38.5	44.43	2.82	43.86	0.12	0.93
0.82	0.82	14.11	39.9	45.58	2.83	45.00	0.12	0.94
0.83	0.83	14.57	41.4	46.72	2.84	46.14	0.13	0.96
0.84	0.84	15.03	42.9	47.87	2.86	47.28	0.13	0.97
0.85	0.85	15.51	44.5	49.01	2.87	48.42	0.13	0.98
0.86	0.86	16.00	46.2	50.16	2.89	49.55	0.13	0.99
0.87	0.87	16.50	47.9	51.31	2.90	50.69	0.13	1.00
0.88	0.88	17.01	49.9	51.99	2.94	51.36	0.13	1.01
0.89	0.89	17.53	52.0	52.66	2.97	52.03	0.14	1.03
0.90	0.90	18.05	54.6	52.67	3.03	52.03	0.14	1.04
0.91	0.91	18.57	57.3	52.68	3.08	52.04	0.15	1.06
0.92	0.92	19.09	60.0	52.69	3.14	52.04	0.15	1.07
0.93	0.93	19.61	62.7	52.70	3.20	52.04	0.16	1.09
0.94	0.94	20.13	65.5	52.71	3.25	52.04	0.16	1.10
0.95	0.95	20.65	68.3	52.72	3.31	52.05	0.17	1.12
0.96	0.96	21.17	71.2	52.73	3.36	52.05	0.18	1.14
0.97	0.97	21.69	74.2	52.75	3.42	52.05	0.18	1.15
0.98	0.98	22.21	77.1	52.76	3.47	52.05	0.19	1.17
WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
1.00	1.00	23.26	83.2	52.78	3.58	52.06	0.20	1.20
1.01	1.01	23.78	86.4	52.79	3.63	52.06	0.20	1.21
1.02	1.02	24.30	89.5	52.80	3.68	52.06	0.21	1.23
1.03	1.03	24.82	92.7	52.81	3.74	52.07	0.22	1.25
1.04	1.04	25.34	96.0	52.82	3.79	52.07	0.22	1.26
1.05	1.05	25.86	99.3	52.83	3.84	52.07	0.23	1.28
1.06	1.06	26.38	102.6	52.84	3.89	52.07	0.23	1.29
1.07	1.07	26.90	106.0	52.85	3.94	52.08	0.24	1.31
1.08	1.08	27.42	109.4	52.86	3.99	52.08	0.25	1.33
1.09	1.09	27.94	112.9	52.87	4.04	52.08	0.25	1.34
1.10	1.10	28.46	116.4	52.88	4.09	52.08	0.26	1.36
1.11	1.11	28.98	120.0	52.89	4.14	52.09	0.27	1.38
1.12	1.12	29.50	123.6	52.90	4.19	52.09	0.27	1.39
1.13	1.13	30.03	127.2	52.91	4.24	52.09	0.28	1.41
1.14	1.14	30.55	130.9	52.92	4.28	52.09	0.29	1.43

E3

BG STA 9+00

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

☐ MANNING'S N= .017 SLOPE= .067

☐POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.86	5	12.00	0.13	9	46.17	1.31
2	9.38	0.67	6	28.00	0.45	10	46.63	1.31
3	9.83	0.67	7	44.00	0.77	11	56.00	1.50
4	10.00	0.00	8	46.00	0.64	12	0.00	0.00

☐ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.01	0.01	0.00	0.0	0.16	0.64	0.16	0.01	0.02
0.02	0.02	0.00	0.0	0.33	1.02	0.31	0.02	0.04
0.03	0.03	0.01	0.0	0.49	1.33	0.47	0.03	0.06
0.04	0.04	0.01	0.0	0.66	1.61	0.63	0.04	0.08
0.05	0.05	0.02	0.0	0.82	1.87	0.78	0.05	0.10
0.06	0.06	0.03	0.1	0.99	2.11	0.94	0.07	0.13
0.07	0.07	0.04	0.1	1.15	2.34	1.09	0.09	0.16
0.08	0.08	0.05	0.1	1.32	2.56	1.25	0.10	0.18
0.09	0.09	0.06	0.2	1.48	2.77	1.41	0.12	0.21
0.10	0.10	0.08	0.2	1.64	2.97	1.56	0.14	0.24
0.11	0.11	0.09	0.3	1.81	3.16	1.72	0.16	0.27
0.12	0.12	0.11	0.4	1.97	3.35	1.88	0.17	0.29
0.13	0.13	0.13	0.5	2.14	3.54	2.03	0.19	0.32
0.14	0.14	0.15	0.5	2.65	3.41	2.54	0.18	0.32
0.15	0.15	0.18	0.6	3.16	3.39	3.04	0.18	0.33
0.16	0.16	0.22	0.7	3.67	3.42	3.54	0.18	0.34
0.17	0.17	0.25	0.9	4.18	3.49	4.04	0.19	0.36
0.18	0.18	0.30	1.1	4.69	3.59	4.55	0.20	0.38
0.19	0.19	0.34	1.3	5.20	3.70	5.05	0.21	0.40
0.20	0.20	0.40	1.5	5.71	3.83	5.55	0.23	0.43
0.21	0.21	0.46	1.8	6.22	3.96	6.05	0.24	0.45
0.22	0.22	0.52	2.1	6.73	4.10	6.56	0.26	0.48
0.23	0.23	0.59	2.5	7.24	4.24	7.06	0.28	0.51
0.24	0.24	0.66	2.9	7.75	4.38	7.56	0.30	0.54
0.25	0.25	0.74	3.3	8.26	4.52	8.06	0.32	0.57
0.26	0.26	0.82	3.8	8.77	4.66	8.57	0.34	0.60
0.27	0.27	0.91	4.4	9.28	4.81	9.07	0.36	0.63
0.28	0.28	1.00	5.0	9.79	4.95	9.57	0.38	0.66
0.29	0.29	1.10	5.6	10.31	5.09	10.07	0.40	0.69
0.30	0.30	1.20	6.3	10.82	5.24	10.58	0.43	0.73
0.31	0.31	1.31	7.1	11.33	5.38	11.08	0.45	0.76
0.32	0.32	1.43	7.9	11.84	5.52	11.58	0.47	0.79
0.33	0.33	1.54	8.7	12.35	5.66	12.08	0.50	0.83
0.34	0.34	1.67	9.7	12.86	5.80	12.59	0.52	0.86
0.35	0.35	1.80	10.7	13.37	5.93	13.09	0.55	0.90
0.36	0.36	1.93	11.7	13.88	6.07	13.59	0.57	0.93
0.37	0.37	2.07	12.8	14.39	6.21	14.09	0.60	0.97
0.38	0.38	2.21	14.0	14.90	6.34	14.60	0.62	1.00
0.39	0.39	2.36	15.3	15.41	6.48	15.10	0.65	1.04
0.40	0.40	2.51	16.6	15.92	6.61	15.60	0.68	1.08
0.41	0.41	2.67	18.0	16.43	6.74	16.10	0.71	1.12
0.42	0.42	2.83	19.5	16.94	6.87	16.61	0.73	1.15
0.43	0.43	3.00	21.0	17.45	7.00	17.11	0.76	1.19

☐ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.45	0.45	3.36	24.4	18.47	7.26	18.11	0.82	1.27
0.46	0.46	3.54	26.1	18.98	7.38	18.62	0.85	1.31
0.47	0.47	3.73	28.0	19.49	7.51	19.12	0.88	1.35
0.48	0.48	3.92	29.9	20.00	7.64	19.62	0.91	1.39
0.49	0.49	4.12	32.0	20.51	7.76	20.12	0.94	1.43
0.50	0.50	4.32	34.1	21.02	7.88	20.63	0.97	1.47
0.51	0.51	4.53	36.3	21.53	8.01	21.13	1.00	1.51

