DEVELOPMENT & BUILDING SERVICE CENTER
ONE STOP
600 SECOND ST. N.W./2ND FLOOR
ATTENTION: _____
505-924-3900

Records Withdrawal Form HYDROLOGY

Project No. D23 / D31 Date: _____

Project Title: TERRAIN MANAGEMENT & GRADING PLAN SANDIA HEIGHTS SOUTH
UNITS 21 & 22 1" = 50'

a. File b. Mylars c. Redlines/Comments

d. Other _____
PRELIMINARY PROPOSED STORM DRAIN PLAN SANDIA HEIGHTS SOUTH
UNITS 21 & 22

Requested By: RESOURCE TECHNOLOGY **Phone No.:** 243-7300
Company

Anticipated Return Date: _____

Receipt Acknowledged

I here by accept full responsibility for the security of the above noted records/plans until return receipt acknowledgement is completed. Records/plans will be returned to the Development & Building Services Center on or before the indicated anticipated return date.

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Name: FRANK ROMERO Organization: ABQ BLUE
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Signed: Frank Romero Date: 7-28-97
Phone No. _____

Office Use Only

Return Acknowledged

Received by: K. Tsoflias Date: 7/30/97
Print

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Sandia Hts Units 21/22 ZONE ATLAS/DRNG. FILE #: D-23

DRB #: 92-237 EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: Tracts 1-A & 2 Sandia Heights Units 21&22

CITY ADDRESS: Tennyson & San Rafael

ENGINEERING FIRM: BOHANNAN HUSTON, INC. CONTACT: James Jaquelin

ADDRESS: 7500 JEFFERSON NE, ALBUQ. NM 87109 PHONE: 823-1000

OWNER: Century Real Estate Corp CONTACT: Lynn Johnson

ADDRESS: 10701 Montgomery NE PHONE: 275-1035

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- ✓ DRAINAGE REPORT
- ___ DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION
- ___ OTHER

PRE-DESIGN MEETING:

- ___ YES
- ___ NO
- ___ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SKETCH PLAT APPROVAL
- ✓ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D. APPROVAL
- ___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- ✓ BUILDING PERMIT APPROVAL
- ___ CERTIFICATE OF OCCUPANCY APPROVAL
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ S.A.D. DRAINAGE REPORT
- ___ DRAINAGE REQUIREMENTS
- ___ OTHER _____ (SPECIFY)

RECEIVED
AUG 5 1992
HYDROLOGY DIVISION

DATE SUBMITTED: 8/3/92

BY: James Jaquelin

REVISED

DRAINAGE REPORT
FOR
SANDIA HEIGHTS SOUTH
UNITS 21 AND 22

July 1992

PREPARED FOR:

CENTEX REAL ESTATE CORPORATION
10701 MONTGOMERY N.E.
ALBUQUERQUE, NEW MEXICO 87111

PREPARED BY:

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

RECEIVED
AUG 5 1992
HYDROLOGY DIVISION

RECEIVED
AUG 3 1992
HYDROLOGY DIVISION

JOB NO. 92182.03

PREPARED BY:

Kevin Patton 8/3/92
KEVIN PATTON DATE

UNDER THE SUPERVISION OF:

James Topmiller 7.31.92
JAMES TOPMILLER, P.E. DATE

JAMES R. TOPMILLER
NEW MEXICO
9354
REGISTERED PROFESSIONAL ENGINEER

PURPOSE OF REVISED REPORT

The purpose of this drainage report is to present historic and proposed drainage conditions for the area pertaining to this site to obtain preliminary and final plat approval. This report has been slightly revised and expanded from the preliminary report submitted with the County Subdivision Package to provide greater detail and additional calculations.

METHODOLOGIES

Site conditions will be analyzed for a 10-year and 100-year, 6-hour storm in accordance with the County of Bernalillo Drainage Ordinance and the City of Albuquerque proposed revisions to Section 22.2, Hydrology of the Development Process Manual (DPM), August 1991.

SITE DESCRIPTION AND CHARACTERISTICS

The site, Sandia Heights South, Units 21 and 22, is located on the southwest corner of Tramway Boulevard and San Rafael. The approximately 13.5 acre site proposes to be developed into 86 lots of single family dwelling units. The main road is oriented north/south through the site and will provide access from Tennyson Street. Tennyson Street provides the west boundary of the site and intersects San Rafael. San Rafael provides the north boundary of the site and intersects with Tramway Boulevard. Tramway Boulevard provides the east boundary of the site and is currently concluding reconstruction. We have coordinated the grading and drainage concepts of this plan with Tramway's concluding reconstruction.

The site area is currently vacant and consist of southwest desert vegetation. Site soils are classified by the SCS's "Soil Survey of Bernalillo County" as those within the Embudo-Tijeras Complex and Tijeras gravelly fine sandy loam, which consist of gravely sandy loam with medium to moderate runoff (class B) and the hazard of water erosion is moderate. The site is not located in a FEMA Floodway.

EXISTING HYDROLOGIC AND SITE DRAINAGE CONDITIONS

Existing site drainage is limited to that generated within the boundaries of the property being studied as well as three small offsite watersheds located at the eastern proposed property boundary and the recent reconstructed edge of pavement on Tramway Boulevard. An offsite watershed north of the proposed property boundary, in San Rafael right-of-way, contributes no flow to existing onsite watersheds but drains to a natural channel on the west side of Tennyson.

Two 24" diameter CMP's are currently placed across Tennyson Street just south of San Rafael. Currently, Basins A, B, and Offsite Basin 2 discharge approximately 5 cfs in a 10-year and 10 cfs in a 100-year 6-hour storm event into the culverts. This discharge, together with Offsite Basin 1, discharge approximately 7 cfs in a 10 year and 13 cfs in a 100-year 6-hour storm event into the existing natural arroyo west of Tennyson(note that these values do not include discharge that flowed to the existing CMP's from the east side of Tramway before reconstruction of Tramway Boulevard). Please refer to the enclosed sheet entitled "Existing Drainage Conditions.

The center portion of the undeveloped site (Basins C, D, E, F) and offsite Basin 3 generate approximately 8 cfs in the 10-year storm event and 20 cfs in the 100-year storm event and discharge to Tennyson Street and then westerly to vacant lands. Basin hydrology data and calculations may be found in Appendix A of this report.

The southerly site basins, Basins G, H,and Offsite Basin 4, drain directly to the Arroyo del Pino with total flows of 2.11 cfs and 4.38 cfs in the 10-year and 100-year storm events, respectively.

PROPOSED (DEVELOPED) HYDROLOGIC AND HYDRAULIC CONDITIONS

Please refer to the Proposed Terrain Management and Grading/Drainage Plan enclosed with this report.

In most cases, runoff from each residential lot will be collected in the public street and drained to the Tennyson access intersections at Del Rey and Santa Monica, where most of the flows are collected into drop inlets. The north Tennyson access intersection at Del Rey provides two inlets that collect and conveys a portion of the runoff (10 cfs) to the existing two 24" diameter CMP's, which in-turn discharge into the existing arroyo. According to the County of Bernalillo drainage files and Michael E. Beyer PE, the CMP's are allowed to carry an ultimate developed flow rate of 37.3 cfs(memo dated 3/09/92, Case No.: BP-91-393, Zone Map No.: D-22).

The residual flow (6.84 cfs) that bypasses the drop inlets at the north Tennyson access intersection (Del Rey) will, together with any flow from Tennyson Street itself, be collected in drop inlets located along the sag of Tennyson Street(approximately the same location as the two existing culverts). The southern Tennyson access intersection at Santa Monica provides three inlets that convey a collected portion of runoff (18 cfs) to a storm drain, which in-turn discharges to the Tramway/Arroyo del Pino crossing structure, south of the site. The residual flow (12.82 cfs) not collected in the drop inlets along the south Tennyson access intersection will, together with any direct flow from Tennyson Street, be substantially collected in drop inlets located in the Tennyson Street/San Antonio Drive intersection. This flow will then be discharged into the Arroyo del Pino via the proposed storm drain. Basin hydrology data and calculations may be found in the Appendix of this report.

LOT DRAINAGE

The lots along Tennyson Street will collect most of their drainage in a 2 ft wide, private V-Notch Ribbon Channel, located along the backyard privacy wall, which will then convey the runoff across property lines into a designated lot containing a Type 'D' drop inlet. The inlet will then convey the runoff to a sidewalk culvert onto Tennyson.

Three residential lots (Lot's 1, 2, 3) in the northeast section of the proposed Basin B will also drain much of their lot drainage (0.938 cfs) to a 2 ft wide, private V-Notch Ribbon Channel located along the backyard privacy wall. The channel will collect the runoff and convey it to the proposed roadway located north of the residential lots in question.

All remaining lots will drain to the street located directly in front of the lot.

STREET CAPACITY

Where shown on the plan, streets will carry flow to the proposed storm drain systems. Mountable curb will be used whenever flows will remain below the top of curb. Standard curb will be used where flows exceed the capacity of mountable curb. Please refer to Table 2 and the enclosed Grading/Drainage Plan.

In accordance with the Ordinance, 10-year event storm flows in Tennyson will remain at or below a depth of 0.5 feet. Storms larger than the 10-year event will be permitted to flow at a depth equal to the top of curb.

Intersections were also analyzed for adverse hydraulic jumps in the flow. All intersections are shown to contain flow within the curbs. Please refer to Table 1 for reference.

PROPOSED STORM DRAIN EXTENSION TO PINO ARROYO

As stated in previous sections, existing undeveloped site drainage flows substantially in a westerly direction, i.e., across Tennyson onto partially developed lands. The southern portion of the site drains directly to the Pino Arroyo. In accordance with County Drainage Ordinance Policy that requires discharge be restricted to meet downstream limitations, a storm drain system is proposed to collect and discharge the bulk of the site flow away from the mostly undeveloped lands west of Tennyson. The storm drain system, involving storm drain pipe sizes of 21", 24" and 42" RCP, will extend in Tennyson from Santa Monica Avenue to San Antonio, then east in an easement to Tramway right-of-way, and then south to the outlet wingwall of the Pino Arroyo/Tramway Crossing structure. Please refer to the enclosed preliminary storm drain plan sheet. The plan identifies the pipe flows and hydraulic grades proposed in the system. Calculations are found in the Appendix of this report. The system will outlet by direct connection to the north concrete wingwall of the Tramway crossing structure (5-10'x10' box culverts) at the Pino Arroyo. Discharge from this structure than drains to the Pino/Tramway dam, west of Tramway Boulevard.

The system alignment using Tramway Boulevard right-of-way, rather than proceeding southerly out of the San Antonio/Tennyson intersection, was selected out of necessity. This necessity arises from the current ownership of the property south of the mentioned intersection. Resolution Trust Corporation (RTC) currently controls this property and has had past drainage difficulties and differences of opinion with the County regarding this area. As no easement currently exists, it is considered improbable that an easement at this time could be obtained from RTC.

The only foreseen difficulty with the selected Tramway alignment is the presence of PNM transmission poles and anchor wires. However, ongoing talks with PNM's Mr. Blake Forbes appear to have solutions available for this difficulty by relocation of the anchors.

The alignment was discussed at the County Review Committee with no adverse comment.

The system was designed for pressure flow since little pipe slope is available. Accordingly, a selection of a beginning water surface elevation at the Pino Arroyo box culvert is necessary. An elevation of 6014 was selected which corresponds to the estimated normal depth of flow in the box culvert during the 100-year storm event, approximately four feet. The selection is considered reasonable and conservative since it is anticipated that the peak flow of the Pino Arroyo drainage basin system will occur significantly after the passage of the peak flow from the Units 21 and 22

storm drain system. The use of the four foot depth also nearly corresponds to the soffit of the 42" pipe exiting at the wingwall of the box culvert.

CONCLUSION

This report has presented a drainage management plan for the proposed Sandia Heights South Unit 21 & 22 Subdivision. The plan provides safe and adequate drainage protection for the proposed development. It is recommended that this plan be approved as requested.

TAB 9

POINT DESIGNATION	INTERSECTION	Q_{100} (CFS)	STREET WIDTH	SLOPE %	DEPTH (FT)	VELOCITY (FT/S)	FLOW AREA	FROUDE NUMBER	CRITICAL DEPTH	CRITICAL VELOCITY	FLOW CHARACTERISTIC	JUMP DEPTH	ENERGY (FT)	MAXIMUM WEIR FLOW RATE	
AP-1 UPSTREAM		13.80	32'	1%	0.405	2.63	5.28	1.13			SUPER-CRITICAL		0.51 **		
STREET B-UPSTREAM	#1	0.20	32'	2%	0.120	1.80	0.10	1.79			SUPER CRITICAL	NA	≈0.51		OK
STREET B- DOWN		14.00	32'	2%	0.498	4.39	3.16	1.64	0.42	2.42	SUPER CRITICAL			12.88	
														≈14.0	
STREET C- UP		5.70	32'	4.98	0.18	3.57	1.98	2.14			SUPER CRITICAL		0.38 **		
STREET B- DOWN	#2	5.70	32'	0.5	0.40	2.11	2.73	0.75	0.31	2.50	SUB CRITICAL		<0.50	12.88	OK
														>5.70	
NORTH INTERSECTION		6.84	44'	4%	0.274	3.84	1.71	2.08			SUPER CRITICAL		0.50		
TENNYSON-UP	#3	3.35	48'	0.542%	0.290	1.43	2.20	0.75			SUB CRITICAL		<0.50 **	35.04	
TENNYSON-DOWN		16.67	48'	0.318%	0.512	1.75	9.30	0.60	0.35	2.12	SUB CRITICAL			>16.67	OK
SOUTH INTERSECTION		12.82	32'	2.49%	0.347	3.63	3.50	2.66			SUPER CRITICAL		0.55 **		
TENNYSON-UP	#4	3.73	48'	0.879%	0.370	1.75	1.95	0.98			SUB CRITICAL		≈0.50	35.04	
TENNYSON-DOWN		20.75	48'	0.879%	0.568	2.74	7.13	1.09	0.41	2.36	SUPER CRITICAL			>20.75	OK

** does not cross 0.5' high crown in Tennyson

TO TOP OF CURB
WEIR COEIF = 3.33
VALUE IS GREATER IF ROW IS INCLUDED.

ANALYSIS POINT	DESCRIPTION OF POINT	Q_{100} cfs
AP-1	BASIN A	13.8
AP-2	1/4 BASIN B	4.21
AP-3	3/4 BASIN B	12.63
AP-4	BASIN H, (1/4) T2	2.26
AP-5	AP-3R'	2.63
AP-6	AP-2, AP-5, 1/2 T2, BASIN G, H	11.12
AP-7	BASIN F, 1/2 T1 (OFFSITE)	6.76
AP-8	AP-7, AP-6, 1/2 T1, 1/2 T2, *	30.86
AP-9	BASIN D	5.78
AP-10	1/2 BASIN C, BASIN A	19.42
AP-11	1/2 BASIN C'	6.62
AP-12	AP-10, 1/2 AP-9	22.31
AP-13	AP-12R	4.31
AP-14	BASIN E	2.51
AP-15		

* - REPRESENTS FLOW OF STORM DRAIN ENTERING POINT

R- DESIGNATES THE RESIDUAL FLOW AFTER INLETS HAVE TAKEN

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH UNIT 21 & 22 SHEET ____ OF ____

PROJECT NO. ____ BY K. PATTON DATE ____

SUBJECT INTERSECTION ANALYSIS CH'D ____ DATE ____

STREET CAPACITY SUMMARY - TABLE 2

internal streets

STREET	MINIMUM SLOPE	RESIDENTIAL LOTS AFFECTED	MAXIMUM FLOW RATE	CURB & GUTTER DESIGNATION	COMMENTS
C	0.5%	1-11	6.9 cfs	*MOUNTABLE	use mountable on west side only, use standard on east side for safety rsn
D	1.0%	23-32	13.8 cfs	MOUNTABLE	both sides of street
B	4.48%	79-86	4.42 cfs	MOUNTABLE	both sides street
A	0.5%	70-78	12.7 cfs	STANDARD LOTS 70-78	due to the 8% inclined street; use west side only
A	0.5%	12-19	12.7 cfs	MOUNTABLE LOTS 12-19	due to 3% incline on street; use east side only
A	0.87	66-69	4.14 cfs	MOUNTABLE LOTS 66-69	to conform w/ street section further down use STANDARD CURB
A	0.87	20-22	4.14 cfs	MOUNTABLE (20-22)	use mountable on east side only
A	2.00%	59-65	19.42 cfs	STANDARD (59-65)	west side only
SANTA MONICA	3.7%	33-41	5.78 cfs	MOUNTABLE	use mountable both sides
A	0.5%	52-58	5.62 cfs	STANDARD	west side only
A	0.5%	42-45	5.62 cfs	MOUNTABLE	east side only
A	3.76%	46-51	1.39 cfs	MOUNTABLE	use STANDARD C&G so as to conform w/ adjs

100-year storm value

see plan

on reach of street being analyzed

BOHANNAN-HUSTON INC.

PROJECT NAME Unit 21, 22 SHEET ____ OF ____

PROJECT NO. ____ BY Kevin P. DATE ____

SUBJECT Table 2 CH'D ____ DATE ____

APPENDIX A

EXISTING SITE CONDITIONS HYDROLOGY

PROPOSED CONDITIONS HYDROLOGY

STREET CAPACITY CHARTS

STORM SYSTEM HYDRAULIC CALCULATIONS

BACKYARD CHANNEL AND INLET DESIGN

CATCH BASIN DESIGN

EXISTING CONDITION

BASIN FLOW RATE ANALYSIS SUMMARY **

BASIN	AREA	Q_{10}	Q_{100}
A	0.966	0.851	2.11
B	3.114	2.74	6.81
C	1.688	1.49	3.69
D	2.534	2.23	5.54
E	2.88	2.54	6.30
F	1.10	0.969	2.41
G	0.339	0.299	0.742
H	0.909	0.8	1.99
OFF SITE 1	0.659	1.49	2.44
OFF SITE 2	0.255	0.576	0.944
OFF SITE 3	0.456	1.03	1.69
OFFSITE 4	0.445	1.01	1.65
		* 14.54	* 38.88

* The total does not include off site basin 1 because it does not cross the proposed property line.