E4

BG STA 14+00

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

□ MANNING'S N= .017 SLOPE= .0353

□POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.86	5	12.00	0.13	9	46.17	1.31
2	9.38	0.67	6	28.00	0.45	10	46.63	1.31
3	9.83	0.67	7	44.00	0.77	11	56.00	1.50
4	10.00	0.00	8	46.00	0.64	12	0.00	0.00

□ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.01	0.01	0.00	0.0	0.16	0.46	0.16	0.00	0.01
0.02	0.02	0.00	0.0	0.33	0.74	0.31	0.01	0.03
0.03	0.03	0.01	0.0	0.49	0.97	0.47	0.01	0.04
0.04	0.04	0.01	0.0	0.66	1.17	0.63	0.02	0.06
0.05	0.05	0.02	0.0	0.82	1.36	0.78	0.03	0.08
0.06	0.06	0.03	0.0	0.99	1.53	0.94	0.04	0.10
0.07	0.07	0.04	0.1	1.15	1.70	1.09	0.04	0.11
0.08	0.08	0.05	0.1	1.32	1.86	1.25	0.05	0.13
0.09	0.09	0.06	0.1	1.48	2.01	1.41	0.06	0.15
0.10	0.10	0.08	0.2	1.64	2.16	1.56	0.07	0.17
0.11	0.11	0.09	0.2	1.81	2.30	1.72	0.08	0.19
0.12	0.12	0.11	0.3	1.97	2.43	1.88	0.09	0.21
0.13	0.13	0.13	0.3	2.14	2.57	2.03	0.10	0.23
0.14	0.14	0.15	0.4	2.65	2.48	2.54	0.10	0.24
0.15	0.15	0.18	0.4	3.16	2.46	3.04	0.09	0.24
0.16	0.16	0.22	0.5	3.67	2.48	3.54	0.10	0.26
0.17	0.17	0.25	0.6	4.18	2.54	4.04	0.10	0.27
0.18	0.18	0.30	0.8	4.69	2.61	4.55	0.11	0.29
0.19	0.19	0.34	0.9	5.20	2.69	5.05	0.11	0.30
0.20	0.20	0.40	1.1	5.71	2.78	5.55	0.12	0.32
0.21	0.21	0.46	1.3	6.22	2.87	6.05	0.13	0.34
0.22	0.22	0.52	1.5	6.73	2.97	6.56	0.14	0.36
0.23	0.23	0.59	1.8	7.24	3.07	7.06	0.15	0.38
0.24	0.24	0.66	2.1	7.75	3.18	7.56	0.16	0.40
0.25	0.25	0.74	2.4	8.26	3.28	8.06	0.17	0.42
0.26	0.26	0.82	2.8	8.77	3.39	8.57	0.18	0.44
0.27	0.27	0.91	3.2	9.28	3.49	9.07	0.19	0.46
0.28	0.28	1.00	3.6	9.79	3.59	9.57	0.20	0.48
0.29	0.29	1.10	4.1	10.31	3.70	10.07	0.21	0.50
0.30	0.30	1.20	4.6	10.82	3.80	10.58	0.22	0.52
0.31	0.31	1.31	5.1	11.33	3.90	11.08	0.24	0.55
0.32	0.32	1.43	5.7	11.84	4.01	11.58	0.25	0.57
0.33	0.33	1.54	6.3	12.35	4.11	12.08	0.26	0.59
0.34	0.34	1.67	7.0	12.86	4.21	12.59	0.27	0.61
0.35	0.35	1.80	7.7	13.37	4.31	13.09	0.29	0.64
0.36	0.36	1.93	8.5	13.88	4.41	13.59	0.30	0.66
0.37	0.37	2.07	9.3	14.39	4.51	14.09	0.32	0.69
0.38	0.38	2.21	10.2	14.90	4.60	14.60	0.33	0.71
0.39	0.39	2.36	11.1	15.41	4.70	15.10	0.34	0.73
0.40	0.40	2.51	12.1	15.92	4.80	15.60	0.36	0.76
0.41	0.41	2.67	13.1	16.43	4.89	16.10	0.37	0.78
0.42	0.42	2.83	14.1	16.94	4.99	16.61	0.39	0.81
0.43	0.43	3.00	15.3	17.45	5.08	17.11	0.40	0.83

□ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.45	0.45	3.36	17.7	18.47	5.27	18.11	0.43	0.88
0.46	0.46	3.54	19.0	18.98	5.36	18.62	0.45	0.91
0.47	0.47	3.73	20.3	19.49	5.45	19.12	0.46	0.93
0.48	0.48	3.92	21.7	20.00	5.54	19.62	0.48	0.96
0.49	0.49	4.12	23.2	20.51	5.63	20.12	0.49	0.98
0.50	0.50	4.32	24.7	21.02	5.72	20.63	0.51	1.01
0.51	0.51	4.53	26.3	21.53	5.81	21.13	0.52	1.03

E5

B & STA 17+50

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

□ MANNING'S N= .017 SLOPE= .0329

□POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.86	5	12.00	0.13	9	46.17	1.31
2	9.38	0.67	6	28.00	0.45	10	46.63	1.31
3	9.83	0.67	7	44.00	0.77	11	56.00	1.50
4	10.00	0.00	8	46.00	0.64	12	0.00	0.00

□ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.01	0.01	0.00	0.0	0.16	0.45	0.16	0.00	0.01
0.02	0.02	0.00	0.0	0.33	0.71	0.31	0.01	0.03
0.03	0.03	0.01	0.0	0.49	0.93	0.47	0.01	0.04
0.04	0.04	0.01	0.0	0.66	1.13	0.63	0.02	0.06
0.05	0.05	0.02	0.0	0.82	1.31	0.78	0.03	0.08
0.06	0.06	0.03	0.0	0.99	1.48	0.94	0.03	0.09
0.07	0.07	0.04	0.1	1.15	1.64	1.09	0.04	0.11
0.08	0.08	0.05	0.1	1.32	1.79	1.25	0.05	0.13
0.09	0.09	0.06	0.1	1.48	1.94	1.41	0.06	0.15
0.10	0.10	0.08	0.2	1.64	2.08	1.56	0.07	0.17
0.11	0.11	0.09	0.2	1.81	2.22	1.72	0.08	0.19
0.12	0.12	0.11	0.3	1.97	2.35	1.88	0.09	0.21
0.13	0.13	0.13	0.3	2.14	2.48	2.03	0.10	0.23
0.14	0.14	0.15	0.4	2.65	2.39	2.54	0.09	0.23
0.15	0.15	0.18	0.4	3.16	2.37	3.04	0.09	0.24
0.16	0.16	0.22	0.5	3.67	2.40	3.54	0.09	0.25
0.17	0.17	0.25	0.6	4.18	2.45	4.04	0.09	0.26
0.18	0.18	0.30	0.7	4.69	2.52	4.55	0.10	0.28
0.19	0.19	0.34	0.9	5.20	2.60	5.05	0.10	0.29
0.20	0.20	0.40	1.1	5.71	2.68	5.55	0.11	0.31
0.21	0.21	0.46	1.3	6.22	2.78	6.05	0.12	0.33
0.22	0.22	0.52	1.5	6.73	2.87	6.56	0.13	0.35
0.23	0.23	0.59	1.7	7.24	2.97	7.06	0.14	0.37
0.24	0.24	0.66	2.0	7.75	3.07	7.56	0.15	0.39
0.25	0.25	0.74	2.3	8.26	3.17	8.06	0.16	0.41
0.26	0.26	0.82	2.7	8.77	3.27	8.57	0.17	0.43
0.27	0.27	0.91	3.1	9.28	3.37	9.07	0.18	0.45
0.28	0.28	1.00	3.5	9.79	3.47	9.57	0.19	0.47
0.29	0.29	1.10	3.9	10.31	3.57	10.07	0.20	0.49
0.30	0.30	1.20	4.4	10.82	3.67	10.58	0.21	0.51
0.31	0.31	1.31	4.9	11.33	3.77	11.08	0.22	0.53
0.32	0.32	1.43	5.5	11.84	3.87	11.58	0.23	0.55
0.33	0.33	1.54	6.1	12.35	3.96	12.08	0.24	0.57
0.34	0.34	1.67	6.8	12.86	4.06	12.59	0.26	0.60
0.35	0.35	1.80	7.5	13.37	4.16	13.09	0.27	0.62
0.36	0.36	1.93	8.2	13.88	4.25	13.59	0.28	0.64
0.37	0.37	2.07	9.0	14.39	4.35	14.09	0.29	0.66
0.38	0.38	2.21	9.8	14.90	4.44	14.60	0.31	0.69
0.39	0.39	2.36	10.7	15.41	4.54	15.10	0.32	0.71
0.40	0.40	2.51	11.6	15.92	4.63	15.60	0.33	0.73
0.41	0.41	2.67	12.6	16.43	4.72	16.10	0.35	0.76
0.42	0.42	2.83	13.6	16.94	4.81	16.61	0.36	0.78
0.43	0.43	3.00	14.7	17.45	4.91	17.11	0.37	0.80

□ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.45	0.45	3.36	17.1	18.47	5.09	18.11	0.40	0.85
0.46	0.46	3.54	18.3	18.98	5.17	18.62	0.42	0.88
0.47	0.47	3.73	19.6	19.49	5.26	19.12	0.43	0.90
0.48	0.48	3.92	21.0	20.00	5.35	19.62	0.44	0.92
0.49	0.49	4.12	22.4	20.51	5.44	20.12	0.46	0.95
0.50	0.50	4.32	23.9	21.02	5.52	20.63	0.47	0.97
0.51	0.51	4.53	25.4	21.53	5.61	21.13	0.49	1.00

Q = 15.9

E6

BG 5TH ZGFCD

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

☐ MANNING'S N= .017 SLOPE= .0371

☐POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.86	5	12.00	0.13	9	46.17	1.31
2	9.38	0.67	6	28.00	0.45	10	46.63	1.31
3	9.83	0.67	7	44.00	0.77	11	56.00	1.50
4	10.00	0.00	8	46.00	0.64	12	0.00	0.00

☐ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.01	0.01	0.00	0.0	0.16	0.48	0.16	0.00	0.01
0.02	0.02	0.00	0.0	0.33	0.76	0.31	0.01	0.03
0.03	0.03	0.01	0.0	0.49	0.99	0.47	0.02	0.05
0.04	0.04	0.01	0.0	0.66	1.20	0.63	0.02	0.06
0.05	0.05	0.02	0.0	0.82	1.39	0.78	0.03	0.08
0.06	0.06	0.03	0.0	0.99	1.57	0.94	0.04	0.10
0.07	0.07	0.04	0.1	1.15	1.74	1.09	0.05	0.12
0.08	0.08	0.05	0.1	1.32	1.90	1.25	0.06	0.14
0.09	0.09	0.06	0.1	1.48	2.06	1.41	0.07	0.16
0.10	0.10	0.08	0.2	1.64	2.21	1.56	0.08	0.18
0.11	0.11	0.09	0.2	1.81	2.35	1.72	0.09	0.20
0.12	0.12	0.11	0.3	1.97	2.49	1.88	0.10	0.22
0.13	0.13	0.13	0.3	2.14	2.63	2.03	0.11	0.24
0.14	0.14	0.15	0.4	2.65	2.54	2.54	0.10	0.24
0.15	0.15	0.18	0.5	3.16	2.52	3.04	0.10	0.25
0.16	0.16	0.22	0.5	3.67	2.55	3.54	0.10	0.26
0.17	0.17	0.25	0.7	4.18	2.60	4.04	0.10	0.27
0.18	0.18	0.30	0.8	4.69	2.67	4.55	0.11	0.29
0.19	0.19	0.34	0.9	5.20	2.76	5.05	0.12	0.31
0.20	0.20	0.40	1.1	5.71	2.85	5.55	0.13	0.33
0.21	0.21	0.46	1.3	6.22	2.95	6.05	0.13	0.34
0.22	0.22	0.52	1.6	6.73	3.05	6.56	0.14	0.36
0.23	0.23	0.59	1.8	7.24	3.15	7.06	0.15	0.38
0.24	0.24	0.66	2.1	7.75	3.26	7.56	0.16	0.40
0.25	0.25	0.74	2.5	8.26	3.36	8.06	0.18	0.43
0.26	0.26	0.82	2.8	8.77	3.47	8.57	0.19	0.45
0.27	0.27	0.91	3.3	9.28	3.58	9.07	0.20	0.47
0.28	0.28	1.00	3.7	9.79	3.68	9.57	0.21	0.49
0.29	0.29	1.10	4.2	10.31	3.79	10.07	0.22	0.51
0.30	0.30	1.20	4.7	10.82	3.90	10.58	0.24	0.54
0.31	0.31	1.31	5.3	11.33	4.00	11.08	0.25	0.56
0.32	0.32	1.43	5.9	11.84	4.11	11.58	0.26	0.58
0.33	0.33	1.54	6.5	12.35	4.21	12.08	0.28	0.61
0.34	0.34	1.67	7.2	12.86	4.31	12.59	0.29	0.63
0.35	0.35	1.80	7.9	13.37	4.42	13.09	0.30	0.65
0.36	0.36	1.93	8.7	13.88	4.52	13.59	0.32	0.68
0.37	0.37	2.07	9.5	14.39	4.62	14.09	0.33	0.70
0.38	0.38	2.21	10.4	14.90	4.72	14.60	0.35	0.73
0.39	0.39	2.36	11.4	15.41	4.82	15.10	0.36	0.75
0.40	0.40	2.51	12.4	15.92	4.92	15.60	0.38	0.78
0.41	0.41	2.67	13.4	16.43	5.02	16.10	0.39	0.80
0.42	0.42	2.83	14.5	16.94	5.11	16.61	0.41	0.83
0.43	0.43	3.00	15.6	17.45	5.21	17.11	0.42	0.85

☐ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.45	0.45	3.36	18.1	18.47	5.40	18.11	0.45	0.90
0.46	0.46	3.54	19.4	18.98	5.50	18.62	0.47	0.93
0.47	0.47	3.73	20.8	19.49	5.59	19.12	0.49	0.96
0.48	0.48	3.92	22.3	20.00	5.68	19.62	0.50	0.98
0.49	0.49	4.12	23.8	20.51	5.77	20.12	0.52	1.01
0.50	0.50	4.32	25.4	21.02	5.87	20.63	0.53	1.03
0.51	0.51	4.53	27.0	21.53	5.96	21.13	0.55	1.06

E1

BG STH 30+00

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

□ MANNING'S N= .017 SLOPE= .0648

□POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.86	5	12.00	0.13	9	46.17	1.31
2	9.38	0.67	6	28.00	0.45	10	46.63	1.31
3	9.83	0.67	7	44.00	0.77	11	56.00	1.50
4	10.00	0.00	8	46.00	0.64	12	0.00	0.00

□ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.01	0.01	0.00	0.0	0.16	0.63	0.16	0.01	0.02
0.02	0.02	0.00	0.0	0.33	1.00	0.31	0.02	0.04
0.03	0.03	0.01	0.0	0.49	1.31	0.47	0.03	0.06
0.04	0.04	0.01	0.0	0.66	1.59	0.63	0.04	0.08
0.05	0.05	0.02	0.0	0.82	1.84	0.78	0.05	0.10
0.06	0.06	0.03	0.1	0.99	2.08	0.94	0.07	0.13
0.07	0.07	0.04	0.1	1.15	2.30	1.09	0.08	0.15
0.08	0.08	0.05	0.1	1.32	2.52	1.25	0.10	0.18
0.09	0.09	0.06	0.2	1.48	2.72	1.41	0.12	0.21
0.10	0.10	0.08	0.2	1.64	2.92	1.56	0.13	0.23
0.11	0.11	0.09	0.3	1.81	3.11	1.72	0.15	0.26
0.12	0.12	0.11	0.4	1.97	3.30	1.88	0.17	0.29
0.13	0.13	0.13	0.5	2.14	3.48	2.03	0.19	0.32
0.14	0.14	0.15	0.5	2.65	3.35	2.54	0.17	0.31
0.15	0.15	0.18	0.6	3.16	3.33	3.04	0.17	0.32
0.16	0.16	0.22	0.7	3.67	3.36	3.54	0.18	0.34
0.17	0.17	0.25	0.9	4.18	3.44	4.04	0.18	0.35
0.18	0.18	0.30	1.0	4.69	3.53	4.55	0.19	0.37
0.19	0.19	0.34	1.3	5.20	3.64	5.05	0.21	0.40
0.20	0.20	0.40	1.5	5.71	3.77	5.55	0.22	0.42
0.21	0.21	0.46	1.8	6.22	3.89	6.05	0.24	0.45
0.22	0.22	0.52	2.1	6.73	4.03	6.56	0.25	0.47
0.23	0.23	0.59	2.4	7.24	4.17	7.06	0.27	0.50
0.24	0.24	0.66	2.8	7.75	4.31	7.56	0.29	0.53
0.25	0.25	0.74	3.3	8.26	4.45	8.06	0.31	0.56
0.26	0.26	0.82	3.8	8.77	4.59	8.57	0.33	0.59
0.27	0.27	0.91	4.3	9.28	4.73	9.07	0.35	0.62
0.28	0.28	1.00	4.9	9.79	4.87	9.57	0.37	0.65
0.29	0.29	1.10	5.5	10.31	5.01	10.07	0.39	0.68
0.30	0.30	1.20	6.2	10.82	5.15	10.58	0.41	0.71
0.31	0.31	1.31	6.9	11.33	5.29	11.08	0.43	0.74
0.32	0.32	1.43	7.7	11.84	5.43	11.58	0.46	0.78
0.33	0.33	1.54	8.6	12.35	5.56	12.08	0.48	0.81
0.34	0.34	1.67	9.5	12.86	5.70	12.59	0.50	0.84
0.35	0.35	1.80	10.5	13.37	5.84	13.09	0.53	0.88
0.36	0.36	1.93	11.5	13.88	5.97	13.59	0.55	0.91
0.37	0.37	2.07	12.6	14.39	6.10	14.09	0.58	0.95
0.38	0.38	2.21	13.8	14.90	6.24	14.60	0.60	0.98
0.39	0.39	2.36	15.0	15.41	6.37	15.10	0.63	1.02
0.40	0.40	2.51	16.3	15.92	6.50	15.60	0.66	1.06
0.41	0.41	2.67	17.7	16.43	6.63	16.10	0.68	1.09
0.42	0.42	2.83	19.2	16.94	6.76	16.61	0.71	1.13
0.43	0.43	3.00	20.7	17.45	6.88	17.11	0.74	1.17

□ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.45	0.45	3.36	24.0	18.47	7.14	18.11	0.79	1.24
0.46	0.46	3.54	25.7	18.98	7.26	18.62	0.82	1.28
0.47	0.47	3.73	27.5	19.49	7.39	19.12	0.85	1.32
0.48	0.48	3.92	29.5	20.00	7.51	19.62	0.88	1.36
0.49	0.49	4.12	31.4	20.51	7.63	20.12	0.90	1.39
0.50	0.50	4.32	33.5	21.02	7.75	20.63	0.93	1.43
0.51	0.51	4.53	35.7	21.53	7.87	21.13	0.96	1.47