** using new DPM hydrological procedures

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH UNIT 2 SHEET ____ OF ____

PROJECT NO. ____ BY ____ DATE ____

SUBJECT EXISTING CONDITIONS CH'D ____ DATE ____

EXISTING FLOW RATES

BASIN A

Total Area = 0.9660 acres
100% TREATMENT "A"

NOTE: SMALL WATERSHED (< 40ac)

Peak intensity and rational method coefficients are taken from the DPM section 22.2 August, 1991 Table 10 & 11

* 100 YR-STORM -6 HR
ZONE 4

$Q = CIA$

$C = 0.39$
$I = 5.61$ in/hr $\quad Q_{100} = 0.39(5.61)(.9660) = 2.1135$ cfs

$Q_{100} = 2.11$ cfs

* 10 YR-STORM 6-HR

$C = 0.23$
$I = 3.83$ in/hr $\quad Q_{10} = 0.23(3.83)(.9660) = 0.8509$ cfs

$Q_{10} = 0.851$ cfs

BASIN B

Total Area = 3.114 ac $\quad$ ZONE 4
100% TREATMENT "A"

* 100 YR-6 HR STORM
ZONE 4

$Q = CIA$

$C = 0.39$
$I = 5.61$ in/hr $\quad Q_{100} = 0.39(5.61)(3.114) = 6.8131$ cfs

$Q_{100} = 6.81$ cfs

* 10 YR-6 HR STORM

$C = 0.23$
$I = 3.83$ in/hr $\quad Q_{10} = 0.23(3.83)(3.114) = 2.7431$

$Q_{10} = 2.74$ cfs

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH SHEET 1 OF
PROJECT NO. C9218201 BY K. PATTON DATE 7/6/92

BASIN C

Total Area = 1.688 acres
100% TREATMENT "A"

* 100 YR - 6 HR STORM
ZONE 4

$Q = CIA$ $C = 0.39$, $I = 6.61$ in/hr

$Q_{100} = 0.39(6.61)(1.688) = 3.6932$ cfs

$Q_{100} = 3.69$ cfs

* 10 YR - 6 HR STORM

$C = 0.23$
$I = 3.83$ in/hr

$Q_{10} = 0.23(3.83)(1.688) = 1.487$ cfs

$Q_{10} = 1.49$ cfs

BASIN D

Total Area = 2.534 acres
100% TREATMENT "A"

* 100 YR - 6 HR STORM
ZONE 4

$Q = CIA$
$C = 0.39$
$I = 5.61$ in/hr

$Q_{100} = 0.39(5.61)(2.534) = 5.5441$ cfs

$Q_{100} = 5.54$ cfs

* 10 YR - 6 HR STORM

$C = 0.23$
$I = 3.83$ in/hr

$Q_{10} = 0.23(3.83)(2.534) = 2.2322$ cfs

$Q_{10} = 2.23$ cfs

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH SHEET 2 OF
PROJECT NO. BY DATE
SUBJECT UNIT-21 - EXISTING Q (cfs) CH'D DATE

BASIN E

Total Area = 2.88 acres
100% Treatment A

* 100 YR - 6 HR STORM
ZONE 4

$Q = CIA$ $C = 0.39$, $I = 5.61$ in/hr

$Q_{100} = 0.39(5.61)(2.88) = 6.3012$ cfs

$Q_{100} = 6.30$ cfs

* 10 YR - 6HR STORM

$C = 0.23$
$I = 3.83$ in/hr

$Q_{10} = 0.23(3.83)(2.88) = 2.5370$ cfs

$Q_{10} = 2.54$ cfs

BASIN F

Total Area = 1.10 acres
100% TREATMENT "A"

* 100 YR - 6 HR STORM

$Q = CIA$ $C = 0.39$
$I = 5.61$ in/hr

$Q_{100} = 0.39(5.61)(1.10) = 2.4067$ cfs

$Q_{100} = 2.41$ cfs

* 10 YR - 6 HR STORM

$C = 0.23$
$I = 3.83$ in/hr

$Q_{10} = 0.23(3.83)(1.10) = 0.969$ cfs

$Q_{10} = 0.969$ cfs

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHT SOUTH SHEET 3 OF
PROJECT NO. BY DATE
SUBJECT UNIT 21 EXISTING Q's CH'D DATE

EXISTING FLOW RATES

BASIN G

Total Area = 0.339 acres
100% Treatment "A"

* 100 YR - 6 HR STORM

$Q = CIA$ $C = 0.39$, $I = 5.61$ in/hr

$Q_{100} = 0.39(5.61)(0.339) = 0.7417$ cfs

$Q_{100} = 0.742$ cfs

* 10 YR - 6 HR STORM

$C = 0.23$, $I = 3.83$ in/hr

$Q_{10} = 0.23(3.83)(0.339) = 0.29866$ cfs

$Q_{10} = 0.299$ cfs

BASIN H

Total Area = 0.909 acres
100% Treatment "A"

* 100 YR - 6 HR STORM

$Q = CIA$ $C = 0.39$, $I = 5.61$

$Q_{100} = 0.39(5.61)(.909) = 1.99888$ cfs

$Q_{100} = 1.99$ cfs

* 10 YR - 6 HR STORM

$C = 0.23$, $I = 3.83$

$Q_{10} = 0.23(3.83)(.909) = 0.80007$

$Q_{10} = 0.8$ cfs

BOHANNAN-HUSTON INC.

PROJECT NAME SANOIA HEIGHTS SOUTH SHEET 4 OF

PROJECT NO. BY DATE

SUBJECT UNIT 21 EXISTING Q's CH'D DATE

EXISTING FLOW RATES

BASIN OFF SITE 1 - (unpaved road)

Total Area = 0.659

100% TREATMENT "C"

100 YR - 6 HR STORM

ZONE 4

$Q = CIA$ $C = 0.66$

$I = 5.61$

$Q_{100} = 0.66(5.61)(0.659) = 2.440$ cfs

$Q_{100} = 2.44$ cfs

10 YR - 6HR STORM

$C = 0.59$

$I = 3.83$

$Q_{10} = 0.59(3.83)(0.659) = 1.4891$ cfs

$Q_{10} = 1.49$ cfs

BASIN OFF SITE 2 - (unpaved shoulder) ROW

TOTAL AREA = 0.255 acres

100% TREATMENT "C"

100 YR - 6 HR STORM

$Q = CIA$ $C = 0.66$

$I = 5.61$

$Q_{100} = 0.66(5.61)(0.255) = 0.9442$ cfs

$Q_{100} = 0.944$ cfs

10 YR - 6 HR STORM

$C = 0.59$

$I = 3.83$

$Q_{10} = 0.59(3.83)(0.255) = 0.5762$ cfs

$Q_{10} = 0.576$ cfs

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH SHEET 5 OF

PROJECT NO. BY DATE

SUBJECT UNIT 21 - EXISTING Q CH'D DATE

BASIN OFFSITE 3 (Compound shoulder Row)

Total Area = 0.456 acres

100% Treatment "C"

* 100 YR - 6 HR STORM

$Q = CIA$ $C = 0.66$

$I = 5.61$ in/hr

$Q_{100} = 0.66(5.61)(0.456) = 1.68894$ cfs

$Q_{100} = 1.69$ cfs

* 10 YR - 6 HR STORM

$Q = CIA$ $C = 0.59$

$I = 3.83$ in/hr

$Q_{10} = 0.59(3.83)(0.456) = 1.0304$ cfs

$Q_{10} = 1.03$ cfs

OFFSITE BASIN 4

TOTAL AREA =

~100% TREATMENT "C"

100 YR - 6 HR STORM

$Q = CIA$ => $C = 0.66$ $I = 5.61$ in/hr $Q_{100} = 1.6477$ cfs

10 YR - 6 HR STORM

$C = 0.59$ $I = 3.83$ in/hr $Q_{10} = 1.0056$

$Q_{100} = 1.648$ cfs

$Q_{10} = 1.006$ cfs

TREATMENT "C" - "...unpaved roads; native grass, weed and shrub areas w/ clay or clay loam soil and other soil of very low permeability..."

TREATMENT "A" - "soil uncompacted by human activity w/ 0-10% slopes; unlined arroyos..."

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH SHEET 6 OF

PROJECT NO. C9218201 BY DATE

SUBJECT UNIT 21 EXISTING Q CH'D DATE

PROPOSED CONDITIONS HYDROLOGY

PROPOSED CONDITION
BASIN FLOW RATES

BASIN	AREA	Q_{10}	Q_{100}
A	3.08	8.88	13.80
B	3.76	10.84	16.84
C	2.51	7.24	11.24
D	1.29	3.72	5.78
E	0.56	1.62	2.51
F	0.58	1.67	2.60
G	0.21	0.60	0.93
H	0.26	0.75	1.16
I	0.31	0.89	1.39
J	0.23	0.66	1.03
K	0.31	0.89	1.39
L	0.31	0.90	1.40
OFF SITE 1P	0.659	2.27	3.36
OFF SITE 2	0.255	0.58	0.95
OFF SITE 3	0.456	1.03	1.70
TENNYSON 1P	0.312	1.07	1.59
TENNYSON 2P	0.859	2.95	4.88
TENNYSON 3P	0.720	2.48	3.67
TENNYSON 4P	0.61	1.75	2.60
TOTAL		50.79 cfs	78.32 cfs

BOHANNAN-HUSTON INC.

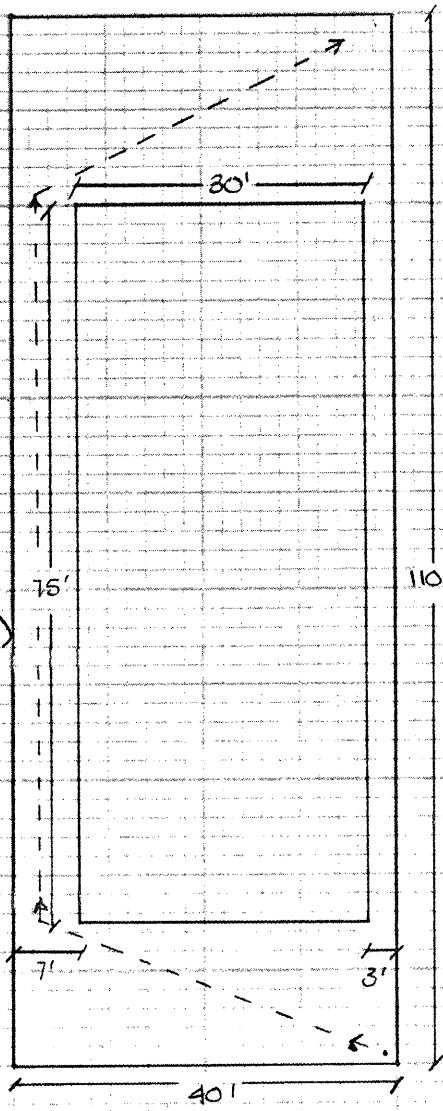
PROJECT NAME SANDIA HEIGHTS SOUTH UNIT 2I SHEET ____ OF ____
PROJECT NO. ____ BY G.PATTON DATE ____
SUBJECT PROPOSED FLOW RATES CH'D ____ DATE ____

TYPICAL LOT
40' x 110'

TYPICAL PAD
30' x 75'

ZONE 4

$I = 5.61 \,//\, 3.83$ in/hr
(100 YR / 10 YR)



LOT AREA = 4400 SF (0.1101 acres)

PAD AREA = 2250 SF (0.0517 ac)
2150 SF (0.0494 ac)

$\frac{2250}{4400} = 0.5114$ 51%

$\frac{2150}{4400} = 0.4886$ 49%

51% Treatment "D"
49% Treatment "B"

Treatment "D"
$E = 2.64 \,//\, 1.69$
$C = 0.94 \,//\, 0.93$

Treatment "B"
$E = 1.08 \,//\, 0.46$
$C = 0.52 \,//\, 0.38$

WEIGHTED E (100yr/10yr)

$E_W = \frac{(0.0517)(2.64) + (0.0494)(1.08)}{.1101}$

$E_W = 1.88 \,//\, 1.09$

100 YR - 6 HR STORM

Volume = $(1.88/12)(.1101) = \underline{0.0158}$ acre-ft (V_{360})

$Q_{100} = CIA = 5.61[0.94(.0517) + 0.52(.0494)] = \underline{0.4167}$ cfs (Q_{100})

10 YR - 6 HR STORM

Volume = $(1.09/12)(.1101) = 0.0092$ acre-ft (V_{360})

$Q_{10} = CIA = 3.83[0.93(0.0517) + 0.38(0.0494)] = 0.2560$ cfs (Q_{10})

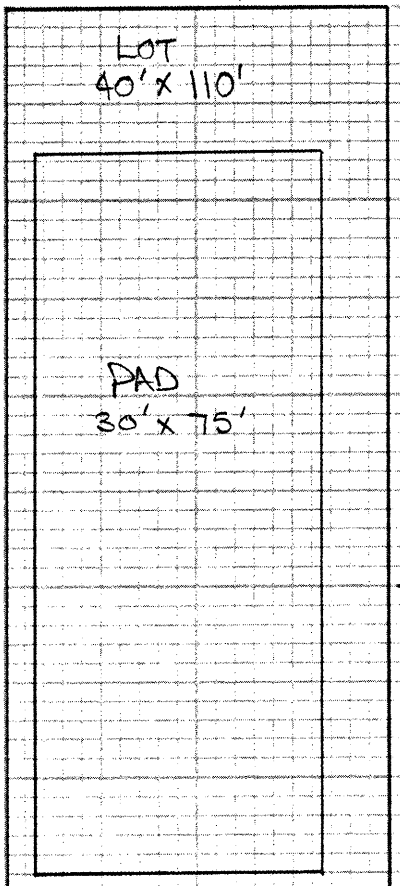
BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH SHEET ____ OF ____

PROJECT NO. ____ BY K. PATTON DATE 7/6/92

SUBJECT LOT FLOW RATES CH'D ____ DATE ____

PROPOSED FLOW RATES



TOTAL AREA OF SUBDIVISION = 13.42 acres ZONE 4
DPM SECTION 22.2, AUGUST 1991, TABLE 5
PERCENT TREATMENT 'D' = 60%
MULTIPLE UNIT RESIDENTIAL - DETACHED
Includes local streets

THE REMAINING TREATMENT IS ASSUMED TO BE
½ TREATMENT 'B' ~ 20%
½ TREATMENT 'C' ~ 20%

TREATMENT 'D' = 13.42 (.60) = 8.052 acres
TREATMENT 'B' = 13.42 (.20) = 2.684 acres
TREATMENT 'C' = 13.42 (.20) = 2.684 acres

PEAK DISCHARGE - Q_P

USING T_c = 12 min (small watersheds) and TABLE 9 FROM DPM SECTION 22.2

100 YR - 6 HR STORM

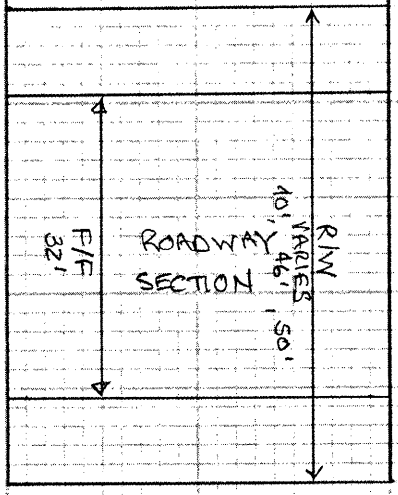
$Q_{P_{100}} = 5.25(8.052) + 2.92(2.684) + 3.73(2.684) = 60.122$ cfs

10 YR - 6 HR STORM

$Q_{P_{10}} = 3.57(8.052) + 1.45(2.684) + 2.26(2.684) = 38.703$ cfs

BASIN FLOW RATES ARE:

BASIN	AREA (ac)	Q_{10} (cfs)	Q_{100} (cfs)
A	3.08	8.88	13.80
B	3.76	10.84	16.84
C	2.51	7.24	11.24
D	1.29	3.72	5.78
E	0.56	1.62	2.51
F	0.58	1.67	2.60
G	0.21	0.60	0.93
H	0.26	0.75	1.16
I	0.31	0.89	1.39
J	0.23	0.66	1.03
K	0.31	0.89	1.39
L	0.31	0.90	1.40



BASIN TENNYSON	AREA	Q_{10}	Q_{100}
1	0.3122	1.07	1.59
2	0.1859	2.95	4.38

90% TREATMENT 'D'
10% TREATMENT 'C'

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH UNIT 1 SHEET ____ OF ____
PROJECT NO. ____ BY K PATTON DATE ____
SUBJECT PROPOSED BASIN FLOW RATES CH'D ____ DATE ____

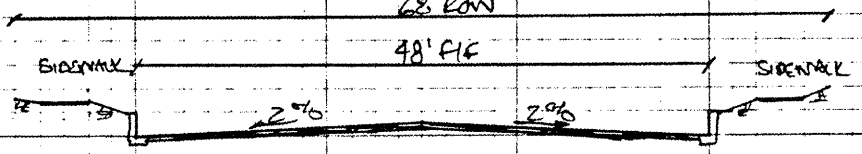
STREET CAPACITY CHARTS

TYPICAL STREET CROSS-SECTIONS AND GRADES
STREET CAPACITY ANALYSIS TABLES

STREET CAPACITY CHARTS

TYPICAL STREET CROSS-SECTIONS AND GRADES

TENNYSON

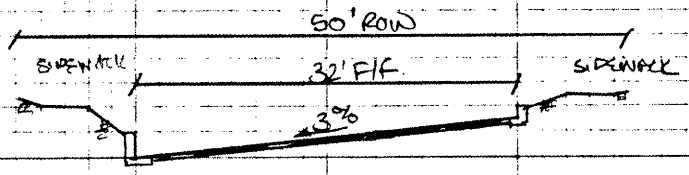


GRADES ALONG TENNYSON

0.635 %
0.318 %
0.879 %

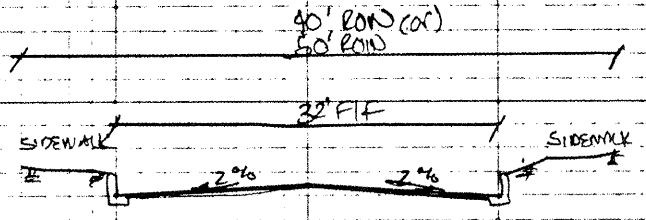
Grades are determined by County of Bernalillo

SUBDIVISION



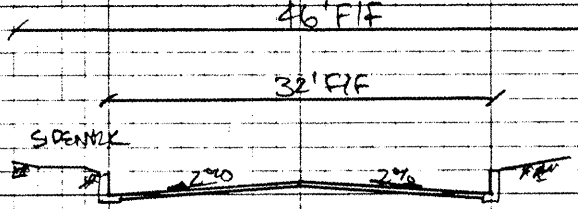
Grades along Subdivision

0.6 %
0.87 %
2.00 %
3.76 %



Grades along Subdivision

1.48 %
3.70 %
1.00 %
2.49 %



Grades along Subdivision

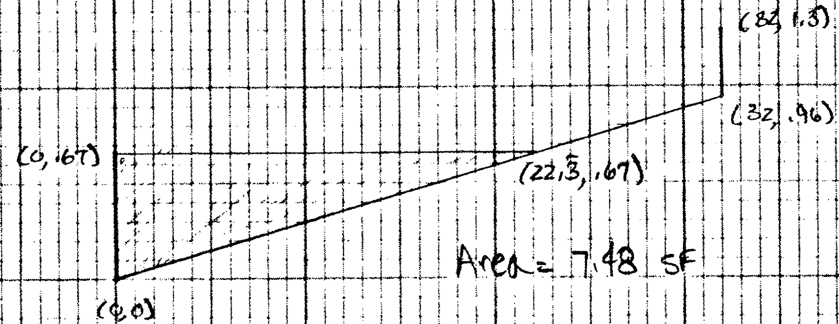
2.48 %
0.50 %

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

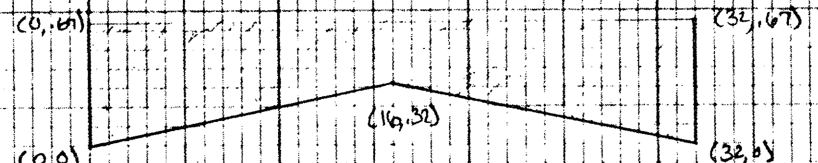
SUBJECT _____ CH'D _____ DATE _____



Area = 7.48 SF

$Yh = \frac{7.48}{22.\bar{3}} = 0.335$

TYPICAL ALONG STREET D IN TABLE



Area = 16.82 SF

$Yh = \frac{16.32}{32} = 0.51$

$NF = \frac{V}{(g\,Yh)^{1/2}}$

$Yh = \frac{A}{T}$

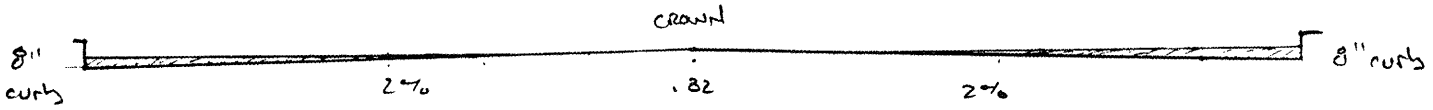
STREET CAPACITY ANALYSIS

SANDIA HEIGHTS SOUTH UNIT 21 - 46' R/W; 32 F/F; SLOPE = 0.5%

MANNING'S N = .0170 SLOPE = .0050

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	32.00	0.67
2	0.10	0.00	4	31.90	0.00			

WSEL	(FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.067	0.1	0.1	0.2	0.1	6.8	0.6	6.7
0.134	0.1	0.1	0.9	0.9	13.6	1.0	13.4
0.201	0.2	0.2	2.0	2.7	20.4	1.3	20.0
0.268	0.3	0.3	3.6	5.7	27.2	1.6	26.7
0.335	0.3	0.3	5.6	10.7	32.5	1.9	31.9
0.402	0.4	0.4	7.7	18.3	32.6	2.4	31.9
0.469	0.5	0.5	9.9	27.4	32.8	2.8	31.9
0.536	0.5	0.5	12.0	37.9	32.9	3.2	32.0
0.603	0.6	0.6	14.1	49.7	33.0	3.5	32.0
0.670	0.7	0.7	16.3	62.7	33.2	3.8	32.0



SANDIA HEIGHTS SOUTH UNIT 21 - 50' R/W; 32 F/F; SLOPE = 1.0%

MANNING'S N = .0170 SLOPE = .0100

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	32.00	0.67
2	0.10	0.00	4	31.90	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.067 0.1	0.1	0.2	0.2	6.8	0.9	6.7
0.1	0.1	0.9	1.3	13.6	1.4	13.4
0.2	0.2	2.0	3.8	20.4	1.9	20.0
0.3	0.3	3.6	8.1	27.2	2.3	26.7
0.335 0.3	0.3	5.6	15.1	32.5	2.7	31.9
0.4	0.4	7.7	25.8	32.6	3.3	31.9
0.5	0.5	9.9	38.7	32.8	3.9	31.9
0.5	0.5	12.0	53.6	32.9	4.5	32.0
0.6	0.6	14.1	70.2	33.0	5.0	32.0
0.670 0.7	0.7	16.3	88.6	33.2	5.4	32.0

SANDIA HEIGHTS SOUTH UNIT 21 - 46' R/W; 32 F/F; SLOPE = 2.48%

MANNING'S N = .0170 SLOPE = .0248

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	32.00	0.67
2	0.10	0.00	4	31.90	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.067	0.067	0.2	0.3	6.8	1.4	6.7
0.134	0.134	0.9	2.0	13.6	2.2	13.4
0.201	0.201	2.0	5.9	20.4	2.9	20.0
0.268	0.268	3.6	12.8	27.2	3.6	26.7
0.335	0.335	5.6	23.7	32.5	4.3	31.9
0.402	0.402	7.7	40.7	32.6	5.3	31.9
0.469	0.469	9.9	61.0	32.8	6.2	31.9
0.536	0.536	12.0	84.3	32.9	7.0	32.0
0.603	0.603	14.1	110.6	33.0	7.8	32.0
0.670	0.670	16.3	139.5	33.2	8.6	32.0

SANDIA HEIGHTS SOUTH UNIT 21 - 50' R/W; 32 F/F; SLOPE = 4.48%

MANNING'S N = .0170 SLOPE = .0448

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	32.00	0.67
2	0.10	0.00	4	31.90	0.00			

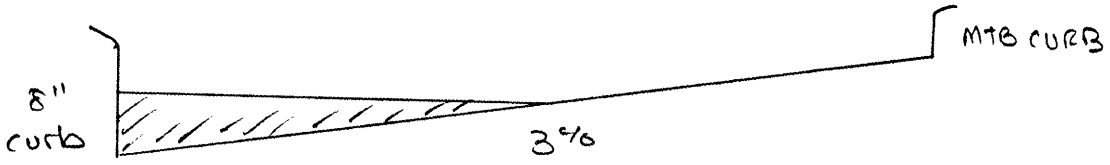
WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1 .067	0.1	0.2	0.4	6.8	1.9	6.7
0.1 .134	0.1	0.9	2.7	13.6	3.0	13.4
0.2 .201	0.2	2.0	8.0	20.4	4.0	20.0
0.3 .268	0.3	3.6	17.1	27.2	4.8	26.7
0.3 .335	0.3	5.6	31.9	32.5	5.7	31.9
0.4 .402	0.4	7.7	54.6	32.6	7.1	31.9
0.5 .469	0.5	9.9	81.9	32.8	8.3	31.9
0.5 .536	0.5	12.0	113.4	32.9	9.4	32.0
0.6 .603	0.6	14.1	148.6	33.0	10.5	32.0
0.7 .670	0.7	16.3	187.5	33.2	11.5	32.0

SANDIA HEIGHTS SOUTH UNIT 21 - 50' R/W; 32 F/F; SLOPE=0.5%

MANNING'S N = .0170 SLOPE = .0050

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	31.90	0.96			
2	0.10	0.00	4	32.00	1.63			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.067	0.067	0.1	0.0	2.3	0.6	2.2
0.134	0.134	0.3	0.3	4.6	1.0	4.5
0.201	0.201	0.7	0.9	6.9	1.3	6.7
0.268	0.268	1.2	1.9	9.2	1.6	8.9
0.335	0.335	1.9	3.4	11.4	1.8	11.1
0.402	0.402	2.7	5.6	13.7	2.1	13.4
0.469	0.469	3.7	8.5	16.0	2.3	15.6
0.536	0.536	4.8	12.1	18.3	2.5	17.8
0.603	0.603	6.0	16.5	20.6	2.7	20.1
0.670	0.670	7.5	21.9	22.9	2.9	22.3



SANDIA HEIGHTS SOUTH UNIT 21 - 50' R/W; 32 F/F; SLOPE=0.87%

MANNING'S N = .0170 SLOPE = .0087

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	31.90	0.96			
2	0.10	0.00	4	32.00	1.63			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1 0.067	0.1	0.1	0.1	2.3	0.8	2.2
0.1	0.1	0.3	0.4	4.6	1.3	4.5
0.2	0.2	0.7	1.2	6.9	1.7	6.7
0.3	0.3	1.2	2.5	9.2	2.1	8.9
0.3 0.335	0.3	1.9	4.5	11.4	2.4	11.1
0.4	0.4	2.7	7.4	13.7	2.7	13.4
0.5	0.5	3.7	11.2	16.0	3.0	15.6
0.5	0.5	4.8	15.9	18.3	3.3	17.8
0.6	0.6	6.0	21.8	20.6	3.6	20.1
0.7 0.67	0.7	7.5	28.9	22.9	3.9	22.3

SANDIA HEIGHTS SOUTH UNIT 21 - 50' R/W; 32 F/F; SLOPE=2.0%

MANNING'S N = .0170 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	31.90	0.96			
2	0.10	0.00	4	32.00	1.63			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.1	0.1	2.3	1.3	2.2
0.1	0.1	0.3	0.6	4.6	2.0	4.5
0.2	0.2	0.7	1.8	6.9	2.6	6.7
0.3	0.3	1.2	3.8	9.2	3.2	8.9
0.3	0.3	1.9	6.9	11.4	3.7	11.1
0.4	0.4	2.7	11.2	13.7	4.2	13.4
0.5	0.5	3.7	16.9	16.0	4.6	15.6
0.5	0.5	4.8	24.1	18.3	5.1	17.8
0.6	0.6	6.0	33.0	20.6	5.5	20.1
0.7	0.7	7.5	43.8	22.9	5.9	22.3

0.1067

0.1335

0.1670

SANDIA HEIGHTS SOUTH UNIT 21 - 50' R/W; 32 F/F; SLOPE=3.76%

MANNING'S N = .0170 SLOPE = .0376

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	31.90	0.96			
2	0.10	0.00	4	32.00	1.63			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1 0.067	0.1	0.1	0.1	2.3	1.7	2.2
0.1	0.1	0.3	0.8	4.6	2.7	4.5
0.2	0.2	0.7	2.4	6.9	3.6	6.7
0.3	0.3	1.2	5.2	9.2	4.4	8.9
0.3 0.335	0.3	1.9	9.5	11.4	5.1	11.1
0.4	0.4	2.7	15.4	13.7	5.7	13.4
0.5	0.5	3.7	23.2	16.0	6.3	15.6
0.5	0.5	4.8	33.1	18.3	6.9	17.8
0.6	0.6	6.0	45.3	20.6	7.5	20.1
0.7 0.167	0.7	7.5	60.0	22.9	8.0	22.3

SANDIA HEIGHTS SOUTH UNIT 21 - ~~50'~~ 40' R/W; 32 F/F; SLOPE=3.7%

MANNING'S N = .0170 SLOPE = .0370

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	16.00	0.32	5	32.00	0.67
2	0.10	0.00	4	31.90	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1 0.067	0.1	0.2	0.4	6.8	1.7	6.7
0.1	0.1	0.9	2.5	13.6	2.7	13.4
0.2	0.2	2.0	7.2	20.4	3.6	20.0
0.3	0.3	3.6	15.6	27.2	4.4	26.7
0.3 0.335	0.3	5.6	29.0	32.5	5.2	31.9
0.4	0.4	7.7	49.7	32.6	6.4	31.9
0.5	0.5	9.9	74.5	32.8	7.6	31.9
0.5	0.5	12.0	103.0	32.9	8.6	32.0
0.6	0.6	14.1	135.1	33.0	9.6	32.0
0.7 0.67	0.7	16.3	170.4	33.2	10.5	32.0

STORM SYSTEM HYDRAULIC CALCULATIONS

HYDRAULIC GRADE LINE TABLE
DETERMINATION OF WATER SUFACE LEVEL @ ARROYO DEL PINO
DEPTH OF FLOW CALCLATIONS ALONG TENNYSON - 10 YR 6 HR STORM
INLET DETERMINATION FOR 10 YR 6 HR STORM
GRATE CAPACITY OF INLETS @ TENNYSON INTERSECTIONS
WEIR ANALYSIS OF TENNYSON STREET FROM 100 YR 6 HR STORM
OPEN CHANNEL ANALYSIS TABLE OF TENNYSON @ 0.318% GRADE

MAIN LINE HYDRAULIC MODEL

SUMMARY OF HYDRAULIC CALCULATION
SANDIA HEIGHTS SOUTH UNITS 21 AND 22

ASSUMED WATER SURFACE ELEV. @ BOX CULVERT

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)	JUNCTION Dia. 3	JUNCTION Dia. 3 area	JUNCTION Dia.1&2 (hidden)	JUNCTION Angle
0+00	ARROYO											0.00	0.00	0.00	0.00	0.00		6014.00	6018.00	0.29	6014.29	6014.29	0.00	0.00		0.00
		42	41.5	9.62	4.31	1006	0.0017	155.00			0.26					0.26										
1+55	MH #5								42	15		0.02	0.00	0.01	0.00	0.04	6014.26	6014.30	6016.80	0.29	6014.55	6014.59	0.00	0.00		0.00
		42	41.5	9.62	4.31	1006	0.0017	255.00			0.43					0.43										
4+10	MH #4								42	85		0.06	0.00	0.01	0.00	0.07	6014.73	6014.81	6021.00	0.29	6015.02	6015.09	0.00	0.00		0.00
		42	41.5	9.62	4.31	1006	0.0017	45.00			0.08					0.08										
4+55	JUNCTION								42	0		0.00	0.03	0.00	0.00	0.03	6014.88	6014.95	6017.00	0.25	6015.17	6015.20	18.00	1.77		45.00
		42	39.0	9.62	4.05	1006	0.0015	170.00			0.25					0.25										
6+25	JUNCTION								42	0		0.00	0.00	0.00	0.00	0.00	6015.20	6015.39	6017.55	0.06	6015.46	6015.46	24.00	3.14		45.00
		42	19.2	9.62	2.00	1006	0.0004	15.00			0.01					0.01										
6+40	MH #3								24	90		0.05	0.00	0.01	0.05	0.12	6015.40	6015.00	6017.55	0.58	6015.46	6015.58	0.00	0.00		0.00
		24	19.2	3.14	6.11	226	0.0072	65.00			0.47					0.47										
7+05	JUNCTION								24	0		0.00	0.08	0.00	0.00	0.08	6015.47	6015.61	6027.90	0.51	6016.05	6016.12	18.00	1.77		45.00
		24	18.0	3.14	5.73	226	0.0063	460.00			2.91					2.91										
11+65	MH #2								21	90		0.14	0.00	0.03	0.01	0.18	6018.53	6018.35	6028.30	0.87	6019.04	6019.22	0.00	0.00		0.00
		21	18.0	2.41	7.48	158	0.0129	30.00			0.39					0.39										
11+95	INLET								18	0		0.00	0.00	0.04	0.00	0.04	6018.73	6018.81	6028.30	0.84	6019.60	6019.65	0.00	0.00		0.00
		18	13.0	1.77	7.36	105	0.0153	15.00			0.23					0.23										

Mannings "n" = 0.013

JUNCTION

HYDRAULIC OF MAIN LINE (up to Sta. 6+25) AND 24" CONNECTOR

SUMMARY OF HYDRAULIC CALCULATION
HGL @ JUCTION @ TENNYSON (EAST OF)

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)	JUNCTION Dia. 3	JUNCTION Dia. 3 area	JUNCTION Dia.1&2 (hidden)	JUNCTION Angle
0+00	ARROYO											0.00	0.00	0.00	0.00	0.00		6014.00	6018.00	0.29	6014.29	6014.29	0.00	0.00		0.00
		42	41.5	9.62	4.31	1006	0.0017	155.00			0.26					0.26										
1+55	MH #5								42	15		0.02	0.00	0.01	0.00	0.04	6014.26	6014.30	6016.80	0.29	6014.55	6014.59	0.00	0.00		0.00
		42	41.5	9.62	4.31	1006	0.0017	255.00			0.43					0.43										
4+10	MH #4								42	85		0.06	0.00	0.01	0.00	0.07	6014.73	6014.81	6021.00	0.29	6015.02	6015.09	0.00	0.00		0.00
		42	41.5	9.62	4.31	1006	0.0017	45.00			0.08					0.08										
4+55	JUNCTION								42	0		0.00	0.03	0.00	0.00	0.03	6014.88	6014.95	6017.00	0.25	6015.17	6015.20	18.00	1.77		45.00
		42	39.0	9.62	4.05	1006	0.0015	170.00			0.25					0.25										
6+25	JUNCTION								24	0		0.00	0.37	0.00	0.02	0.38	6015.20	6015.22	6017.55	0.61	6015.46	6015.84	42.00	9.62		45.00
		24	19.8	3.14	6.29	226	0.0076	15.00			0.11					0.11										
6+40	INLET #1								24	45		0.06	0.00	0.00	0.00	0.06	6015.34	6015.40	6017.55	0.61	6015.95	6016.01	0.00	0.00		0.00
		24	19.8	3.14	6.29	226	0.0076	0.00			0.00					0.00										

LOCATED IN TENNYSON

REFER TO PLAN AND PROFILE SHEET OF STORM DRAIN.
(Preliminary Storm Drain Plan)

CBC ANALYSIS - STORM DRAIN EXIT INTO WINGWALL OF SOUTH ARROYO DEL PINO

MANNING'S N = .0170 SLOPE = .0318 SEE ENCLOSE_PLAN & PROFILE

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	10.00	3	10.00	0.00			
2	0.01	0.00	4	10.01	10.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.5	0.5	5.0	46.0	11.0	9.2	10.0
1.0	1.0	10.0	137.9	12.0	13.8	10.0
1.5	1.5	15.0	257.0	13.0	17.1	10.0
2.0	2.0	20.0	395.1	14.0	19.8	10.0
2.5	2.5	25.0	547.4	15.0	21.9	10.0
3.0	3.0	30.0	710.5	16.0	23.7	10.0
3.5	3.5	35.0	882.3	17.0	25.2	10.0
4.0	4.0	40.0	1061.1	18.0	26.5	10.0
4.5	4.5	45.0	1245.6	19.0	27.7	10.0
5.0	5.0	50.0	1434.9	20.0	28.7	10.0
5.5	5.5	55.0	1628.2	21.0	29.6	10.0
6.0	6.0	60.0	1825.0	22.0	30.4	10.0
6.5	6.5	65.0	2024.7	23.0	31.2	10.0
7.0	7.0	70.0	2226.9	24.0	31.8	10.0
7.5	7.5	75.0	2431.4	25.0	32.4	10.0
8.0	8.0	80.0	2637.9	26.0	33.0	10.0
8.5	8.5	85.0	2846.0	27.0	33.5	10.0
9.0	9.0	90.0	3055.7	28.0	34.0	10.0
9.5	9.5	95.0	3266.8	29.0	34.4	10.0
10.0	10.0	100.0	3479.1	30.0	34.8	10.0

2.93' ← 688 cfs

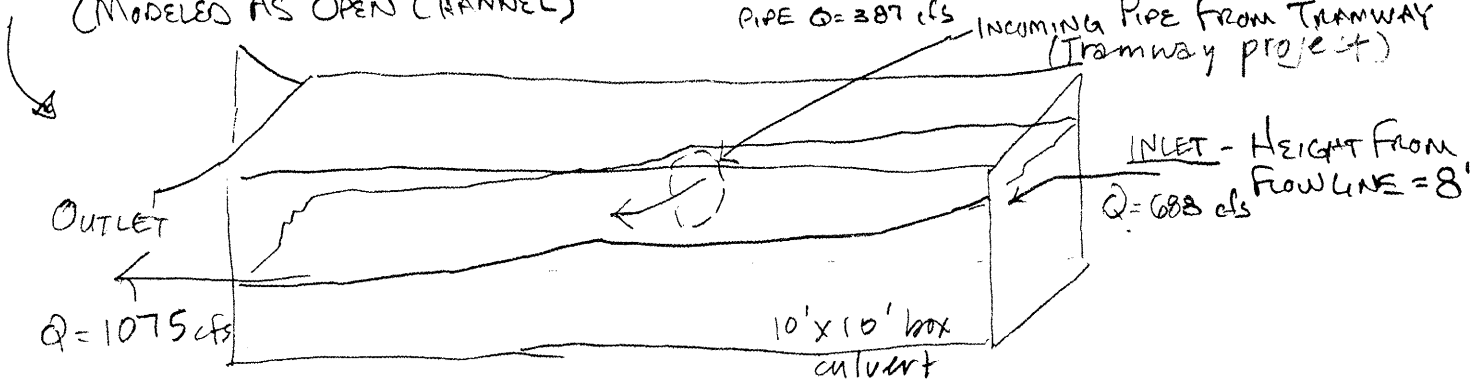
4.04' ← 1075 cfs

1 BARREL OF A 5 BARREL 10'x10'x720 CBC (BARREL # 5)

ASSUME HEIGHT OF WATER EXITING CBC = 4 ft (FROM ABOVE)

(MODELED AS OPEN CHANNEL)

HGL HEIGHT 8.05' FL = 8' FOR INCOMING PIPE



PEAK DISCHARGE ENTERING CBC WAS TAKEN FROM NMSHTD CONSTRUCTION PLANS (M-4067 (5)) TRAMWAY BOULEVARD SHEET 3-28

HGL ANALYSIS ON MAINLINE STORM DRAIN - BETWEEN MANHOLE #3 AND #2

SEE P&P SHEET.

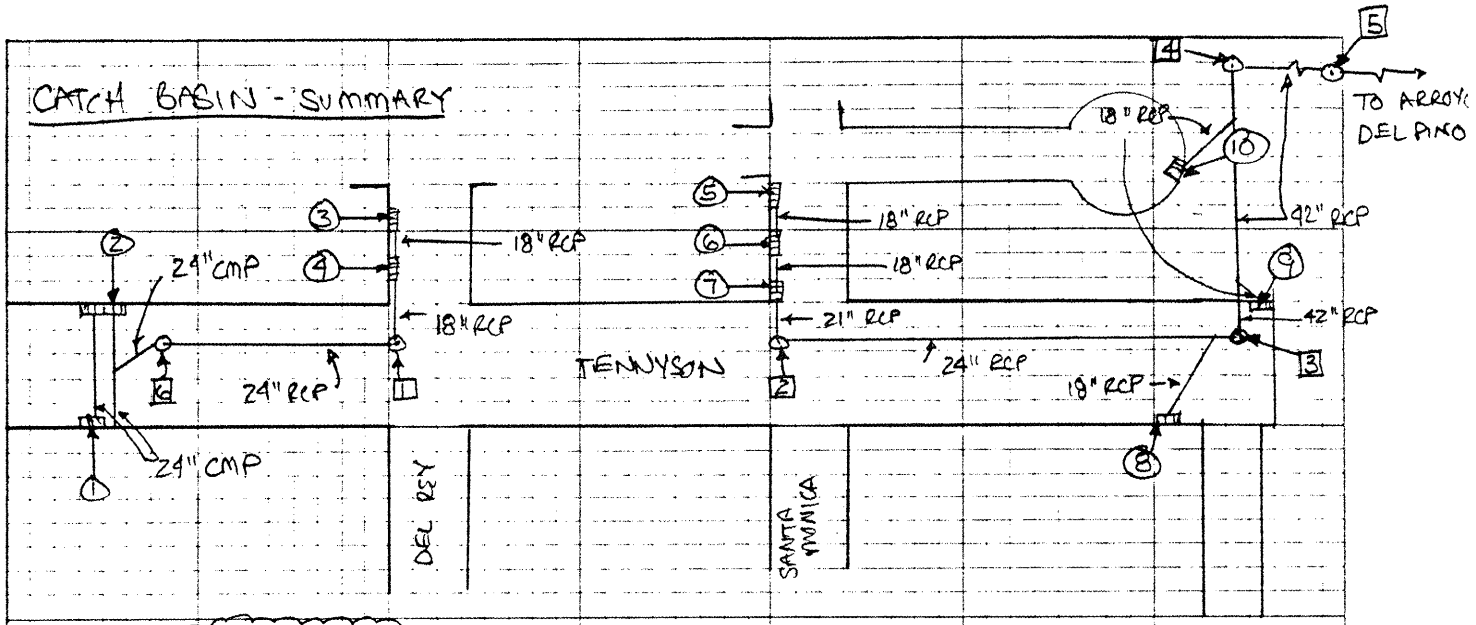
CULVERT RATING TABLE

24. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 1.00 SLOPE = 0.02200

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
1.00000	0.04479	0.10911	2.43623
2.00000	0.12504	0.47707	3.81529
3.00000	0.22665	1.11743	4.93012
4.00000	0.34416	2.02606	5.88693
5.00000	0.47417	3.19120	6.73014
6.00000	0.61418	4.59633	7.48364
7.00000	0.76224	6.22150	8.16208
8.00000	0.91669	8.04403	8.77510
9.00000	1.07605	10.03893	9.32940
10.00000	1.23901	12.17910	9.82969
11.00000	1.40432	14.43552	10.27935
12.00000	1.57079	16.77719	10.68070
13.00000	1.73727	19.17116	11.03523
14.00000	1.90258	21.58228	11.34370
15.00000	2.06554	23.97295	11.60616
16.00000	2.22490	26.30268	11.82195
17.00000	2.37935	28.52724	11.98953
18.00000	2.52741	30.59752	12.10629
19.00000	2.66742	32.45729	12.16803
20.00000	2.79743	34.03927	12.16806
21.00000	2.91494	35.25668	12.09518
22.00000	3.01655	35.98216	11.92825
23.00000	3.09680	35.97210	11.61588
24.00000	3.14159	33.55442	10.68071

CATCH BASIN - SUMMARY



10 INLETS
6 MANHOLES

INLET	TYPE	CONDITION	Q100
1	SINGLE 'C'	SUMP	3.0 cfs
2	DOUBLE 'C'	SUMP	17.88 cfs
3	SINGLE 'A'		6 cfs
4	SINGLE 'C'		4 cfs
5	SINGLE 'A'		7 cfs
6	SINGLE 'C'		6 cfs
7	SINGLE 'C'		5 cfs
8	SINGLE 'A'		1.12 cfs
9	DOUBLE 'C'	SUMP	19.76 cfs
10	SINGLE 'C'	SUMP	2.51 cfs

MANHOLE	TYPE
1	"C"
2	"C"
3	"E"
4	"E"
5	"E"
6	"C"

MANHOLE TYPES ARE AS FOLLOWS:

FROM RIM TO INVERT OF PIPE

<6' -> USE TYPE 'C'

>6' -> USE TYPE 'E'

FROM S.P.M.