E8

24+00

Blue Grama

$Q_{residual} = 1.84$ cfs

23+00

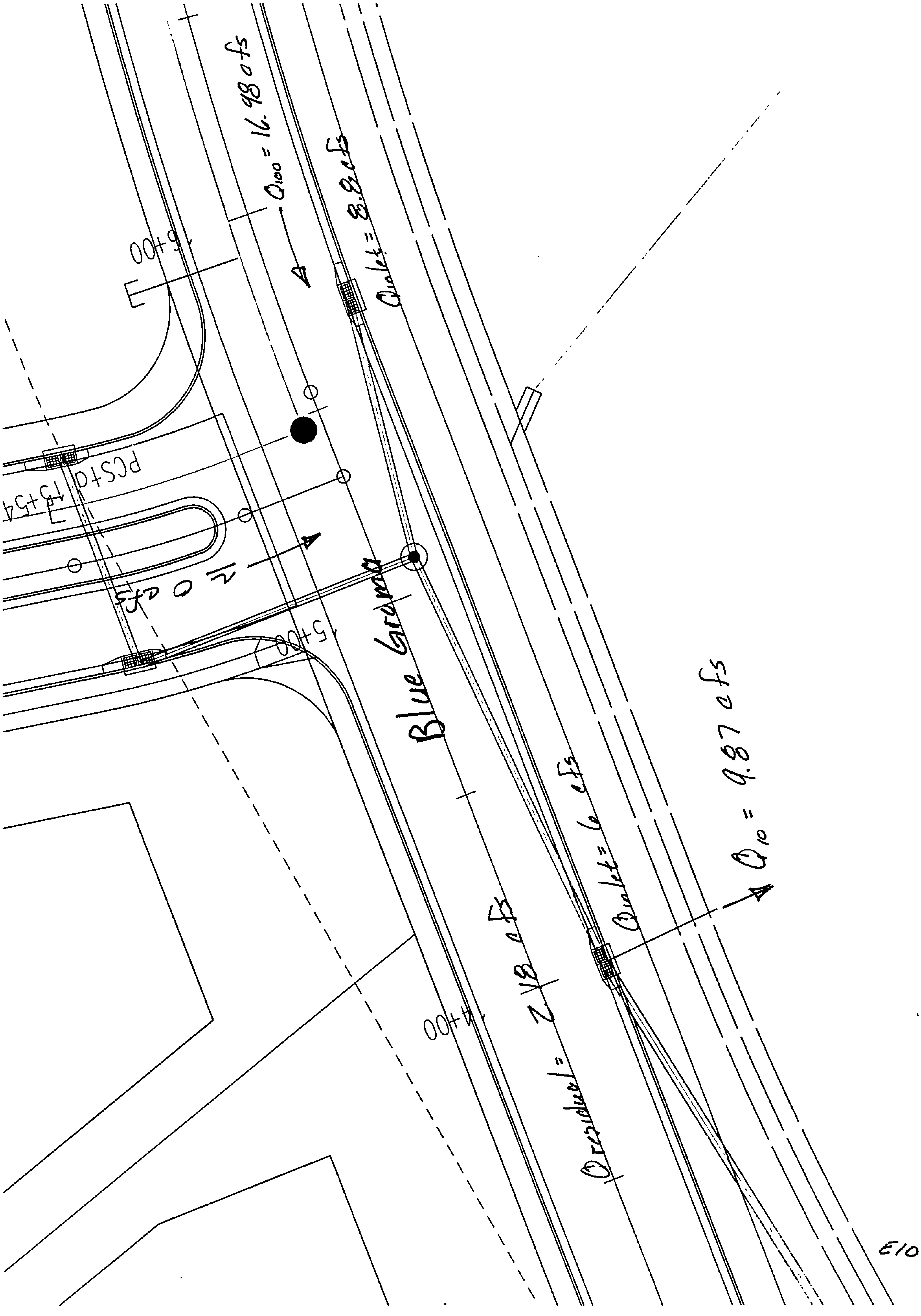
$Q_{100} = 5$ cfs

$Q_{inlet} = 4.8$ cfs

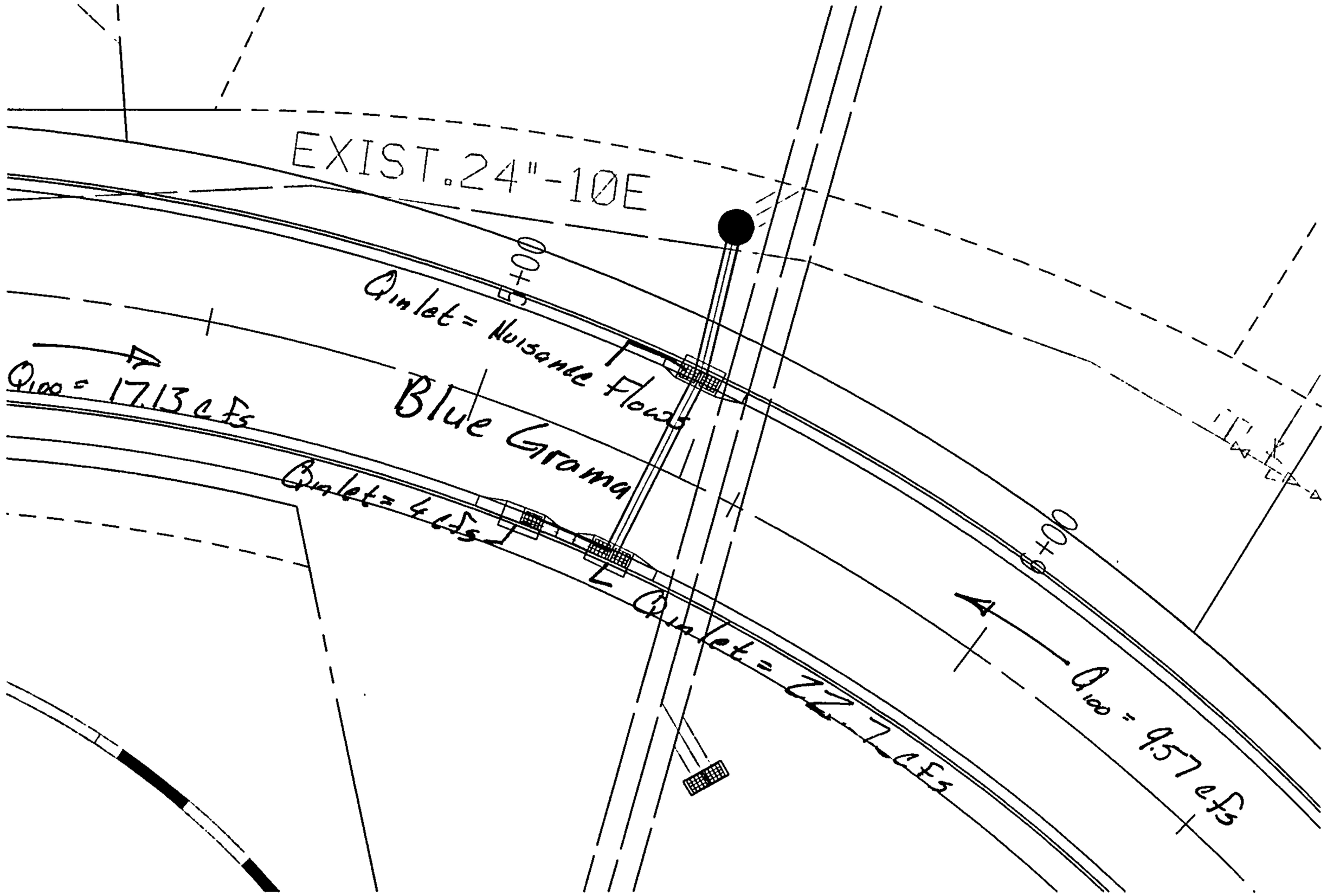
$Q_{10} = 8.4$ cfs

$Q_{inlet} = 7.8$ cfs

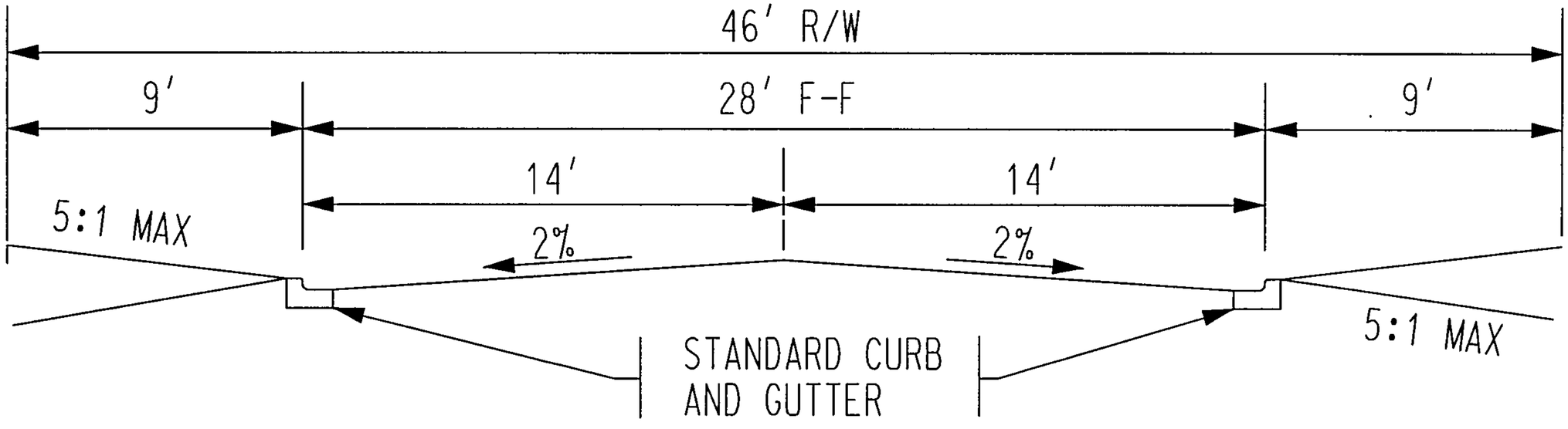
$Q_{100} = 9.4$ cfs



Q_{100} = 16.98 cfs
Q_{inlet} = 8.8 cfs
16+00
12 cfs
Blue Grama
15+00
Q_{10} = 9.87 cfs
Q_{inlet} = 6 cfs
$Q_{residual}$ = 2.18 cfs
14+00


EXIST.24"-10E
Q+5
Qinlet = Nuisance Flows
Q100 = 17.13 cfs
Blue Grama
Qinlet = 4 cfs
Qinlet = 22.7 cfs
Q+6
A
Q100 = 9.57 cfs

11/1/13



BLACK GRAMA

Black Groma

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

□ MANNING'S N= .017 SLOPE= .0517

□POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.87	5	11.00	0.13	9	37.17	0.67
2	8.38	0.67	6	23.00	0.37	10	37.63	0.67
3	8.83	0.67	7	35.00	0.13	11	46.00	0.83
4	9.00	0.00	8	37.00	0.00	12	0.00	0.00

□ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.01	0.01	0.00	0.0	0.33	0.56	0.31	0.00	0.01
0.02	0.02	0.01	0.0	0.66	0.89	0.63	0.01	0.03
0.03	0.03	0.01	0.0	0.99	1.17	0.94	0.02	0.05
0.04	0.04	0.03	0.0	1.32	1.42	1.25	0.03	0.07
0.05	0.05	0.04	0.1	1.64	1.64	1.56	0.04	0.09
0.06	0.06	0.06	0.1	1.97	1.86	1.88	0.05	0.11
0.07	0.07	0.08	0.2	2.30	2.06	2.19	0.07	0.14
0.08	0.08	0.10	0.2	2.63	2.25	2.50	0.08	0.16
0.09	0.09	0.13	0.3	2.96	2.43	2.81	0.09	0.18
0.10	0.10	0.16	0.4	3.29	2.61	3.13	0.11	0.21
0.11	0.11	0.19	0.5	3.62	2.78	3.44	0.12	0.23
0.12	0.12	0.23	0.7	3.95	2.95	3.75	0.13	0.25
0.13	0.13	0.26	0.8	4.28	3.11	4.07	0.15	0.28
0.14	0.14	0.31	0.9	5.30	3.00	5.07	0.14	0.28
0.15	0.15	0.37	1.1	6.32	2.97	6.08	0.14	0.29
0.16	0.16	0.43	1.3	7.34	3.01	7.08	0.14	0.30
0.17	0.17	0.51	1.6	8.36	3.07	8.09	0.15	0.32
0.18	0.18	0.59	1.9	9.38	3.15	9.09	0.15	0.33
0.19	0.19	0.69	2.2	10.40	3.25	10.10	0.16	0.35
0.20	0.20	0.80	2.7	11.42	3.36	11.10	0.18	0.38
0.21	0.21	0.91	3.2	12.44	3.48	12.11	0.19	0.40
0.22	0.22	1.04	3.7	13.46	3.60	13.11	0.20	0.42
0.23	0.23	1.17	4.4	14.49	3.72	14.12	0.22	0.45
0.24	0.24	1.32	5.1	15.51	3.85	15.12	0.23	0.47
0.25	0.25	1.48	5.9	16.53	3.97	16.13	0.24	0.49
0.26	0.26	1.64	6.7	17.55	4.10	17.13	0.26	0.52
0.27	0.27	1.82	7.7	18.57	4.22	18.14	0.28	0.55
0.28	0.28	2.00	8.7	19.59	4.35	19.14	0.29	0.57
0.29	0.29	2.20	9.8	20.61	4.47	20.15	0.31	0.60
0.30	0.30	2.41	11.1	21.63	4.60	21.15	0.33	0.63
0.31	0.31	2.62	12.4	22.65	4.72	22.16	0.35	0.66
0.32	0.32	2.85	13.8	23.67	4.85	23.16	0.36	0.68
0.33	0.33	3.09	15.3	24.69	4.97	24.17	0.38	0.71
0.34	0.34	3.33	17.0	25.71	5.09	25.17	0.40	0.74
0.35	0.35	3.59	18.7	26.74	5.21	26.18	0.42	0.77
0.36	0.36	3.86	20.6	27.76	5.33	27.18	0.44	0.80
0.37	0.37	4.13	22.5	28.78	5.45	28.19	0.46	0.83
0.38	0.38	4.42	25.2	28.80	5.69	28.19	0.50	0.88
0.39	0.39	4.70	27.9	28.82	5.93	28.20	0.55	0.94
0.40	0.40	4.98	30.7	28.84	6.16	28.20	0.59	0.99
0.41	0.41	5.26	33.6	28.86	6.39	28.21	0.63	1.04
0.42	0.42	5.54	36.7	28.88	6.61	28.21	0.68	1.10
0.43	0.43	5.83	39.8	28.90	6.83	28.22	0.73	1.16

□ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.45	0.45	6.39	46.4	28.94	7.26	28.23	0.82	1.27
0.46	0.46	6.67	49.9	28.96	7.47	28.23	0.87	1.33
0.47	0.47	6.96	53.4	28.98	7.68	28.24	0.91	1.38
0.48	0.48	7.24	57.0	29.00	7.88	28.24	0.96	1.44
0.49	0.49	7.52	60.8	29.02	8.08	28.25	1.01	1.50
0.50	0.50	7.80	64.6	29.04	8.28	28.25	1.06	1.56
0.51	0.51	8.09	68.5	29.07	8.47	28.26	1.11	1.62

F2

Black Groma

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

☐ MANNING'S N= .017 SLOPE= .0161

☐POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.87	5	11.00	0.13	9	37.17	0.67
2	8.38	0.67	6	23.00	0.37	10	37.63	0.67
3	8.83	0.67	7	35.00	0.13	11	46.00	0.83
4	9.00	0.00	8	37.00	0.00	12	0.00	0.00

☐ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.01	0.01	0.00	0.0	0.33	0.31	0.31	0.00	0.01
0.02	0.02	0.01	0.0	0.66	0.50	0.63	0.00	0.02
0.03	0.03	0.01	0.0	0.99	0.65	0.94	0.01	0.04
0.04	0.04	0.03	0.0	1.32	0.79	1.25	0.01	0.05
0.05	0.05	0.04	0.0	1.64	0.92	1.56	0.01	0.06
0.06	0.06	0.06	0.1	1.97	1.04	1.88	0.02	0.08
0.07	0.07	0.08	0.1	2.30	1.15	2.19	0.02	0.09
0.08	0.08	0.10	0.1	2.63	1.25	2.50	0.02	0.10
0.09	0.09	0.13	0.2	2.96	1.36	2.81	0.03	0.12
0.10	0.10	0.16	0.2	3.29	1.46	3.13	0.03	0.13
0.11	0.11	0.19	0.3	3.62	1.55	3.44	0.04	0.15
0.12	0.12	0.23	0.4	3.95	1.64	3.75	0.04	0.16
0.13	0.13	0.26	0.5	4.28	1.73	4.07	0.05	0.18
0.14	0.14	0.31	0.5	5.30	1.67	5.07	0.04	0.18
0.15	0.15	0.37	0.6	6.32	1.66	6.08	0.04	0.19
0.16	0.16	0.43	0.7	7.34	1.68	7.08	0.04	0.20
0.17	0.17	0.51	0.9	8.36	1.71	8.09	0.05	0.22
0.18	0.18	0.59	1.0	9.38	1.76	9.09	0.05	0.23
0.19	0.19	0.69	1.3	10.40	1.82	10.10	0.05	0.24
0.20	0.20	0.80	1.5	11.42	1.88	11.10	0.05	0.25
0.21	0.21	0.91	1.8	12.44	1.94	12.11	0.06	0.27
0.22	0.22	1.04	2.1	13.46	2.01	13.11	0.06	0.28
0.23	0.23	1.17	2.4	14.49	2.08	14.12	0.07	0.30
0.24	0.24	1.32	2.8	15.51	2.15	15.12	0.07	0.31
0.25	0.25	1.48	3.3	16.53	2.22	16.13	0.08	0.33
0.26	0.26	1.64	3.8	17.55	2.29	17.13	0.08	0.34
0.27	0.27	1.82	4.3	18.57	2.36	18.14	0.09	0.36
0.28	0.28	2.00	4.9	19.59	2.43	19.14	0.09	0.37
0.29	0.29	2.20	5.5	20.61	2.50	20.15	0.10	0.39
0.30	0.30	2.41	6.2	21.63	2.57	21.15	0.10	0.40
0.31	0.31	2.62	6.9	22.65	2.64	22.16	0.11	0.42
0.32	0.32	2.85	7.7	23.67	2.70	23.16	0.11	0.43
0.33	0.33	3.09	8.6	24.69	2.77	24.17	0.12	0.45
0.34	0.34	3.33	9.5	25.71	2.84	25.17	0.13	0.47
0.35	0.35	3.59	10.4	26.74	2.91	26.18	0.13	0.48
0.36	0.36	3.86	11.5	27.76	2.98	27.18	0.14	0.50
0.37	0.37	4.13	12.6	28.78	3.04	28.19	0.14	0.51
0.38	0.38	4.42	14.0	28.80	3.18	28.19	0.16	0.54
0.39	0.39	4.70	15.6	28.82	3.31	28.20	0.17	0.56
0.40	0.40	4.98	17.1	28.84	3.44	28.20	0.18	0.58
0.41	0.41	5.26	18.8	28.86	3.57	28.21	0.20	0.61
0.42	0.42	5.54	20.5	28.88	3.69	28.21	0.21	0.63
0.43	0.43	5.83	22.2	28.90	3.81	28.22	0.23	0.66

☐ WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.45	0.45	6.39	25.9	28.94	4.05	28.23	0.25	0.70
0.46	0.46	6.67	27.8	28.96	4.17	28.23	0.27	0.73
0.47	0.47	6.96	29.8	28.98	4.28	28.24	0.28	0.75
0.48	0.48	7.24	31.8	29.00	4.40	28.24	0.30	0.78
0.49	0.49	7.52	33.9	29.02	4.51	28.25	0.32	0.81
0.50	0.50	7.80	36.0	29.04	4.62	28.25	0.33	0.83
0.51	0.51	8.09	38.2	29.07	4.73	28.26	0.35	0.86