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY C. PATTON DATE _____

SUBJECT _____ CH'D _____ DATE _____

PROPOSED FLOW ENTERING EXISTING CULVERT ON TENNYSON

CONTAINS BASINS

OFFSITE 1
TENNYSON 1
TENNYSON 2
BASIN B
BASIN F
BASIN G
BASIN H

} TOTAL FLOW RATES

Q_{10} = 20.13 cfs

Q_{100} = 30.82 cfs

ANALYSIS OF 10 YR STORM NOT TO EXCEED 0.5 FT ALONG CURB:

SLOPES ALONG TENNYSON & ANALYSIS ARE AS FOLLOWS:

SLOPE = 0.653 %

BASINS CONTAINED ARE: OFFSITE 1, TENNYSON 1, BASIN F

FLOW RATES: 2.27 + 1.07 + 1.67 = 5.01 cfs

From DPM 22.3 PLATE 22.3 D-3 STREET CAPACITY

48' STREET
68' ROW
2% CROWN
8" CURB
.017 N

½ street flow = 11 cfs < 5.01 OK

SLOPE = 0.318 %

BASINS CONTAINED ARE: TENNYSON 2, BASIN B, BASIN G, BASIN H

FLOW RATE: 2.95/2 + 10.84 + 0.60 + 0.75 = 13.67 cfs

FROM PLATE 22.3 D-3 STREET CAPACITY & STREAM PROGRAM

½ street flow = 7.55 cfs ← NG < 13.67 cfs

INSTALL INLETS

SLOPE = 0.542 %

BASINS CONTAINED ARE: SAME AS SLOPE 0.318 %

FLOW RATE = 15.14 cfs

FROM PLATE 22.3 D-3 STREET CAPACITY

½ STREET FLOW = 9.8 cfs < 15.14 NG INSTALL INLETS

AFTER INLETS @ INTERSECTION

slope = 0.318 % ½ street flow = 7.55 cfs > 6.03 cfs OK

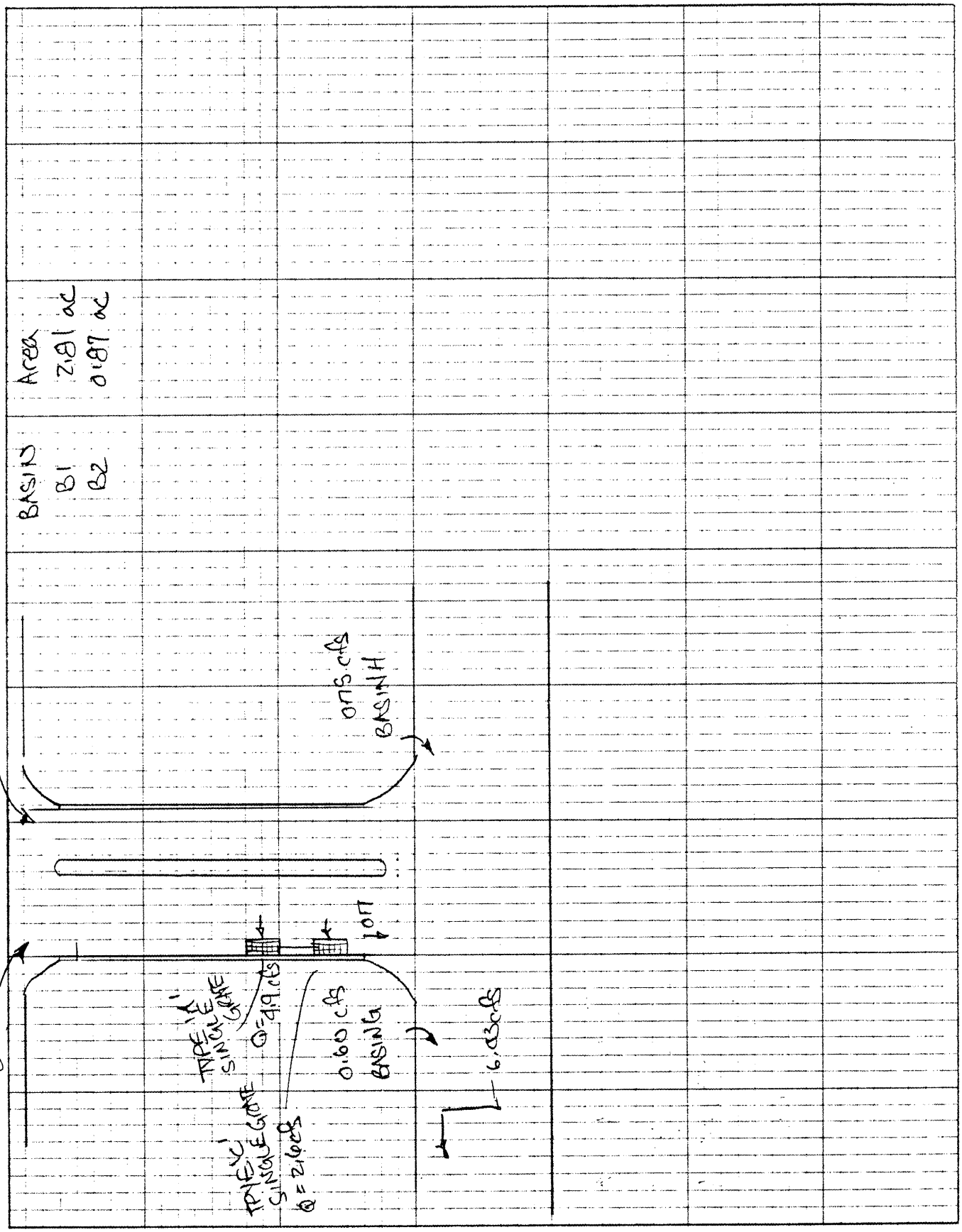
slope = 0.542 % ½ street flow = 9.8 cfs > 6.03 cfs OK

BOHANNAN-HUSTON INC.

PROJECT NAME SANDIA HEIGHTS SOUTH UNIT 21 SHEET _____ OF _____

PROJECT NO. _____ BY L. PATTON DATE _____

SUBJECT 10 YR - STORM / 0.5' max @ CURB CH'D _____ DATE _____



BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT INLET INSTALLED @ INTERSECTION CH'D _____ DATE _____

ANALYSIS OF 10 YR-STORM W/ STREET SLOPES ON TENNYSON

PURPOSE IS TO DETERMINE IF THE SLOPES ON TENNYSON WILL CONTAIN THE 10 YR STORM FLOW RATE @ A MAXIMUM HEIGHT NO GREATER THAN 0.5 FT ALONG CURB.

PLATE 22.3 D-3 FROM DPM MANUAL IS USED TO DETERMINE MAXIMUM ½ STREET FLOWS

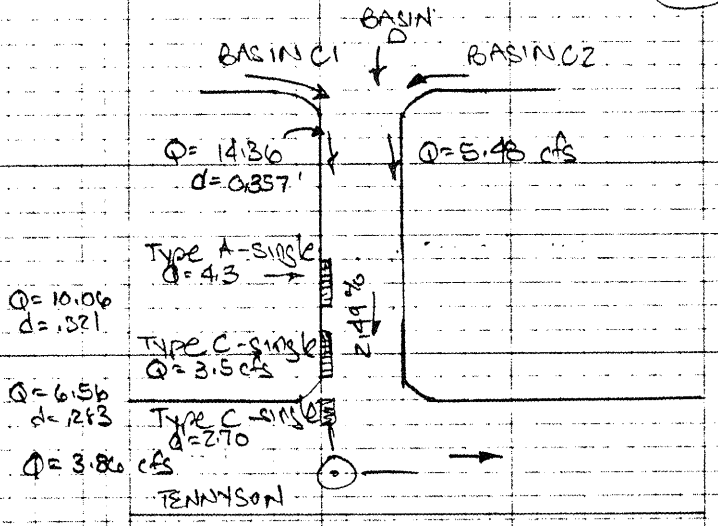
SLOPE = 0.879%

BASINS THAT EFFECT STREET SLOPE: BASIN A, BASIN C, BASIN D, BASIN I, BASIN J, ½ BASIN TENNYSON 3P

FLOW RATE = 8.88 + 7.24 + 3.72 + 0.89 + 0.66 + 1.24 = 22.63 cfs

FROM PLATE 22.3 D-3

½ STREET FLOW = 12.7 cfs < 22.63 (NG) → PROVIDE INLETS



AFTER INLETS

FLOW RATE ON TENNYSON = 3.86 + 5.48 + 0.89 + 0.66 + 1.24 = 12.13 cfs

½ STREET FLOW = 12.7 cfs > 12.13 cfs (OK)

SLOPE = 1.394%

BASINS THAT EFFECT SLOPE = BASIN A, C, D, I, J, ½ TENNYSON 3P, ½ TENNYSON 4P

FLOW RATE = 12.13 + 0.88 = 13.00 cfs

FROM PLATE 22.3 D-3 ½ STREET FLOW = 11.5 cfs > 13 cfs (OK)

SLOPE 3.96%

BASINS THAT EFFECT SLOPE = BASINS A, C, D, I, J, ½ TENNYSON 3P, 4P AND BASIN K

FLOW RATE = 13.00 + .89 = 13.89 cfs
½ STREET FLOW = 27 cfs > 13.89 (OK)

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

TENNYSON STREET

SANDIA HEIGHTS SOUTH UNIT 21, 68' R/W, 48' F/F

MANNING'S N = .0170 SLOPE = .0032

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	24.00	0.56	7	48.00	0.67
2	0.00	0.00	5	46.00	0.13			
3	2.00	0.13	6	48.00	0.00			

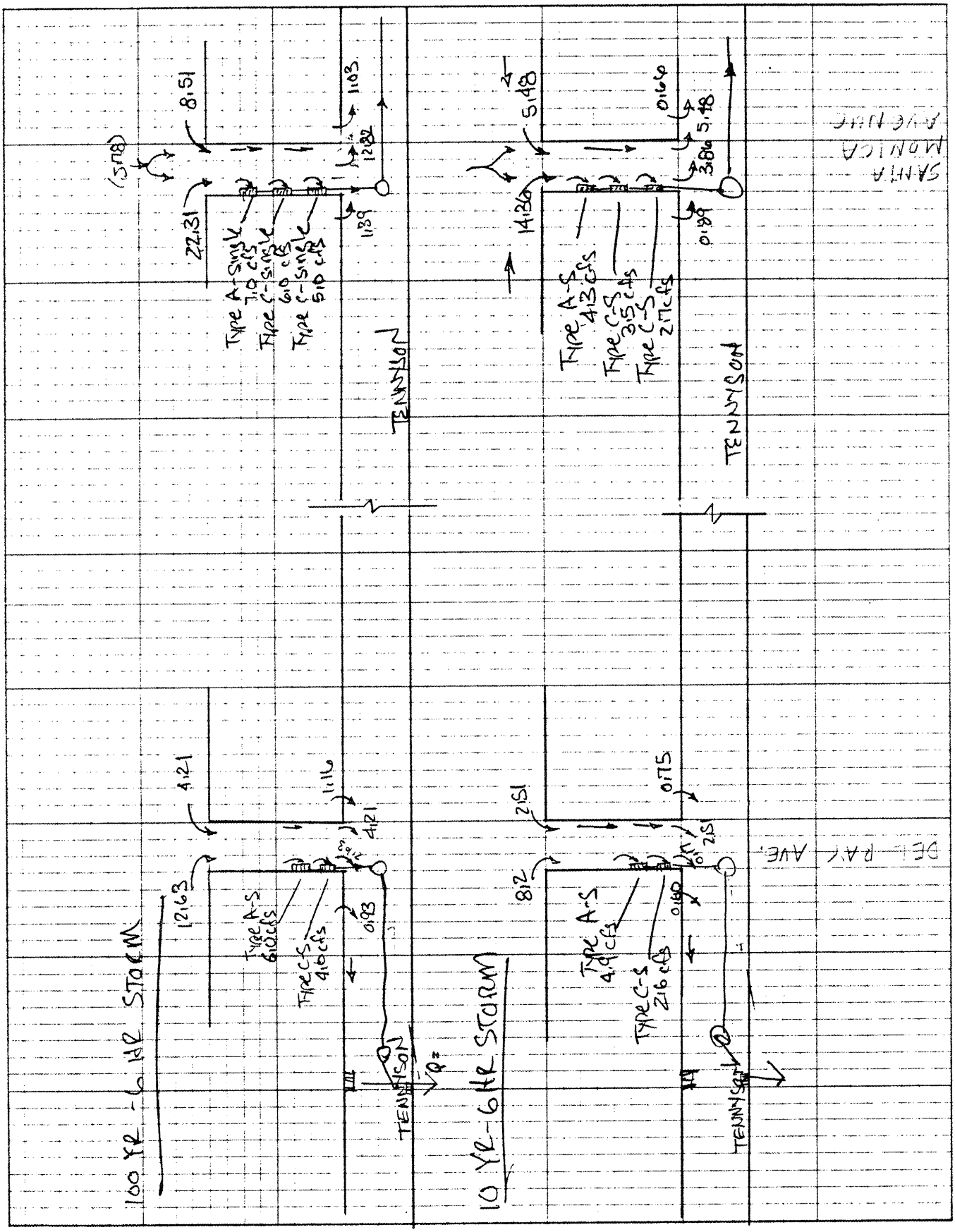
WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.2	0.1	3.4	0.6	3.2
0.2	0.2	0.8	0.7	11.9	0.8	11.5
0.3	0.3	2.5	2.8	22.1	1.1	21.5
0.4	0.4	5.1	7.4	32.3	1.4	31.5
0.5	0.5	8.8	15.1	42.5	1.7	41.5
0.6	0.6	13.4	27.6	49.2	2.1	48.0
0.7	0.7	16.7	40.1	49.4	2.4	48.0

includes both curbs flows

DURING A 10 YR-6 HR STORM,
MAX FLOW RATE ON TENNYSON W/ A STREET SLOPE @ 0.32%
AND A HEIGHT NOT TO EXCEED 0.5 FT $Q_{10} = 15.1$ cfs

1/2 STREET FLOW = 7.55 cfs

~ 85% of FLOW considered will be restricted to 1/2 of the street. (1/2 of the street flow on (TENNYSON) BASIN ONLY will flow to west side)



BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

STREET CAPACITY

10YR-6HR

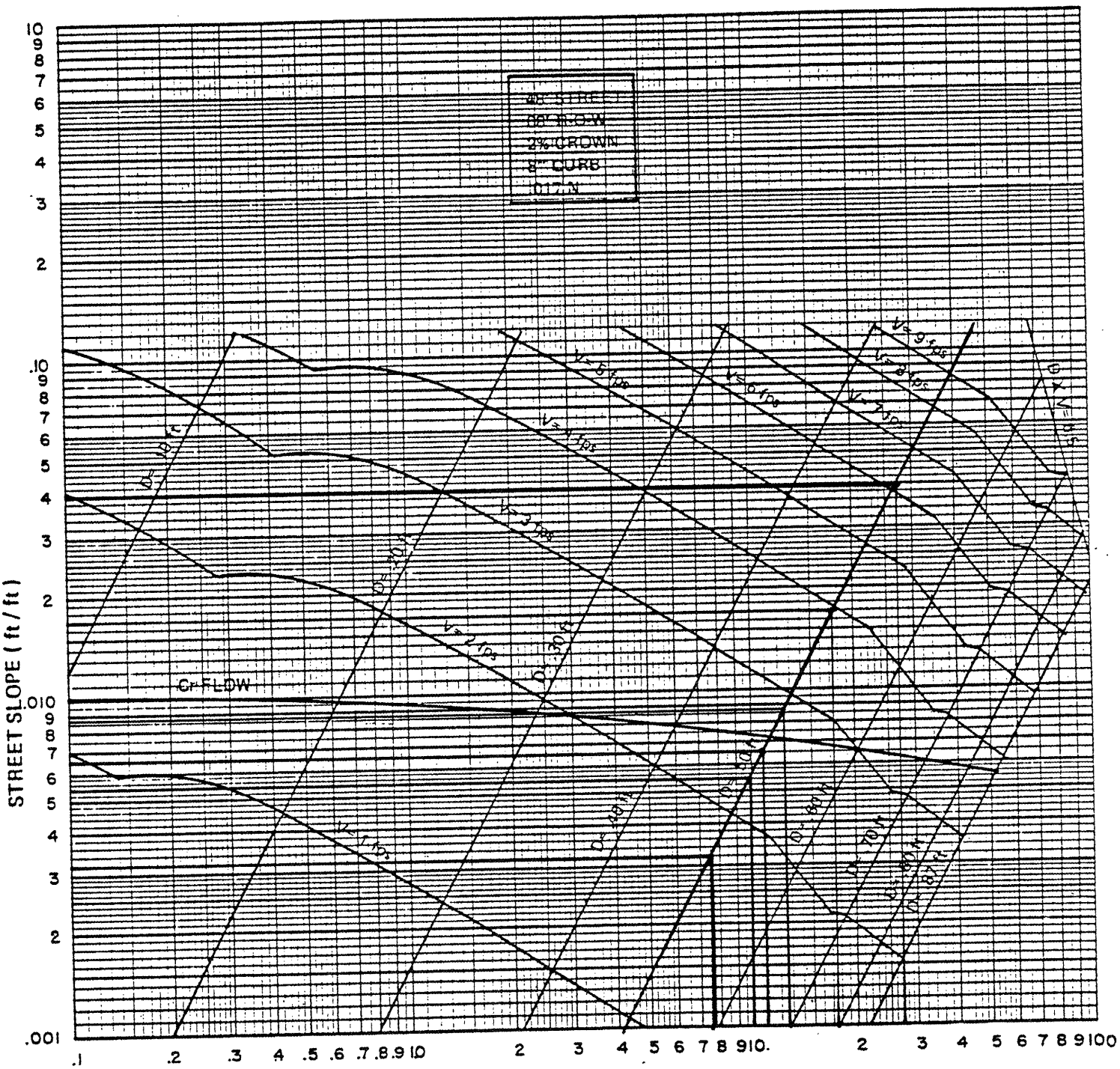
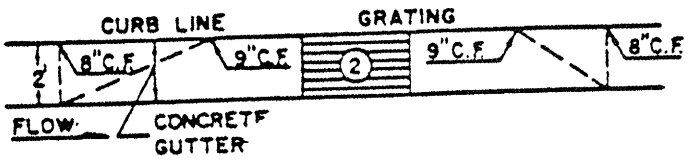


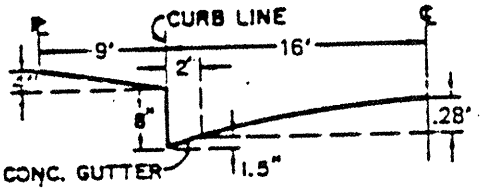
PLATE 22.3 D-3

REV. 3-83

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

10 YR-6HR STORM

4"/0

SANDIA HEIGHTS SOUTH UNIT 21 - TENNYSON INTERSECTION SLOPE=2.49%

MANNING'S N = .0170 SLOPE = .0249

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	16.00	0.41	7	32.00	0.67
2	0.01	0.00	5	30.00	0.13			
3	2.00	0.13	6	31.99	0.00			

WSEL (FT)		DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)		WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02		0.0	0.0	0.0		0.7	0.6	0.6
0.04		0.0	0.0	0.0		1.4	1.0	1.3
0.06		0.1	0.1	0.1		2.0	1.3	1.9
0.08		0.1	0.1	0.2		2.7	1.5	2.5
0.10		0.1	0.2	0.3		3.4	1.8	3.2
0.12		0.1	0.2	0.5		4.1	2.0	3.8
0.14		0.1	0.3	0.6		5.8	2.0	5.5
0.16		0.2	0.4	0.9		7.8	2.1	7.5
0.18		0.2	0.6	1.4		9.8	2.2	9.5
0.20		0.2	0.8	1.9		11.9	2.3	11.5
0.22		0.2	1.1	2.7		13.9	2.5	13.5
0.24		0.2	1.4	3.7		16.0	2.7	15.5
0.26		0.3	1.7	4.9		18.0	2.9	17.5
0.28	.283	0.3	2.1	6.3	6.56	20.1	3.0	19.5
0.30		0.3	2.5	7.9		22.1	3.2	21.5
0.32	.321	0.3	2.9	9.9	10.06	24.1	3.4	23.5
0.34	.357	0.3	3.4	12.1	14.36	26.2	3.6	25.5
0.36		0.4	3.9	14.7		28.2	3.7	27.5
0.38		0.4	4.5	17.5		30.3	3.9	29.5
0.40		0.4	5.1	20.7		32.3	4.0	31.5
0.42		0.4	5.8	24.9		32.8	4.3	32.0
0.44		0.4	6.4	29.7		32.9	4.6	32.0
0.46		0.5	7.0	34.8		32.9	4.9	32.0
0.48		0.5	7.7	40.2		33.0	5.2	32.0
0.50		0.5	8.3	45.9		33.0	5.5	32.0
0.52		0.5	9.0	51.8		33.0	5.8	32.0
0.54		0.5	9.6	58.1		33.1	6.0	32.0
0.56		0.6	10.2	64.6		33.1	6.3	32.0
0.58		0.6	10.9	71.5		33.2	6.6	32.0
0.60		0.6	11.5	78.5		33.2	6.8	32.0
0.62		0.6	12.2	85.9		33.2	7.1	32.0
0.64		0.6	12.8	93.4		33.3	7.3	32.0
0.66		0.7	13.4	101.3		33.3	7.5	32.0
0.67		0.7	13.8	105.3		33.3	7.6	32.0

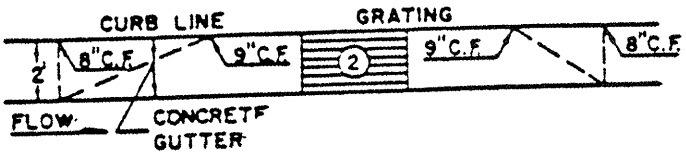
SANDIA HEIGHTS SOUTH UNIT 21 - TENNYSON INTERSECTION SLOPE=4%

MANNING'S N = .0170 SLOPE = .0400

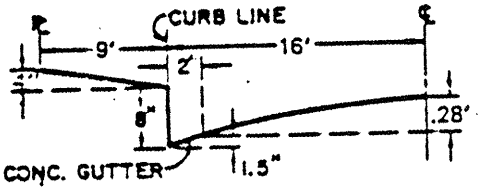
POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	3	2.00	0.13			
2	0.01	0.00	4	24.00	0.44			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02	0.0	0.0	0.0	0.3	0.8	0.3
0.04	0.0	0.0	0.0	0.7	1.2	0.6
0.06	0.1	0.0	0.0	1.0	1.6	1.0
0.08	0.1	0.1	0.1	1.4	2.0	1.3
0.10	0.1	0.1	0.2	1.7	2.3	1.6
0.12	0.1	0.1	0.3	2.0	2.6	1.9
0.14	0.1	0.2	0.4	3.2	2.4	3.0
0.16	0.2	0.2	0.6	4.6	2.4	4.4
0.18	0.2	0.3	0.9	6.0	2.6	5.8
0.20	0.2	0.5	1.3	7.4	2.8	7.2
0.22	0.2	0.6	1.9	8.8	3.0	8.6
0.24	0.2	0.8	2.6	10.3	3.2	10.0
0.26	0.3	1.0	3.6	11.7	3.5	11.4
0.28	0.3	1.3	4.7	13.1	3.7	12.8
0.30	0.3	1.5	6.1	14.5	3.9	14.2
0.32	0.3	1.8	7.6	15.9	4.1	15.6
0.34	0.3	2.2	9.5	17.4	4.4	17.0
0.36	0.4	2.5	11.6	18.8	4.6	18.4
0.38	0.4	2.9	13.9	20.2	4.8	19.8
0.40	0.4	3.3	16.6	21.6	5.0	21.2
0.42	0.4	3.8	19.6	23.0	5.2	22.6
0.44	0.4	4.2	22.9	24.4	5.4	24.0

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

100 YR-6HR STORM

TENNYSON INTER. UNIT 21

DISCHARGE = 12.8 CFS

POINT	ELEV	DIST	POINT	ELEV	DIST	POINT	ELEV	DIST
1	0.67	0.00	4	0.41	16.00	7	0.67	32.00
2	0.00	0.01	5	0.13	30.00			
3	0.13	2.00	6	0.00	31.99			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW VEL (FPS)	FROUDE NUM	E (FT)	M (CU FT)
0.02	0.02	0.01	2011.31	3544.46	62816.00	800.77
0.04	0.04	0.03	502.83	626.58	3926.04	200.19
0.06	0.06	0.06	223.48	227.38	775.57	88.98
0.08	0.08	0.10	125.71	110.76	245.45	50.05
0.10	0.10	0.16	80.45	63.41	100.61	32.04
0.12	0.12	0.23	55.87	40.19	48.59	22.25
0.14	0.14	0.32	40.06	29.23	25.06	15.97
0.16	0.16	0.45	28.51	20.50	12.78	11.37
0.18	0.18	0.62	20.70	14.27	6.83	8.27
0.20	0.20	0.83	15.46	10.14	3.91	6.20
0.22	0.22	1.08	11.88	7.40	2.41	4.80
0.24	0.24	1.37	9.37	5.55	1.60	3.82
0.26	0.26	1.70	7.55	4.27	1.14	3.13
0.28	0.28	2.07	6.20	3.35	0.88	2.63
0.30	0.30	2.48	5.17	2.69	0.72	2.26
0.32	0.32	2.93	4.38	2.19	0.62	2.00
0.34	0.34	3.42	3.75	1.81	0.56	1.82
0.36	0.36	3.95	3.25	1.51	0.52	1.69
0.38	0.38	4.52	2.84	1.28	0.51	1.61
0.40	0.40	5.13	2.50	1.09	0.50	1.57
0.42	0.42	5.77	2.22	0.92	0.50	1.57
0.44	0.44	6.41	2.00	0.79	0.50	1.60
0.46	0.46	7.05	1.82	0.68	0.51	1.67
0.48	0.48	7.69	1.67	0.60	0.52	1.75
0.50	0.50	8.32	1.54	0.53	0.54	1.86
0.52	0.52	8.96	1.43	0.48	0.55	1.99
0.54	0.54	9.60	1.33	0.43	0.57	2.14
0.56	0.56	10.24	1.25	0.39	0.58	2.30
0.58	0.58	10.88	1.18	0.36	0.60	2.49
0.60	0.60	11.52	1.11	0.33	0.62	2.68
0.62	0.62	12.16	1.05	0.30	0.64	2.90
0.64	0.64	12.80	1.00	0.28	0.66	3.13
0.66	0.66	13.44	0.95	0.26	0.67	3.37
0.67	0.67	13.76	0.93	0.25	0.68	3.50

DISCHARGE = 6.8 CFS

POINT	ELEV	DIST	POINT	ELEV	DIST	POINT	ELEV	DIST
1	0.67	0.00	5	0.90	24.01	9	0.00	43.99
2	0.00	0.01	6	0.90	27.99	10	0.67	44.00
3	0.13	2.00	7	0.56	28.00			
4	0.56	24.00	8	0.13	42.00			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW VEL (FPS)	FROUDE NUM	E (FT)	M (CU FT)
0.02	0.02	0.01	1073.11	1891.12	17881.61	227.95
0.04	0.04	0.03	268.28	334.31	1117.64	56.99
0.06	0.06	0.06	119.23	121.32	220.82	25.33
0.08	0.08	0.10	67.07	59.10	69.93	14.25
0.10	0.10	0.16	42.92	33.83	28.71	9.12
0.12	0.12	0.23	29.81	21.45	13.92	6.34
0.14	0.14	0.32	21.51	15.36	7.32	4.58
0.16	0.16	0.44	15.58	10.87	3.93	3.33
0.18	0.18	0.59	11.53	7.71	2.24	2.48
0.20	0.20	0.78	8.76	5.58	1.39	1.91
0.22	0.22	1.00	6.83	4.14	0.95	1.52
0.24	0.24	1.25	5.45	3.15	0.70	1.24
0.26	0.26	1.54	4.44	2.45	0.57	1.06
0.28	0.28	1.86	3.68	1.95	0.49	0.93
0.30	0.30	2.21	3.09	1.57	0.45	0.85
0.32	0.32	2.60	2.63	1.29	0.43	0.80
0.34	0.34	3.02	2.27	1.07	0.42	0.77
0.36	0.36	3.47	1.97	0.90	0.42	0.78
0.38	0.38	3.96	1.73	0.77	0.43	0.80
0.40	0.40	4.47	1.53	0.66	0.44	0.84
0.42	0.42	5.03	1.36	0.57	0.45	0.90
0.44	0.44	5.61	1.22	0.50	0.46	0.98
0.46	0.46	6.23	1.10	0.44	0.48	1.07
0.48	0.48	6.88	0.99	0.39	0.50	1.18
0.50	0.50	7.56	0.90	0.34	0.51	1.30
0.52	0.52	8.28	0.83	0.31	0.53	1.45
0.54	0.54	9.03	0.76	0.27	0.55	1.60
0.56	0.56	9.81	0.70	0.25	0.57	1.78
0.58	0.58	10.61	0.64	0.22	0.59	1.97
0.60	0.60	11.41	0.60	0.20	0.61	2.18
0.62	0.62	12.21	0.56	0.18	0.62	2.41
0.64	0.64	13.01	0.53	0.16	0.64	2.66
0.66	0.66	13.81	0.50	0.15	0.66	2.92
0.67	0.67	14.21	0.48	0.14	0.67	3.06

AJ

SANDIA HEIGHTS SOUTH UNIT 21 - 44' F/F, SLOPE=4%

MANNING'S N = .0170 SLOPE = .0400

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	5	24.01	0.90	9	43.99	0.00
2	0.01	0.00	6	27.99	0.90	10	44.00	0.67
3	2.00	0.13	7	28.00	0.56			
4	24.00	0.56	8	42.00	0.13			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02	0.0	0.0	0.0	0.7	0.8	0.6
0.04	0.0	0.0	0.0	1.4	1.2	1.3
0.06	0.1	0.1	0.1	2.0	1.6	1.9
0.08	0.1	0.1	0.2	2.7	2.0	2.5
0.10	0.1	0.2	0.4	3.4	2.3	3.2
0.12	0.1	0.2	0.6	4.1	2.6	3.8
0.14	0.1	0.3	0.8	5.5	2.6	5.2
0.16	0.2	0.4	1.2	7.2	2.7	6.8
0.18	0.2	0.6	1.7	8.8	2.9	8.5
0.20	0.2	0.8	2.4 3.11	10.5	3.1	10.1
0.22	0.2	1.0	3.3	12.2	3.3	11.8
0.24	0.2	1.2	4.4	13.9	3.5	13.4
0.26	0.3	1.5	5.7 6.84	15.6	3.7	15.0 1.62
0.28	0.3	1.8	7.3	17.2	3.9	16.7
0.30	0.3	2.2	9.2	18.9	4.2	18.3
0.32	0.3	2.6	11.3	20.6	4.4	19.9
0.34	0.3	3.0	13.8	22.3	4.6	21.6
0.36	0.4	3.4	16.5	23.9	4.8	23.2
0.38	0.4	3.9	19.7	25.6	5.0	24.9
0.40	0.4	4.4	23.1	27.3	5.2	26.5
0.42	0.4	5.0	27.0	29.0	5.4	28.1
0.44	0.4	5.6	31.2	30.6	5.6	29.8
0.46	0.5	6.2	35.8	32.3	5.8	31.4
0.48	0.5	6.8	40.9	34.0	6.0	33.0
0.50	0.5	7.5	46.3	35.7	6.2	34.7
0.52	0.5	8.2	52.2	37.4	6.4	36.3
0.54	0.5	9.0	58.6	39.0	6.5	38.0
0.56	0.6	9.7	65.5	40.7	6.7	39.6
0.58	0.6	10.5	74.1	41.2	7.0	40.0
0.60	0.6	11.3	83.6	41.3	7.4	40.0
0.62	0.6	12.1	93.6	41.3	7.7	40.0
0.64	0.6	12.9	103.9	41.4	8.0	40.0
0.66	0.7	13.7	114.7	41.5	8.4	40.0
0.67	0.7	14.1	120.3	41.5	8.5	40.0

SANDIA HTS SOUTH UNIT 21 - WEIR ANANLYSIS 32' F/F 3% CS SLOP

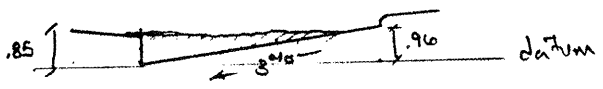
WEIR COEFFICENT = 3.3300
CROSS SECTION DIVIDED INTO VERTICAL SLICES 0.2 FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.85	3	9.01	0.00	5	39.00	0.96
2	9.00	0.67	4	11.00	0.13	6	40.99	1.12

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW RATE (CFS)	FLOW VEL (FPS)	TOP WID PLUS OBSTRUCTIONS
0.02	0.02	0.00	0.00	0.36	0.32
0.04	0.04	0.01	0.01	0.53	0.64
0.06	0.06	0.03	0.02	0.65	0.96
0.08	0.08	0.05	0.04	0.75	1.27
0.10	0.10	0.08	0.07	0.84	1.59
0.12	0.12	0.11	0.11	0.92	1.91
0.14	0.14	0.16	0.16	0.99	2.49
0.16	0.16	0.21	0.22	1.04	3.16
0.18	0.18	0.28	0.31	1.08	3.83
0.20	0.20	0.37	0.42	1.13	4.49
0.22	0.22	0.46	0.55	1.18	5.16
0.24	0.24	0.57	0.70	1.22	5.83
0.26	0.26	0.70	0.89	1.27	6.49
0.28	0.28	0.83	1.10	1.32	7.16
0.30	0.30	0.98	1.34	1.37	7.83
0.32	0.32	1.15	1.62	1.41	8.49
0.34	0.34	1.32	1.93	1.46	9.16
0.36	0.36	1.51	2.27	1.50	9.83
0.38	0.38	1.72	2.65	1.54	10.50
0.40	0.40	1.93	3.07	1.59	11.16
0.42	0.42	2.16	3.52	1.63	11.83
0.44	0.44	2.41	4.02	1.67	12.50
0.46	0.46	2.66	4.55	1.71	13.16
0.48	0.48	2.93	5.13	1.75	13.83
0.50	0.50	3.22	5.75	1.79	14.50
0.52	0.52	3.51	6.41	1.83	15.16
0.54	0.54	3.82	7.12	1.86	15.83
0.56	0.56	4.15	7.88	1.90	16.50
0.58	0.58	4.48	8.68	1.94	17.17
0.60	0.60	4.83	9.52	1.97	17.83
0.62	0.62	5.20	10.42	2.01	18.50
0.64	0.64	5.57	11.37	2.04	19.17
0.66	0.66	5.96	12.37	2.07	19.83
0.68	0.68	6.37	13.42	2.11	21.00
0.70	0.70	6.81	14.53	2.13	22.67
0.72	0.72	7.28	15.71	2.16	24.33
0.74	0.74	7.78	16.96	2.18	26.00
0.76	0.76	8.32	18.30	2.20	27.67
0.78	0.78	8.89	19.72	2.22	29.33
0.80	0.80	9.49	21.24	2.24	31.00
0.82	0.82	10.13	22.84	2.26	32.67
0.84	0.84	10.80	24.55	2.27	34.33
0.85	0.85	11.14	25.43	2.28	35.17

0.67
1 x FCURB
0.69
1 2"
12.88
14.00

R.O.W.



SANDIA HTS SOUTH UNIT 21 - WEIR ANANLYSIS 48' F/F TENNYSON

WEIR COEFFICENT = 3.3300
CROSS SECTION DIVIDED INTO VERTICAL SLICES 0.2 FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.85	4	11.00	0.13	7	56.99	0.00
2	9.00	0.67	5	33.00	0.56	8	57.00	0.67
3	9.01	0.00	6	55.00	0.13	9	66.00	0.85

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW RATE (CFS)	FLOW VEL (FPS)	TOP WID PLUS OBSTRUCTIONS
0.02	0.02	0.01	0.00	0.36	0.64
0.04	0.04	0.03	0.01	0.53	1.27
0.06	0.06	0.06	0.04	0.65	1.91
0.08	0.08	0.10	0.08	0.75	2.55
0.10	0.10	0.16	0.13	0.84	3.19
0.12	0.12	0.23	0.21	0.92	3.82
0.14	0.14	0.32	0.31	0.98	5.48
0.16	0.16	0.45	0.46	1.01	7.48
0.18	0.18	0.62	0.65	1.05	9.49
0.20	0.20	0.83	0.90	1.08	11.49
0.22	0.22	1.08	1.22	1.13	13.49
0.24	0.24	1.37	1.60	1.17	15.49
0.26	0.26	1.70	2.07	1.22	17.49
0.28	0.28	2.07	2.62	1.27	19.49
0.30	0.30	2.48	3.26	1.31	21.49
0.32	0.32	2.93	3.98	1.36	23.49
0.34	0.34	3.42	4.81	1.41	25.49
0.36	0.36	3.95	5.73	1.45	27.49
0.38	0.38	4.52	6.76	1.50	29.49
0.40	0.40	5.13	7.90	1.54	31.49
0.42	0.42	5.78	9.14	1.58	33.49
0.44	0.44	6.47	10.51	1.62	35.49
0.46	0.46	7.20	11.99	1.67	37.49
0.48	0.48	7.97	13.59	1.71	39.49
0.50	0.50	8.78	15.32	1.75	41.49
0.52	0.52	9.63	17.18	1.78	43.50
0.54	0.54	10.52	19.17	1.82	45.50
0.56	0.56	11.45	21.29	1.86	47.50
0.58	0.58	12.40	23.55	1.90	48.00
0.60	0.60	13.36	25.92	1.94	48.00
0.62	0.62	14.32	28.40	1.98	48.00
0.64	0.64	15.28	30.98	2.03	48.00
0.66	0.66	16.24	33.66	2.07	48.00
0.68	0.68	17.21	36.42	2.12	49.00
0.70	0.70	18.21	39.29	2.16	51.00
0.72	0.72	19.25	42.28	2.20	53.00
0.74	0.74	20.33	45.39	2.23	55.00
0.76	0.76	21.45	48.63	2.27	57.00
0.78	0.78	22.61	52.01	2.30	59.00
0.80	0.80	23.81	55.53	2.33	61.00
0.82	0.82	25.05	59.19	2.36	63.00
0.84	0.84	26.33	63.00	2.39	65.00
0.85	0.85	26.98	64.96	2.41	66.00

0.67' TOP OF CURB

35.04

ROW.