F3

Black Groma

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

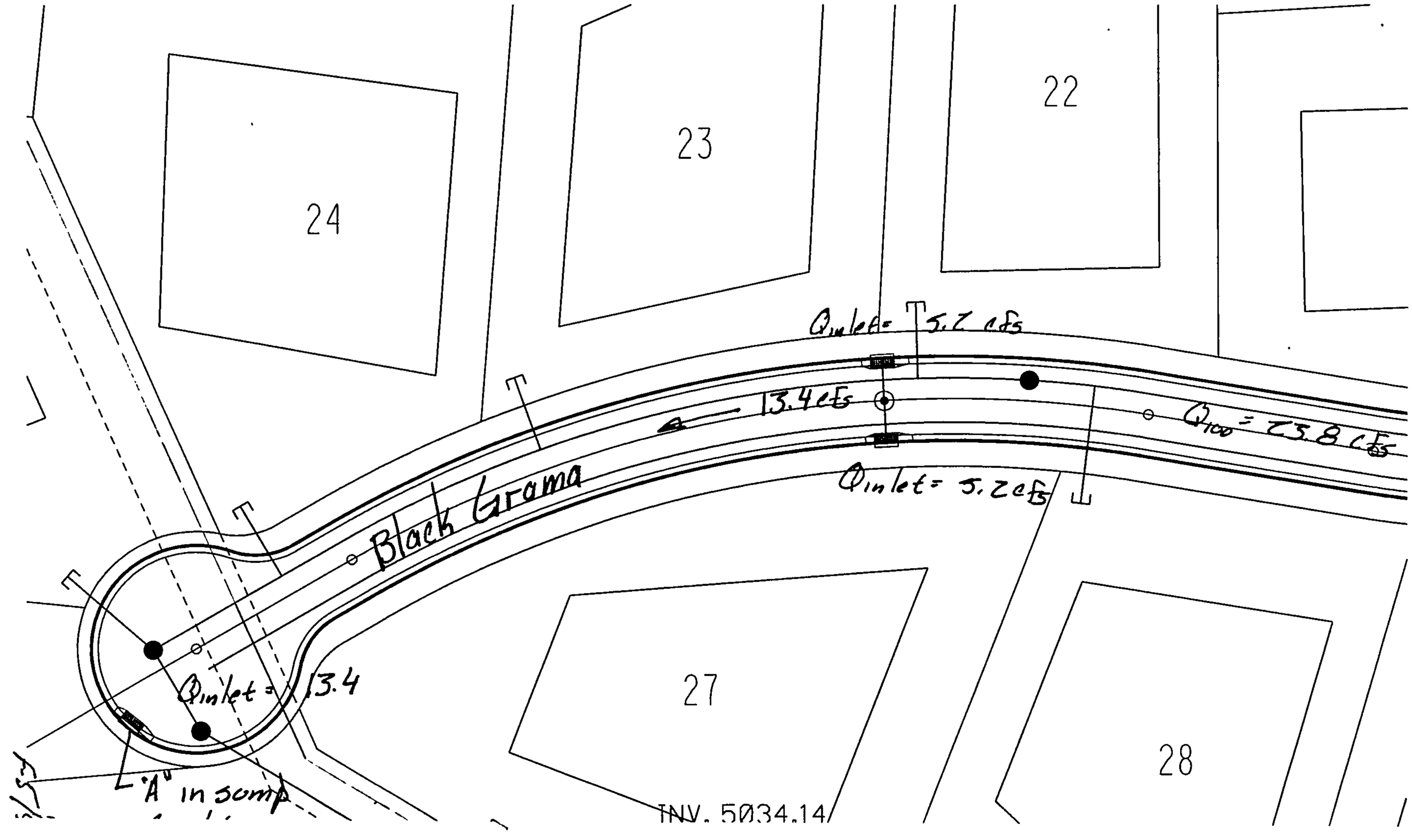
MANNING'S N= .017 SLOPE= .0677

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.87	5	11.00	0.13	9	37.17	0.67
2	8.38	0.67	6	23.00	0.37	10	37.63	0.67
3	8.83	0.67	7	35.00	0.13	11	46.00	0.83
4	9.00	0.00	8	37.00	0.00	12	0.00	0.00

WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.01	0.01	0.00	0.0	0.33	0.64	0.31	0.01	0.02
0.02	0.02	0.01	0.0	0.66	1.02	0.63	0.02	0.04
0.03	0.03	0.01	0.0	0.99	1.34	0.94	0.03	0.06
0.04	0.04	0.03	0.0	1.32	1.62	1.25	0.04	0.08
0.05	0.05	0.04	0.1	1.64	1.88	1.56	0.05	0.10
0.06	0.06	0.06	0.1	1.97	2.12	1.88	0.07	0.13
0.07	0.07	0.08	0.2	2.30	2.35	2.19	0.09	0.16
0.08	0.08	0.10	0.3	2.63	2.57	2.50	0.10	0.18
0.09	0.09	0.13	0.4	2.96	2.78	2.81	0.12	0.21
0.10	0.10	0.16	0.5	3.29	2.98	3.13	0.14	0.24
0.11	0.11	0.19	0.6	3.62	3.18	3.44	0.16	0.27
0.12	0.12	0.23	0.8	3.95	3.37	3.75	0.18	0.30
0.13	0.13	0.26	0.9	4.28	3.56	4.07	0.20	0.33
0.14	0.14	0.31	1.1	5.30	3.43	5.07	0.18	0.32
0.15	0.15	0.37	1.2	6.32	3.40	6.08	0.18	0.33
0.16	0.16	0.43	1.5	7.34	3.44	7.08	0.18	0.34
0.17	0.17	0.51	1.8	8.36	3.51	8.09	0.19	0.36
0.18	0.18	0.59	2.1	9.38	3.61	9.09	0.20	0.38
0.19	0.19	0.69	2.6	10.40	3.72	10.10	0.22	0.41
0.20	0.20	0.80	3.1	11.42	3.85	11.10	0.23	0.43
0.21	0.21	0.91	3.6	12.44	3.98	12.11	0.25	0.46
0.22	0.22	1.04	4.3	13.46	4.12	13.11	0.26	0.48
0.23	0.23	1.17	5.0	14.49	4.26	14.12	0.28	0.51
0.24	0.24	1.32	5.8	15.51	4.40	15.12	0.30	0.54
0.25	0.25	1.48	6.7	16.53	4.54	16.13	0.32	0.57
0.26	0.26	1.64	7.7	17.55	4.69	17.13	0.34	0.60
0.27	0.27	1.82	8.8	18.57	4.83	18.14	0.36	0.63
0.28	0.28	2.00	10.0	19.59	4.98	19.14	0.38	0.66
0.29	0.29	2.20	11.3	20.61	5.12	20.15	0.41	0.70
0.30	0.30	2.41	12.7	21.63	5.26	21.15	0.43	0.73
0.31	0.31	2.62	14.2	22.65	5.41	22.16	0.45	0.76
0.32	0.32	2.85	15.8	23.67	5.55	23.16	0.48	0.80
0.33	0.33	3.09	17.6	24.69	5.69	24.17	0.50	0.83
0.34	0.34	3.33	19.4	25.71	5.83	25.17	0.53	0.87
0.35	0.35	3.59	21.4	26.74	5.97	26.18	0.55	0.90
0.36	0.36	3.86	23.5	27.76	6.10	27.18	0.58	0.94
0.37	0.37	4.13	25.8	28.78	6.24	28.19	0.60	0.97
0.38	0.38	4.42	28.8	28.80	6.52	28.19	0.66	1.04
0.39	0.39	4.70	31.9	28.82	6.79	28.20	0.72	1.11
0.40	0.40	4.98	35.1	28.84	7.05	28.20	0.77	1.17
0.41	0.41	5.26	38.5	28.86	7.31	28.21	0.83	1.24
0.42	0.42	5.54	42.0	28.88	7.57	28.21	0.89	1.31
0.43	0.43	5.83	45.6	28.90	7.82	28.22	0.95	1.38

WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.45	0.45	6.39	53.1	28.94	8.31	28.23	1.07	1.52
0.46	0.46	6.67	57.0	28.96	8.55	28.23	1.13	1.59
0.47	0.47	6.96	61.1	28.98	8.78	28.24	1.20	1.67
0.48	0.48	7.24	65.3	29.00	9.02	28.24	1.26	1.74
0.49	0.49	7.52	69.5	29.02	9.24	28.25	1.33	1.82
0.50	0.50	7.80	73.9	29.04	9.47	28.25	1.39	1.89
0.51	0.51	8.09	78.4	29.07	9.69	28.26	1.46	1.97

F4


24
23
22
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27
28
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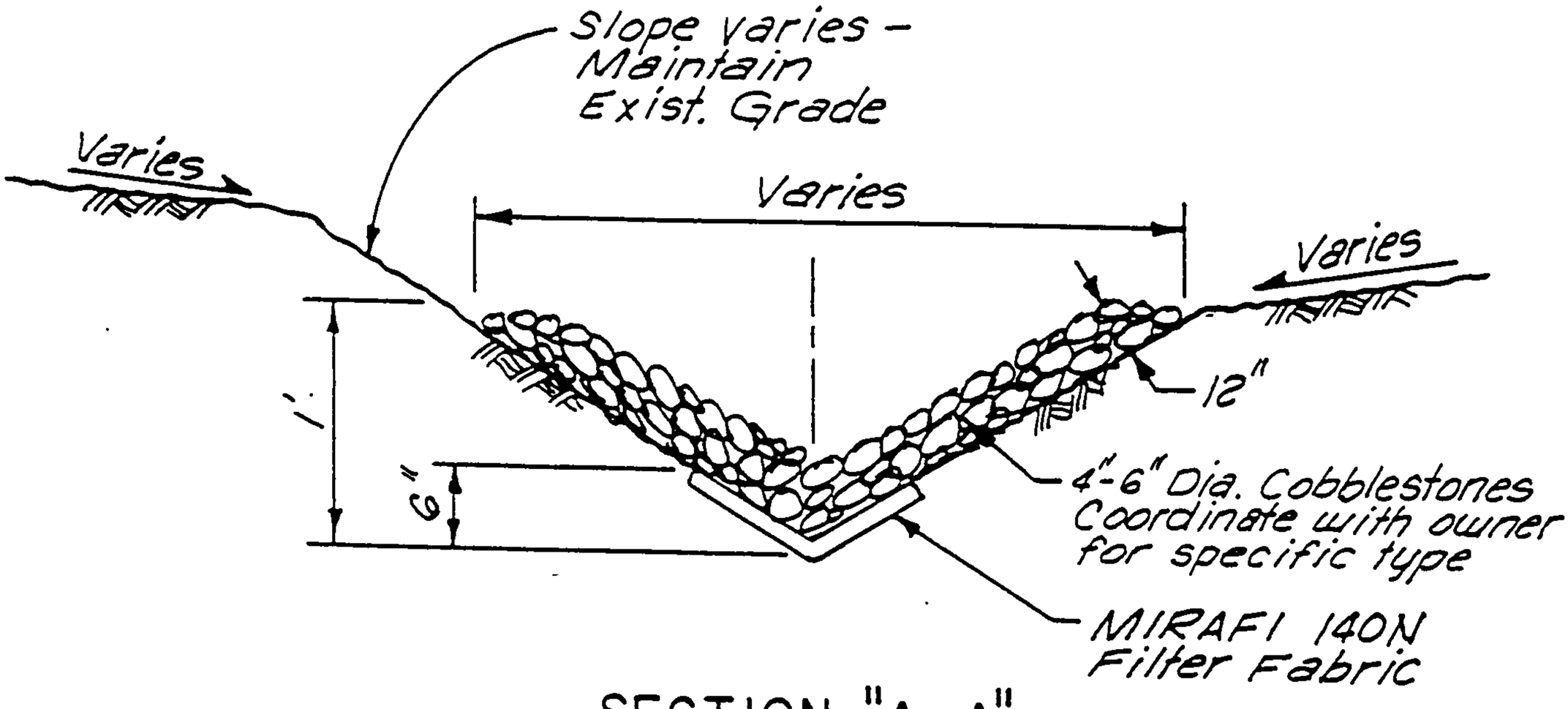
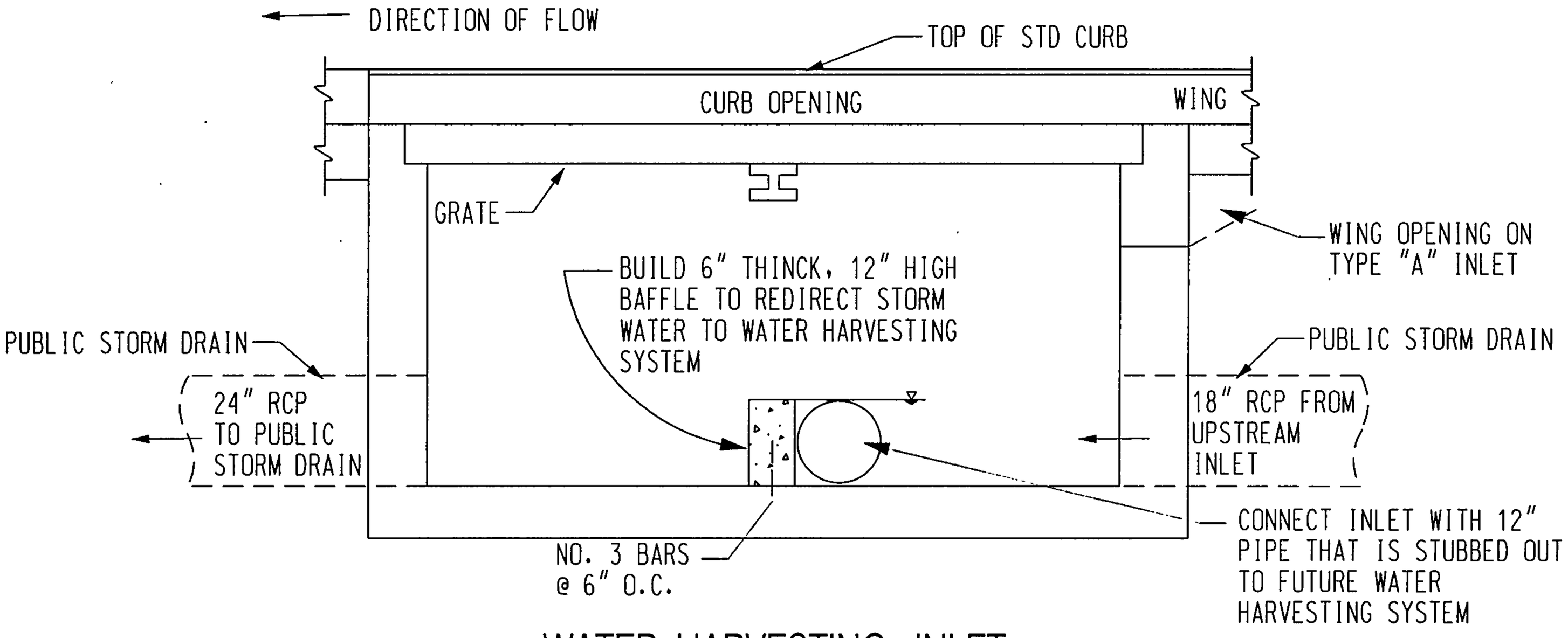


SECTION "A-A"

NTS



WATER-HARVESTING INLET

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