TENNYSON - 48' F/F, SLOPE=0.318%

MANNING'S N = .0170 SLOPE = .0032

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	24.00	0.56	7	48.00	0.67
2	0.01	0.00	5	46.00	0.13			
3	2.00	0.13	6	47.99	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02	0.0	0.0	0.0	0.7	0.2	0.6
0.04	0.0	0.0	0.0	1.4	0.3	1.3
0.06	0.1	0.1	0.0	2.0	0.5	1.9
0.08	0.1	0.1	0.1	2.7	0.6	2.5
0.10	0.1	0.2	0.1	3.4	0.6	3.2
0.12	0.1	0.2	0.2	4.1	0.7	3.8
0.14	0.1	0.3	0.2	5.8	0.7	5.5
0.16	0.2	0.4	0.3	7.8	0.7	7.5
0.18	0.2	0.6	0.5	9.8	0.8	9.5
0.20	0.2	0.8	0.7	11.9	0.8	11.5
0.22	0.2	1.1	1.0	13.9	0.9	13.5
0.24	0.2	1.4	1.3	16.0	1.0	15.5
0.26	0.3	1.7	1.7	18.0	1.0	17.5
0.28	0.3	2.1	2.2	20.1	1.1	19.5
0.30	0.3	2.5	2.8	22.1	1.1	21.5
0.32	0.3	2.9	3.5	24.1	1.2	23.5
0.34	0.3	3.4	4.3	26.2	1.3	25.5
0.36	0.4	3.9	5.2	28.2	1.3	27.5
0.38	0.4	4.5	6.3	30.3	1.4	29.5
0.40	0.4	5.1	7.4	32.3	1.4	31.5
0.42	0.4	5.8	8.7	34.3	1.5	33.5
0.44	0.4	6.5	10.1	36.4	1.6	35.5
0.46	0.5	7.2	11.6	38.4	1.6	37.5
0.48	0.5	8.0	13.3	40.5	1.7	39.5
0.50	0.5	8.8	15.1	42.5	1.7	41.5
0.52	0.5	9.6	17.1	44.5	1.8	43.5
0.54	0.5	10.5	19.2	46.6	1.8	45.5
0.56	0.6	11.4	21.5	48.6	1.9	47.5
0.58	0.6	12.4	24.4	49.2	2.0	48.0
0.60	0.6	13.4	27.6	49.2	2.1	48.0
0.62	0.6	14.3	31.0	49.2	2.2	48.0
0.64	0.6	15.3	34.5	49.3	2.3	48.0
0.66	0.7	16.2	38.2	49.3	2.4	48.0
0.67	0.7	16.7	40.1	49.3	2.4	48.0

BACKYARD CHANNEL/INLET DESIGN

BACKYARD V-NOTCH RIBBON CHANNEL ANALYSIS
BACKYARD INLET DESIGN
SIDEWALK CULVERT DETAILS

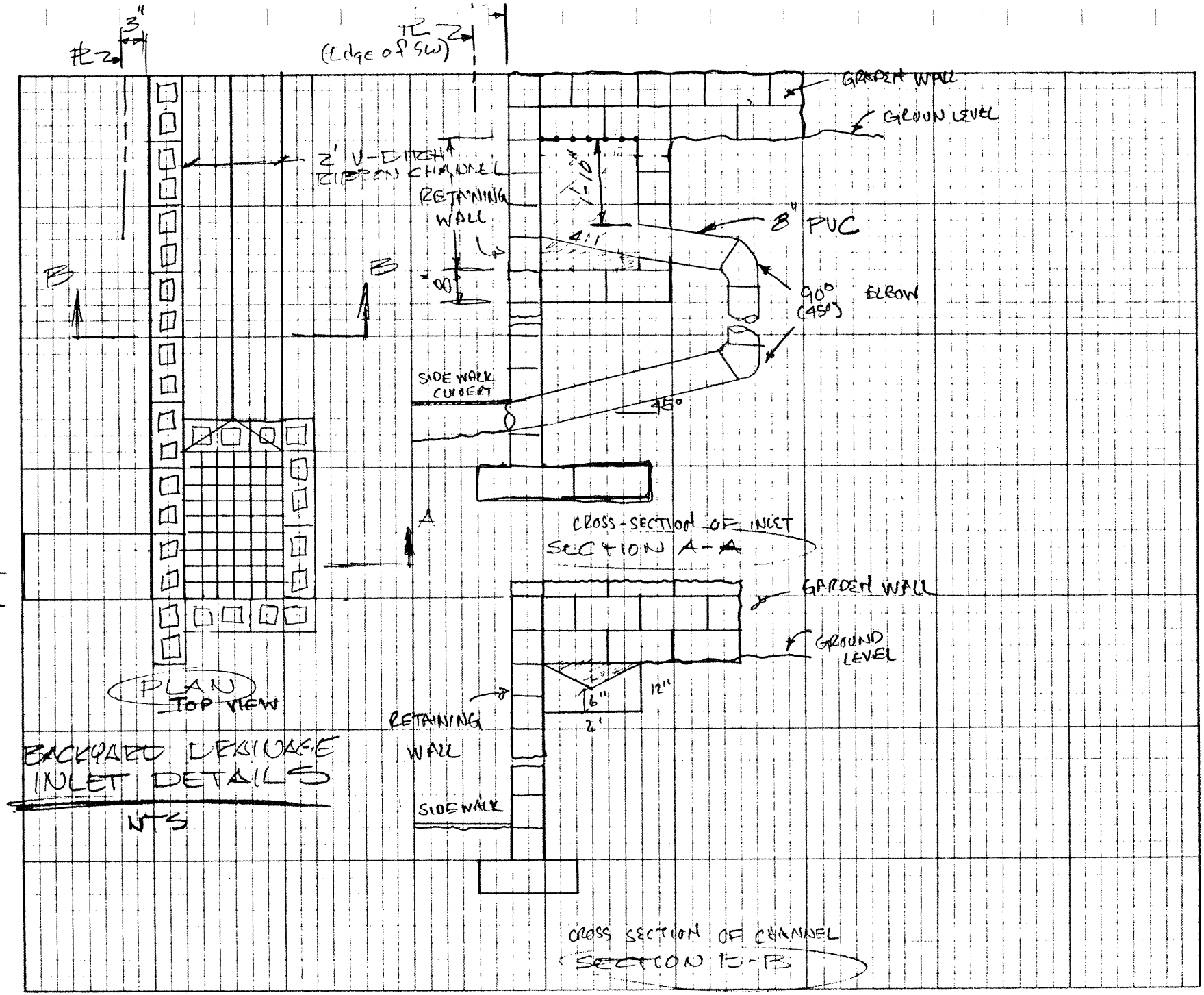
BACKYARD V-NOTCH RIBBON CHANNEL ANALYSIS - SLOPE=1.0%

MANNING'S N = .0170 SLOPE = .0100

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.50	2	1.00	0.00	3	2.00	0.50

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.0	0.0	0.0	0.0	0.1	0.4	0.1
0.0	0.0	0.0	0.0	0.2	0.6	0.2
0.1	0.1	0.0	0.0	0.3	0.8	0.2
0.1	0.1	0.0	0.0	0.4	0.9	0.3
0.1	0.1	0.0	0.0	0.4	1.1	0.4
0.1	0.1	0.0	0.0	0.5	1.2	0.5
0.1	0.1	0.0	0.1	0.6	1.4	0.6
0.2	0.2	0.1	0.1	0.7	1.5	0.6
0.2	0.2	0.1	0.1	0.8	1.6	0.7
0.2	0.2	0.1	0.1	0.9	1.7	0.8
0.2	0.2	0.1	0.2	1.0	1.9	0.9
0.2	0.2	0.1	0.2	1.1	2.0	1.0
0.3	0.3	0.1	0.3	1.2	2.1	1.0
0.3	0.3	0.2	0.3	1.3	2.2	1.1
0.3	0.3	0.2	0.4	1.3	2.3	1.2
0.3	0.3	0.2	0.5	1.4	2.4	1.3
0.3	0.3	0.2	0.6	1.5	2.5	1.4
0.4	0.4	0.3	0.7	1.6	2.6	1.4
0.4	0.4	0.3	0.8	1.7	2.7	1.5
0.4	0.4	0.3	0.9	1.8	2.8	1.6
0.4	0.4	0.4	1.0	1.9	2.9	1.7
0.4	0.4	0.4	1.1	2.0	3.0	1.8
0.5	0.5	0.4	1.3	2.1	3.0	1.8
0.5	0.5	0.5	1.4	2.1	3.1	1.9
0.5	0.5	0.5	1.6	2.2	3.2	2.0

SEE FIGURE THAT FOLLOWS



BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

BAKEYARD DRAINAGE INLET DESIGN

BASIN F

TOTAL Area = 0.58 acres

$Q_{100} = 2.60$ cfs

Assume inlet acts as an orifice

Try a single grate type D inlet

There are 96 opening per single grate area

Opening area = $4\frac{1}{2}" \times \frac{25}{16}" = 7.03$ in^2 say 7.00 in^2

96×7.00 in^2/opening = 672 in^2 $\Rightarrow$ 4.67 ft^2 ← orifice area

Assume a 30% clogging factor $4.67(0.7) = 3.27$ ft^2

$Q = CA\sqrt{2gh}$ $C = 0.60$ discharge coefficient

C value determine from Handbook of Hydraulics by King & Brater

solve for h

$2g = 2(32.2) = 64.4$

$h = \left(\frac{Q}{CA}\right)^2 / 64.4$

$h = 0.027$ ft $= 0.33$ in

BASIN G

TOTAL AREA = 0.21 acres

$Q_{100} = 0.93$ cfs

$h = \left(\frac{Q}{CA}\right)^2 / 64.4$

solve for $h = 0.0035$ FT $= 0.04$ in

BASIN H

TOTAL AREA = 0.26 acres

$Q_{100} = 1.16$ cfs

$h = 0.0054$ ft $= 0.07$ inches

BASIN I

TOTAL AREA = 0.31 acres

$Q_{100} = 1.39$ cfs

$h = 0.0078$ ft $\Rightarrow$ 0.094 inches

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 1 OF 2

PROJECT NO. _____ BY K. PATTON DATE 7/26/92

Backyard Drainage Inlet Design

BASIN K

Total Area = 0.181 acres

Q_{100} = 1.39 cfs solve for h = 0.0078 ft
0.094 in

BASIN J

Total Area = 0.123 acres

Q_{100} = 1.03 cfs h = 0.0043 ft => 0.05 inches

SUMMARY: DEPTH OF INCOMING FLOW USING A SINGLE GRATE TYPE D INLET INLET

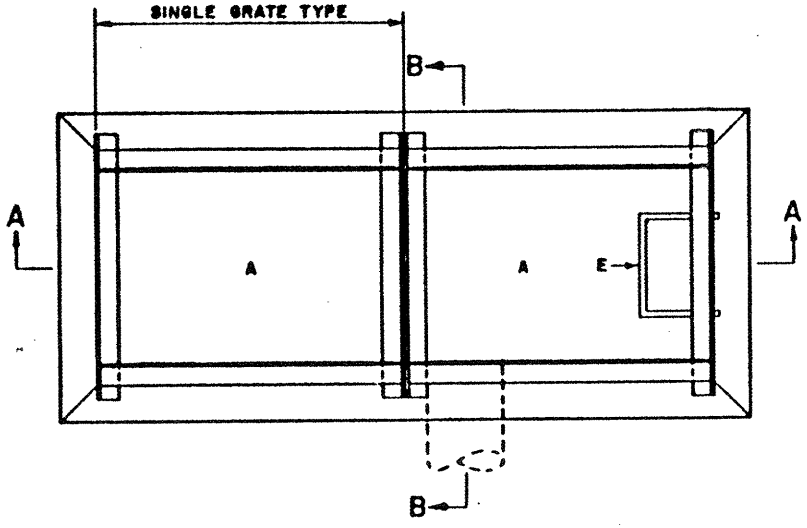
BASIN	Q_{100}	DEPTH @ Q_{100}
F	2.60	0.27'
G	0.93	0.004'
H	1.16	0.006'
I	1.39	0.008'
J	1.03	0.004'
K	1.39	0.008'

BOHANNAN-HUSTON INC.

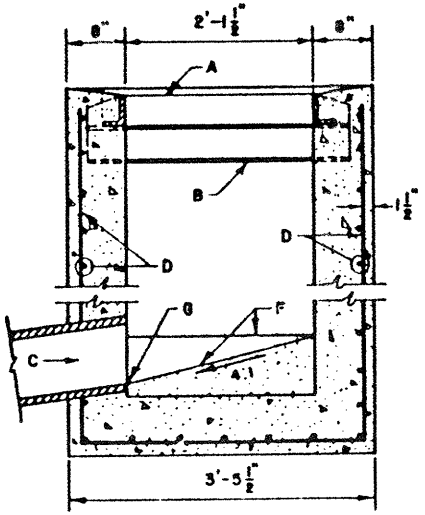
PROJECT NAME _____ SHEET 2 OF 2

PROJECT NO. _____ BY _____ DATE _____

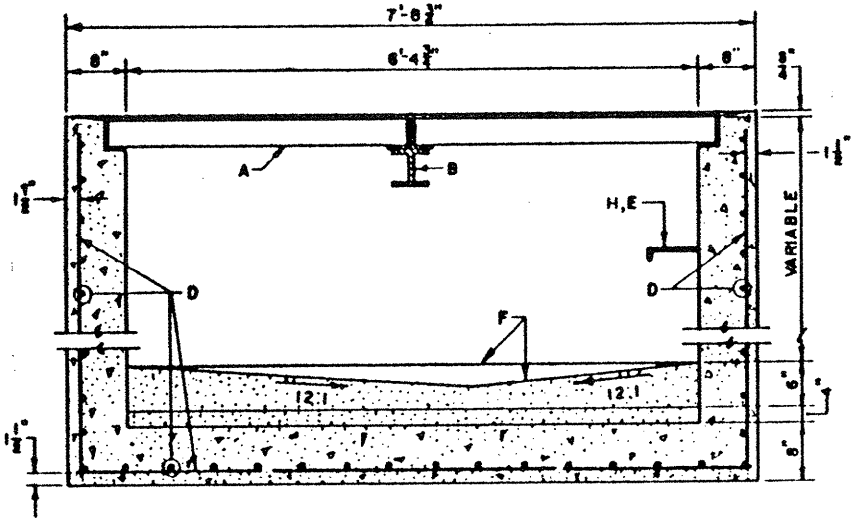
SUBJECT _____ CH'D _____ DATE _____



PLAN



SECTION B-B



SECTION A-A

GENERAL NOTES:

1. FOR SINGLE GRATE TYPE STORM INLET, DELETE CENTER SUPPORT AND MOVE ONE END WALL TO FORM NEW SINGLE GRATE INLET.
2. STORM INLET GUTTER TRANSITION WILL BE SHOWN ON THE CONSTRUCTION PLANS.
3. OUTLET PIPE SIZE, PER DESIGN REQUIREMENT.
4. FOR FRAME & GRATING, SEE DWG 2216, 2220 & 2221.
5. FOR CENTER SUPPORT ASSEMBLY, SEE DWG 2215.

CONSTRUCTION NOTES:

A. FRAME & GRATE

B. CENTER SUPPORT ASSEMBLY.

C. CUT ONE HORIZONTAL AND ONE VERTICAL BAR MAX. AT PIPE OPENING.

D. NO. 4 BARS A 6" O.C. EACH WAY.

E. USE STANDARD STEPS, SEE DWG 2229.

F. CONC. FILL, SEE NOTE C DWG 2201.

G. INVERT PER DESIGN.

H. INSTALL STEPS ON UPSTREAM FACE.

CITY OF ALBUQUERQUE

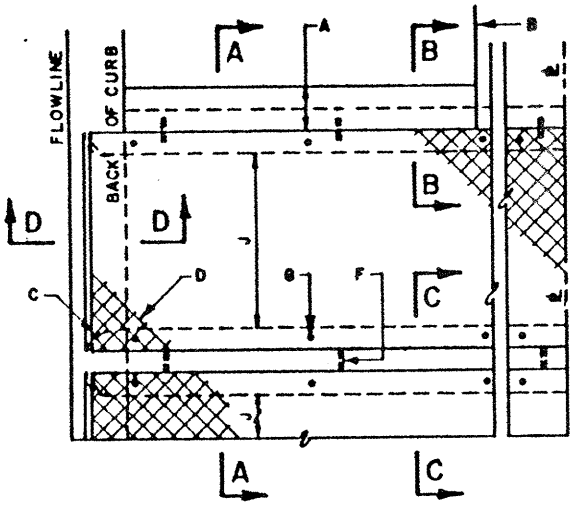
REVISIONS

DRAINAGE

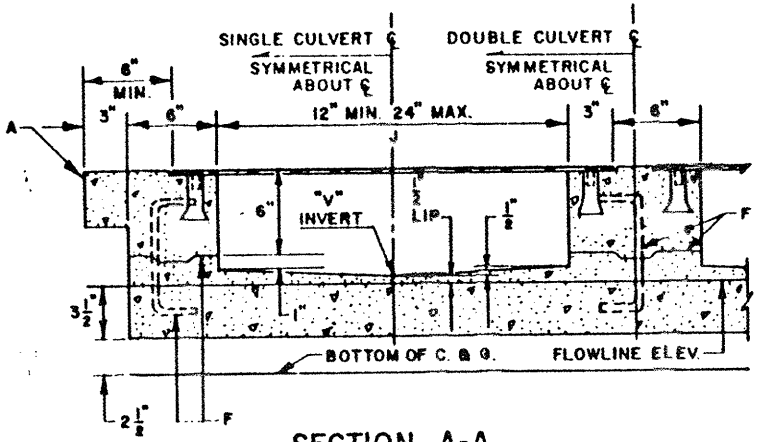
STORM INLET DOUBLE "D"

DWG 2206

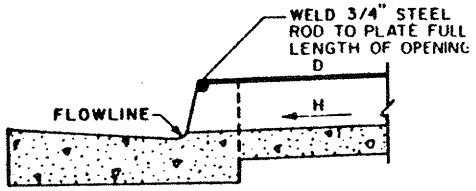
NOV 1985



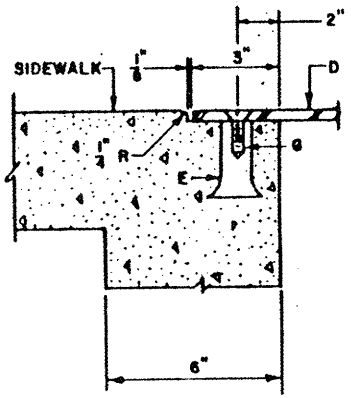
PLAN
SINGLE AND OR MULTIPLE CULVERT



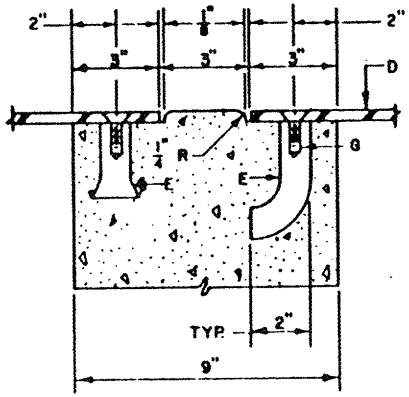
SECTION A-A



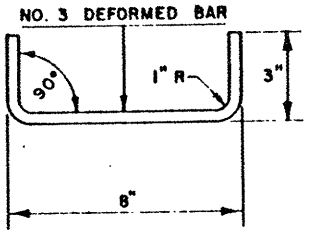
SECTION D-D



SECTION B-B



SECTION C-C



DOWEL DETAIL

GENERAL NOTES:

1. PLACING OF DRAIN THRU EXIST. SIDEWALK AND CURB & GUTTER REQUIRES THAT ENTIRE SIDEWALK AND C & G STONES BE REMOVED AND REPLACED AS DETAILED HEREIN.
2. BOTTOM SLAB OF CULVERT SHALL BE POURED MONOLITHICALLY WITH NEW GUTTER.
3. THE INVERT SHALL BE TROWELED TO PRODUCE A HARD POLISHED SURFACE OF MAX DENSITY AND SMOOTHNESS. INVERT SHALL BE V-SHAPED TO WITHIN 3" OF OUTLET, THEN WARPED TO PARALLEL FLOWLINE AT OUTLET, UNLESS OTHERWISE SHOWN.
4. ALL EXPOSED CONC. SURFACE SHALL MATCH GRADE, COLOR, FINISH AND SCORING OF ADJACENT CURB AND SIDEWALK.
5. SIDEWALK REPLACED DURING CONSTRUCTION SHALL BE POURED MONOLITHICALLY WITH CULVERT WALLS.
6. IF ROD ANCHORS ARE USED, DRILL & TAP FOR F.H. MACHINE SCREW. ATTACH ANCHORS TO PLATE AND SECURE PLATE IN PLACE PRIOR TO POURING OF WALLS.
7. LENGTH OF EACH PLATE SHALL BE SUCH THAT THE WEIGHT WILL NOT EXCEED 300 LBS. AND SHALL BE STRESS RELIEVED AFTER FABRICATION. CLEAN SURFACE OF PLATE AND FRAMING MEMBERS AND PAINT W/ ONE SHOP COAT RED OXIDE AND TWO FINISH COATS ALUMINUM PAINT (AASHTO M 69).
8. THE CITY WILL NOT ASSUME RESPONSIBILITY FOR MAINTENANCE OF ANY SIDEWALK CULVERT INSTALLED BY OR FOR PRIVATE PROPERTY OWNERS.

CONSTRUCTION NOTES:

A. MATCH NEAREST CONTROL JOINT, INSTALL 1/2" EXPANSION JOINT.
B. EDGE OF SIDEWALK OR SETBACK (VARIABLE).
C. 3" RADIUS (TYPICAL).
D. 3/8" CHECKERED STEEL PLATE (PAINT PER NOTE 7, ABOVE).
E. FOR SECURING PLATE USE 1"X 5" S.S. ROD ANCHOR, "RED HEAD MULTI-SET II SRM-38 ANCHOR" OR APPROVED EQUAL. INSTALL PER MANUFACTURER'S INSTRUCTIONS AT MAX. 24" O.C., A MINIMUM OF 2 PER SIDE AND ONE WITHIN 6" OF EACH END.
F. CONSTRUCTION JOINT IS OPTIONAL. IF USED, SPACE DOWELS AT 18" O.C. MAX., 1 1/2" MINIMUM FROM FACE OF CONCRETE.
G. 3/8" - 16 x 1 1/4" COUNTERSUNK, F.H., STAINLESS STEEL, MACHINE SCREW.
H. SLOPE 1/4" PER FT. MIN.
J. DRAIN WIDTH PER PLAN (12" MIN., 24" MAX).

CITY OF ALBUQUERQUE

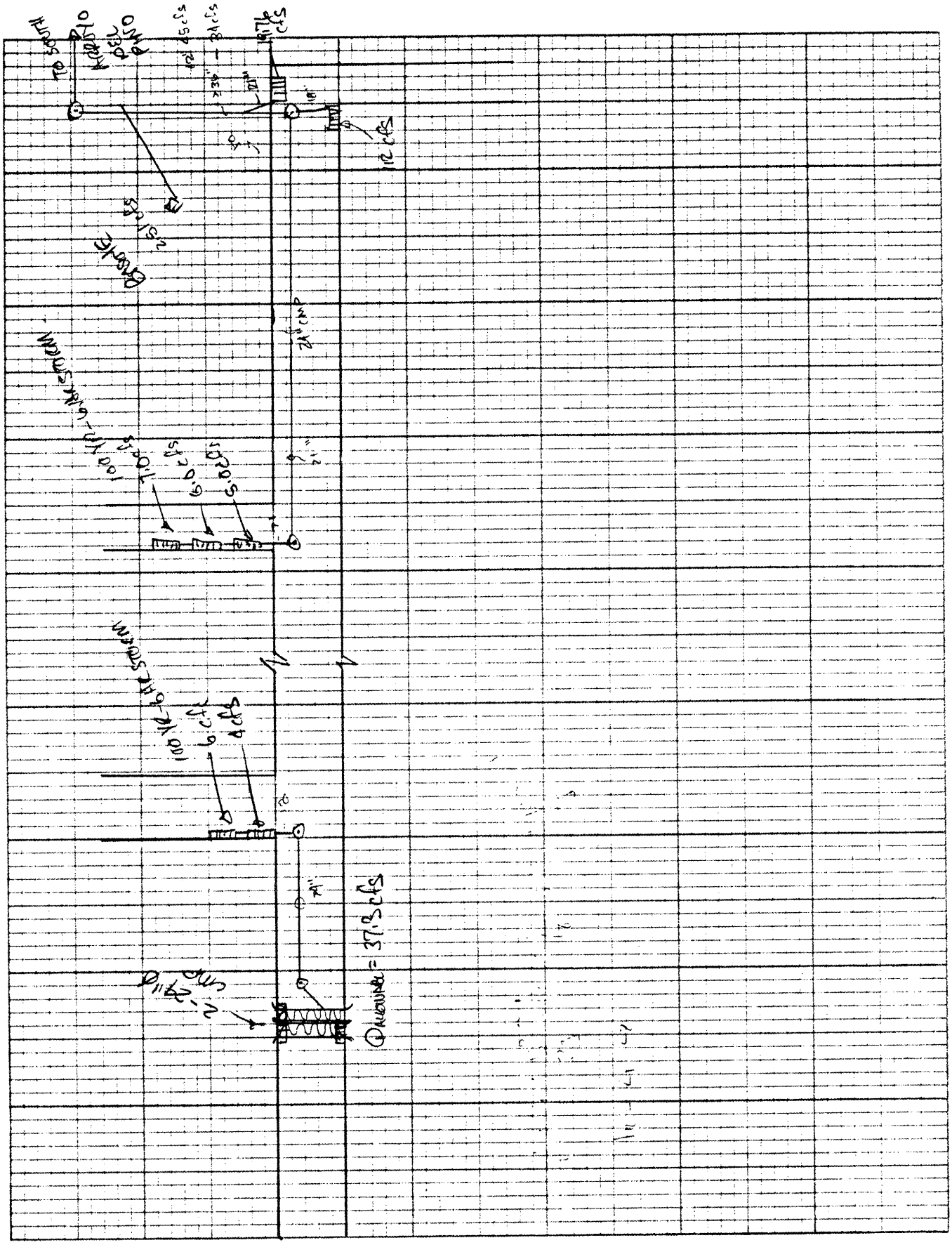
REVISIONS

DRAINAGE
SIDEWALK CULVERT
WITH STEEL PLATE TOP
DWG. 2236

AUG 1986

CATCH BASIN DESIGN

STORM DRAIN INLET ANALYSIS
ANALYSIS OF EXISTING 24" CMP CROSSING TENNYSON



BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

BASIN E - INLET DESIGN

TOTAL AREA = 0.56 Acres

Q_{100} = 2.51 cfs

Assume orifice condition

$Q = CA(2gh)^{1/2}$

C - discharge coefficient = 0.60 according King and Brater Handbook of Hydraulics used throughout calculations.

Try one single grate type 'C'

Total Area = $\frac{40" \times 25"}{144}$ = 6.94 ft²

Orifice Area = dia bars$_H$ = ½" & bars are 6" oc => 4.5"

dia bars$_V$ = ½" & bars are 2 1/16" oc => 25/16"

there are 12 x 8 openings = 96 opening

Area of 1 opening = 4.5" x 25/16" = 7.03 in² say 7.00 in²

orifice area = 672 in² => 4.67 ft²

Assume a 30% clogging factor 4.67 (0.7) = 3.27 ft²

solve for h = 0.03 ft < 0.167 OK

< 0.335 OK

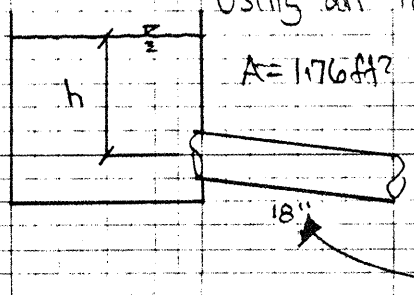
Using an 18" RCP

Q = 2.51

C = 0.6

$A = \frac{\pi D^2}{4}$

g = 32.2 ft/s²



A = 1.176 ft²

Assume Orifice:

$Q = CA(2gh)^{1/2}$

h = 0.09 ft

is not orifice.

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

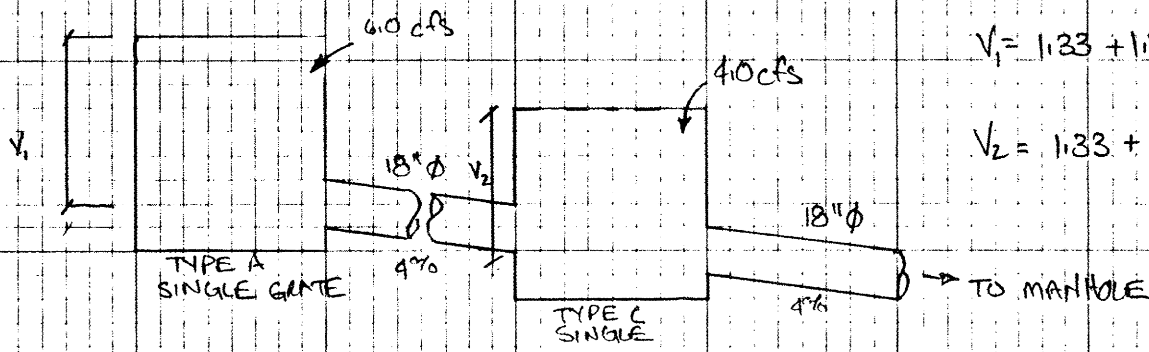
CATCH BASIN DESIGN

Assuming a catch basin opening of 10 inches

POINT OF CONCERN = AP-3 ~> AP-3R

$$V_1 = 1.33 + 1.2\frac{V^2}{2g} + d$$

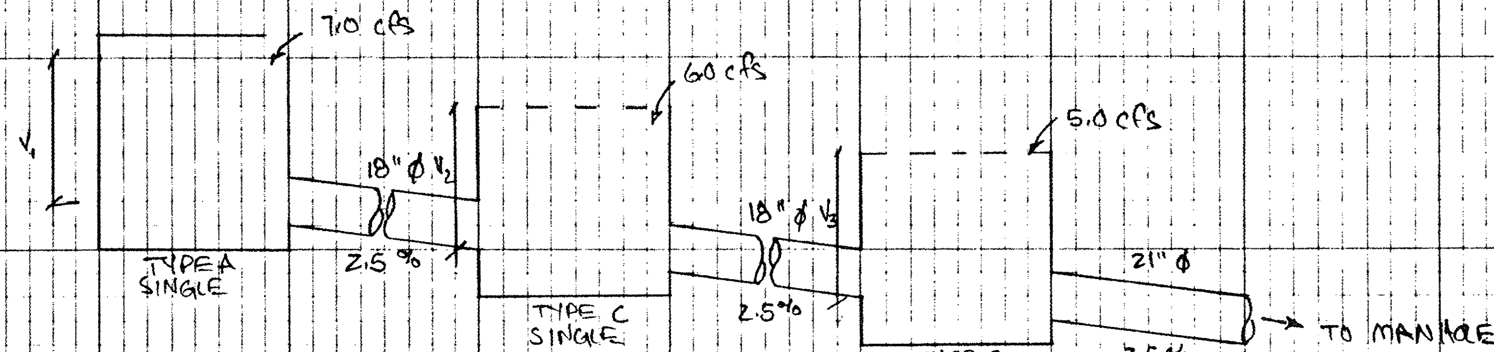
$$V_2 = 1.33 + H_1 + 1.2\frac{V_2^2}{2g} + d_2 - G$$



V_1 = 2.5 FT gravity flow

V_2 = 2.5 FT gravity flow

POINT OF CONCERN = AP-12 ~> AP-12R



V_1 = 3.0 FT gravity flow

V_2 = 3.0 FT gravity flow

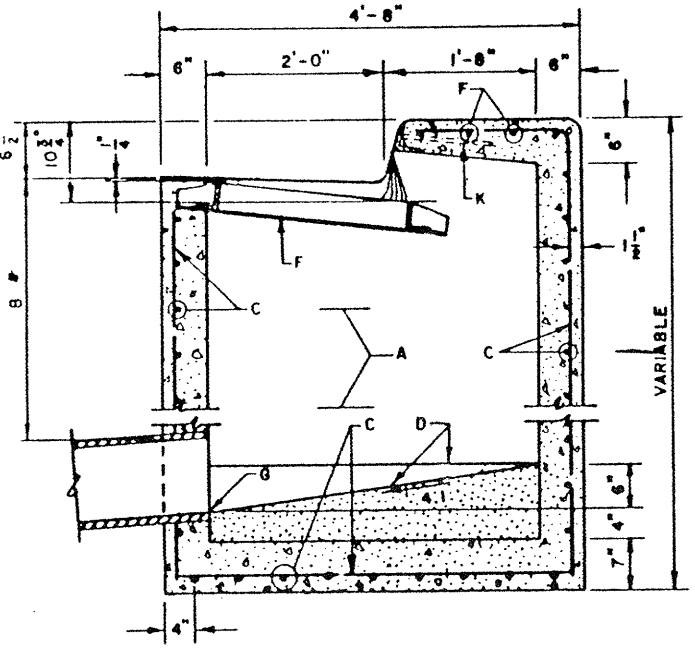
V_3 = 3.0 FT pressure flow

BOHANNAN-HUSTON INC.

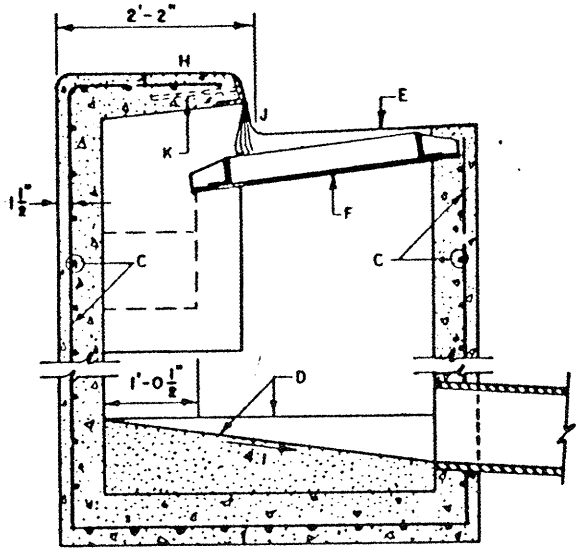
PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY K. PATTON DATE ______

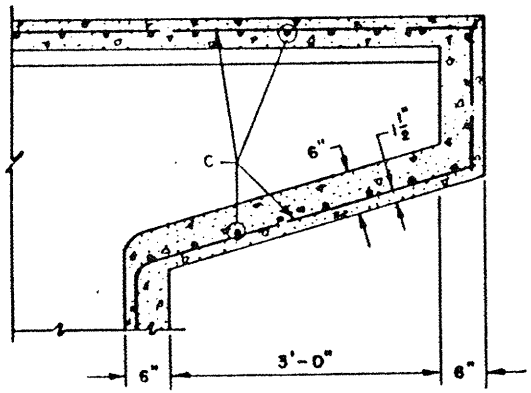
SUBJECT CATCH BASINS IN SERIES CH'D ______ DATE ______



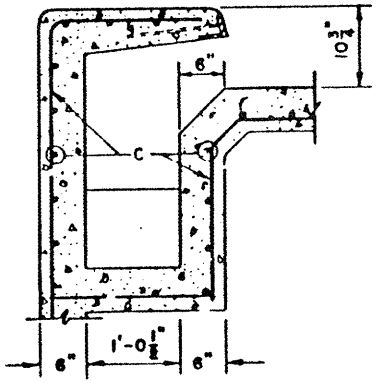
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

GENERAL NOTES:

1. SEE DWG 2201 FOR PLAN AND SECTION A-A.
2. GENERAL NOTES 2, 3 & 4 ON DWG 2201 ALSO APPLY TO THIS DWG.
3. FOR ANCHOR DETAIL, SEE DWG 2204.

CONSTRUCTION NOTES:

A. STORM INLET STEPS, SEE DWG 2229 FOR SPACING.

B. 1"-10" MIN UNLESS OTHER. WISE DIRECTED.

C. NO. 4 BARS AT 6" O.C. EACH WAY.

D. CONCRETE FILL, MINIMUM SLOPES SHOWN IN SECTIONS.

E. NORMAL GUTTER.

F. GRATE FRAME.

G. INVERT ELEVATION PER DESIGN.

H. TOP OF CURB.

J. FLOWLINE.

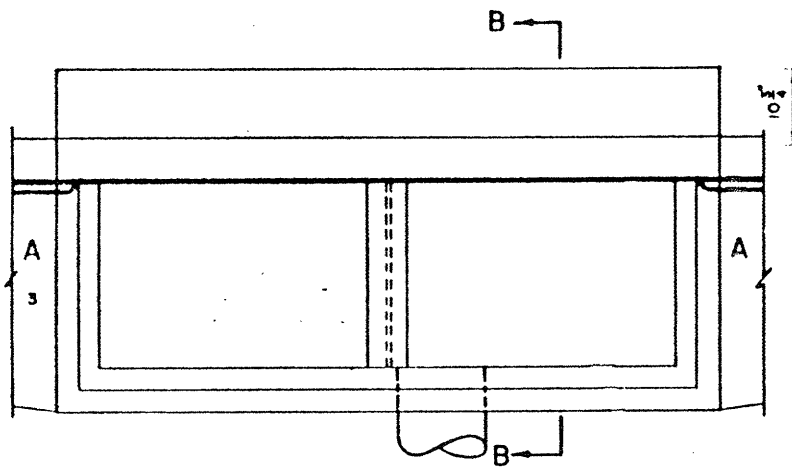
K. ANGLE ANCHOR.

CITY OF ALBUQUERQUE

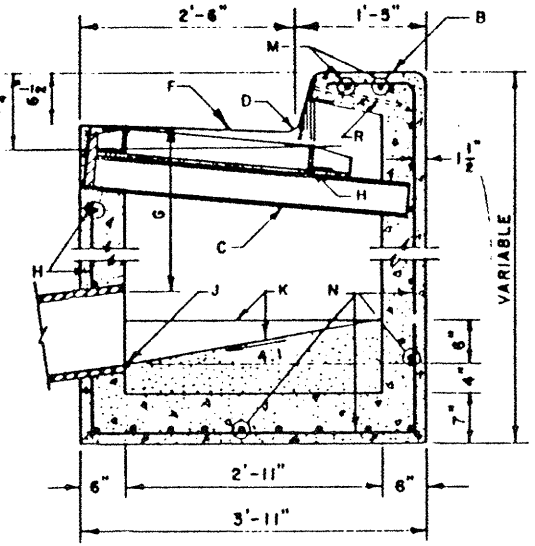
REVISIONS

DRAINAGE
STORM INLET TYPE "A"
SECTIONS B-B, C-C, D-D & E-E
DWG. 2202

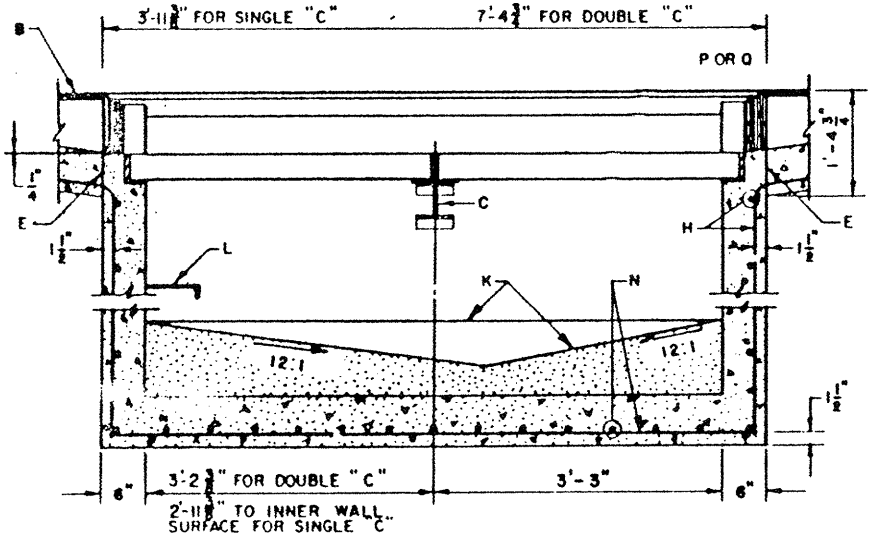
AUG. 1986



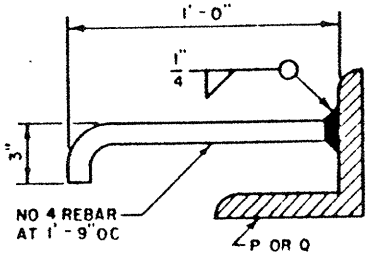
PLAN



SECTION B-B



SECTION A-A



ANCHOR DETAIL

GENERAL NOTES:

1. FOR SINGLE GRATE TYPE STORM INLET DELETE CENTER SUPPORT AND MOVE ONE END WALL TO FORM NEW SINGLE GRATE INLET.
2. FOR STORM INLET GUTTER TRANSITION, SEE DWG 2207.
3. OUTLET PIPE SIZE, PER DESIGN REQUIREMENT.
4. FOR FRAME & GRATING, SEE DWG 2216, 2220 & 2221.
5. FOR ANCHOR SEE DETAIL.
6. FOR CENTER SUPPORT ASSEMBLY, SEE DWG 2215.

CONSTRUCTION NOTES:

A. GUTTER TRANSITION.

B. TOP OF CURB.

C. CENTER SUPPORT ASSEMBLY.

D. FLOWLINE.

E. CONSTRUCTION JOINT.

F. NORMAL GUTTER LINE.

G. 1'-10" MIN, UNLESS OTHERWISE DIRECTED.

H. FRAME AND GRATE.

J. INVERT OF OUTLET PIPE.

K. CONCRETE FILL, MINIMUM SLOPES AS SHOWN.

L. FOR STORM INLET DEPTHS GREATER THAN 4' INSTALL STD STEPS, SEE DWG 2229, UPSTREAM SIDE.

M. EXTEND NO 4 REBARS 18" INTO CURB ON EACH SIDE OF STORM INLET.

N. NO. 4 BARS AT 6" O.C.

P. 3 1/2" X 3 1/2" X 1/2" X 4' - 0" FOR SINGLE GRATE TYPE "C" STORM INLET.

Q. 3 1/2" X 3 1/2" X 1/2" X 7' - 6" FOR DOUBLE GRATE TYPE "C" STORM INLET.

R. ANCHOR.

CITY OF ALBUQUERQUE

REVISIONS

DRAINAGE

STORM INLET DOUBLE "C"

DWG. 2205

AUG 1986

AP-12 INLET ANALYSIS

CULVERT RATING TABLE

18. INCH DIAMETER PIPE

N = 0.01700 INCREMENT = 0.50 SLOPE = 0.02490

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
0.50000	0.01377	0.01727	1.25410
1.00000	0.03862	0.07621	1.97316
1.50000	0.07034	0.18022	2.56223
2.00000	0.10733	0.33007	3.07531
2.50000	0.14864	0.52545	3.53499
3.00000	0.19359	0.76536	3.95348
3.50000	0.24166	1.04838	4.33831
4.00000	0.29240	1.37271	4.69454
4.50000	0.34548	1.73630	5.02578
5.00000	0.40056	2.13685	5.33467
5.50000	0.45736	2.57187	5.62325
6.00000	0.51564	3.03869	5.89308
6.50000	0.57514	3.53446	6.14541
7.00000	0.63565	4.05619	6.38122
7.50000	0.69694	4.60074	6.60131
8.00000	0.75883	5.16482	6.80630
8.50000	0.82110	5.74500	6.99668
9.00000	0.88357	6.33771	7.17282
9.50000	0.94604	6.93921	7.33500
10.00000	1.00831	7.54561	7.48339
10.50000	1.07020	8.15286	7.61807
11.00000	1.13150	8.75670	7.73903
11.50000	1.19201	9.35267	7.84616
12.00000	1.25151	9.93603	7.93925
12.50000	1.30978	10.50177	8.01797
13.00000	1.36659	11.04452	8.08183
13.50000	1.42167	11.55843	8.13020
14.00000	1.47474	12.03709	8.16218
14.50000	1.52549	12.47326	8.17656
15.00000	1.57355	12.85858	8.17169
15.50000	1.61850	13.18297	8.14517
16.00000	1.65981	13.43359	8.09343
16.50000	1.69681	13.59252	8.01064
17.00000	1.72852	13.63092	7.88588
17.50000	1.75337	13.48762	7.69239
18.00000	1.76715	12.67542	7.17283

AP-3 INLET ANALYSIS

CULVERT RATING TABLE

18. INCH DIAMETER PIPE

N = 0.01700 INCREMENT = 0.50 SLOPE = 0.04000

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
0.50000	0.01377	0.02189	1.58951
1.00000	0.03862	0.09659	2.50088
1.50000	0.07034	0.22842	3.24749
2.00000	0.10733	0.41835	3.89780
2.50000	0.14864	0.66598	4.48042
3.00000	0.19359	0.97006	5.01083
3.50000	0.24166	1.32876	5.49858
4.00000	0.29240	1.73984	5.95009
4.50000	0.34548	2.20067	6.36992
5.00000	0.40056	2.70835	6.76142
5.50000	0.45736	3.25972	7.12718
6.00000	0.51564	3.85138	7.46917
6.50000	0.57514	4.47975	7.78899
7.00000	0.63565	5.14102	8.08787
7.50000	0.69694	5.83121	8.36682
8.00000	0.75883	6.54615	8.62664
8.50000	0.82110	7.28150	8.86793
9.00000	0.88357	8.03272	9.09118
9.50000	0.94604	8.79509	9.29674
10.00000	1.00831	9.56368	9.48481
10.50000	1.07020	10.33333	9.65551
11.00000	1.13150	11.09867	9.80882
11.50000	1.19201	11.85402	9.94460
12.00000	1.25151	12.59340	10.06259
12.50000	1.30978	13.31046	10.16236
13.00000	1.36659	13.99836	10.24331
13.50000	1.42167	14.64972	10.30461
14.00000	1.47474	15.25639	10.34514
14.50000	1.52549	15.80921	10.36337
15.00000	1.57355	16.29758	10.35719
15.50000	1.61850	16.70874	10.32358
16.00000	1.65981	17.02639	10.25801
16.50000	1.69681	17.22782	10.15307
17.00000	1.72852	17.27649	9.99495
17.50000	1.75337	17.09487	9.74971
18.00000	1.76715	16.06545	9.09119

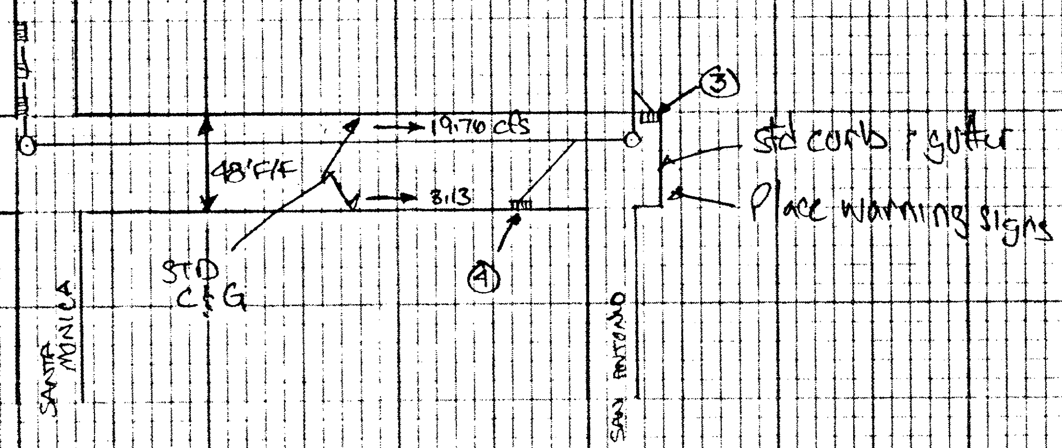
AP-12 INLET ANALYSIS

CULVERT RATING TABLE

21. INCH DIAMETER PIPE

N = 0.01700 INCREMENT = 0.50 SLOPE = 0.02500

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
0.50000	0.01489	0.01874	1.25818
1.00000	0.04182	0.08289	1.98218
1.50000	0.07626	0.19655	2.57742
2.00000	0.11652	0.36098	3.09790
2.50000	0.16160	0.57629	3.56616
3.00000	0.21077	0.84191	3.99440
3.50000	0.26350	1.15681	4.39016
4.00000	0.31934	1.51957	4.75851
4.50000	0.37792	1.92853	5.10304
5.00000	0.43892	2.38176	5.42646
5.50000	0.50205	2.87717	5.73081
6.00000	0.56707	3.41247	6.01770
6.50000	0.63374	3.98522	6.28842
7.00000	0.70184	4.59284	6.54401
7.50000	0.77117	5.23262	6.78533
8.00000	0.84153	5.90172	7.01307
8.50000	0.91275	6.59717	7.22782
9.00000	0.98464	7.31589	7.43004
9.50000	1.05703	8.05469	7.62014
10.00000	1.12975	8.81026	7.79841
10.50000	1.20264	9.57916	7.96511
11.00000	1.27553	10.35783	8.12041
11.50000	1.34825	11.14257	8.26445
12.00000	1.42064	11.92957	8.39730
12.50000	1.49253	12.71484	8.51897
13.00000	1.56375	13.49424	8.62942
13.50000	1.63411	14.26342	8.72855
14.00000	1.70344	15.01785	8.81619
14.50000	1.77154	15.75272	8.89211
15.00000	1.83821	16.46295	8.95598
15.50000	1.90323	17.14308	9.00738
16.00000	1.96636	17.78723	9.04575
16.50000	2.02736	18.38894	9.07037
17.00000	2.08594	18.94099	9.08031
17.50000	2.14178	19.43515	9.07430
18.00000	2.19451	19.86173	9.05066
18.50000	2.24368	20.20879	9.00698
19.00000	2.28876	20.46073	8.93967
19.50000	2.32902	20.59523	8.84287
20.00000	2.36346	20.57530	8.70558
20.50000	2.39039	20.32007	8.50075
21.00000	2.40528	19.15833	7.96511



(3) - INLET DESIGN - SUMP CONDITION

Assume inlet acts as an orifice

$Q = CA\sqrt{2gh}$

Assume 30% clogging - Double grate

$A = 6.34\ ft^2$ (clogging taken into account)

$C = 0.6$ ← King & Brater

solve for h using a Double Type 'C' inlet

$h = 0.394$ FT < 0.48 FT ← assumed elevation of street crown (2%)

OK

(4) - INLET DESIGN - Q = 3.13 cfs

street slope = 1.49%

depth of income flow = 0.23 ft

Try one single type 'A' - inlet

From Plate 22.3 D-5 D.P.M.

Q in grating = 1.2 cfs

Residual flow = 1.93 cfs

BOHANNAN-HUSTON INC.

PROJECT NAME ______ SHEET ______ OF ______

PROJECT NO. ______ BY ______ DATE ______

SUBJECT ______ CH'D ______ DATE ______

CATCH BASIN DEPTH

③ INLET - SUMP CONDITION

$Q_p = 19.76$ cfs

Assume orifice condition

$Q = CA\sqrt{2gh}$

Try a 27" RCP

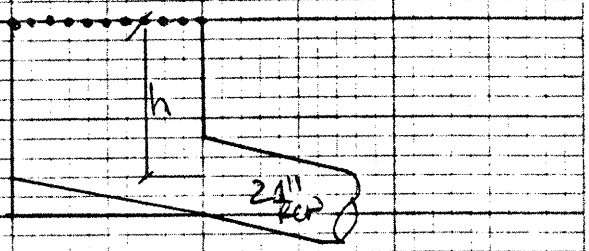
$Q = 19.76$

$C = 0.6$ King & Brater

$A = 3.976$ FT²

solve for h

$h = 1.065$



TRY A 21" RCP

$Q = 19.76$

$A = 2.41$ SF

solve $h = 2.91$ FT

TRY A 24" RCP

$Q = 19.76$ cfs

$A = \pi = 3.14$ SF

$h = 1.71$ FT

Use a 24" Ø RCP

④ INLET -

$Q_p = 1.2$ cfs

Assume orifice condition

$Q = CA\sqrt{2gh}$

Try an 18" RCP

solve for h

$h = 0.02$ FT ~~=~~ does not act as an orifice but controled by gravity flow.

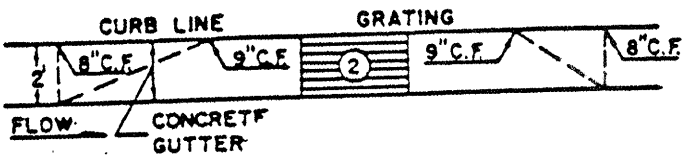
BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

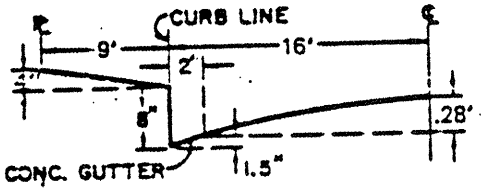
PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

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

STREET CAPACITY ON S. TENNYSON 48' F/F

MANNING'S N = .0170 SLOPE = .0149

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	24.00	0.48	7	48.00	0.67
2	0.01	0.00	5	46.00	0.13			
3	2.00	0.13	6	47.99	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.2	0.2	3.4	1.4	3.2
0.2	0.2	0.9	1.6	13.7	1.7	13.3
0.3	0.3	2.8	6.9	26.3	2.4	25.7
0.4	0.4	6.0	18.6	38.9	3.1	38.1
0.5	0.5	10.4	39.7	49.0	3.8	48.0
0.6	0.6	15.2	74.4	49.2	4.9	48.0
0.7	0.7	18.6	103.5	49.3	5.6	48.0

0.405

3.13

STREET CAPACITY ON S. TENNYSON 48' F/F

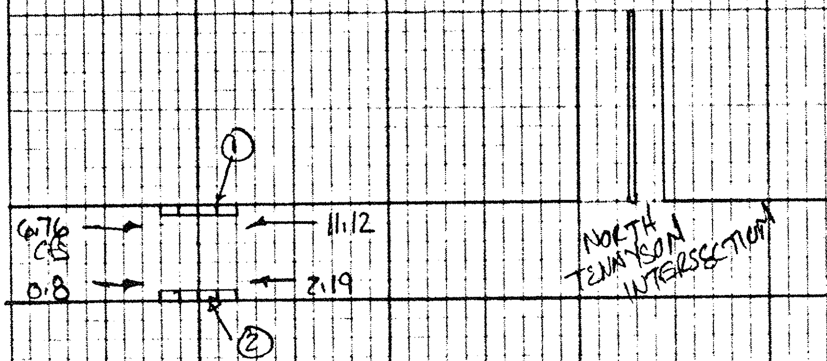
MANNING'S N = .0170 SLOPE = .0611

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	24.00	0.48	7	48.00	0.67
2	0.01	0.00	5	46.00	0.13			
3	2.00	0.13	6	47.99	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.1	0.1	0.2	0.4	3.4	2.8	3.2
0.2	0.2	0.9	3.1	13.7	3.5	13.3
0.3	0.3	2.8	14.0	26.3	4.9	25.7
0.4	0.4	6.0	37.6	38.9	6.2	38.1
0.5	0.5	10.4	80.4	49.0	7.7	48.0
0.6	0.6	15.2	150.7	49.2	9.9	48.0
0.7	0.7	18.6	209.6	49.3	11.3	48.0

0.302, 0.324, 14.46, 19.76 cfs

.9



① INLET DESIGN – TENNYSON

$Q = 17.88$ cfs SUMP CONDITION

ASSUME ORIFICE CONDITION = $Q = CA\sqrt{2gh}$

Orifice Area of Grate Opening = 4.67 SF
(SEE BASIN E DESIGN)

ASSUME 30% CLOGGING FACTOR

Area = 4.67 (.7) = 3.27 SF

solve for h   C = 0.6 ← assumed orifice coef

h = 1.29 FT for a single grate (#6)

use two Type 'D' inlets
A = 6.54 SF   C = 0.6

solve
h = 0.3224' ← use Type 'C' Double Grate inlet

② INLET DESIGN

$Q = 3.00$ Sump Condition

Assume Orifice

$Q = CA\sqrt{2gh}$

Area w/ 30% clogging factor
A = 3.27 SF

solve for h
h = 0.0363 ← use Type 'C' SINGLE GRATE INLET

STORM DRAIN ANALYSIS DISCHARGING INTO 24" CMP

CULVERT RATING TABLE

NORTH TENNYSON STREET (NORTH OF DEL REY AVE)

24. INCH DIAMETER PIPE

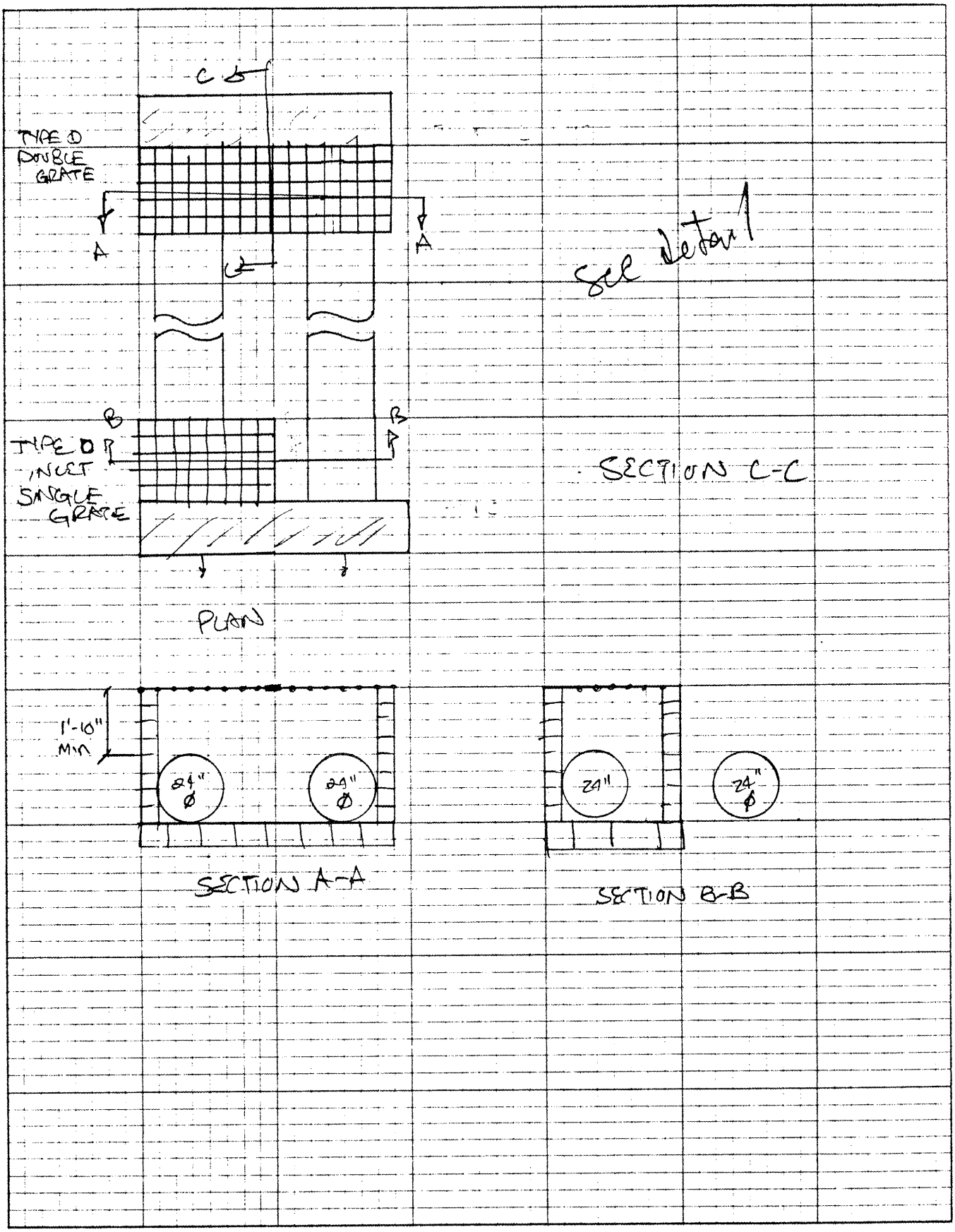
N = 0.01300 INCREMENT = 0.50 SLOPE = 0.00318

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
0.50000	0.01594	0.00936	0.58735
1.00000	0.04479	0.04148	0.92623
1.50000	0.08175	0.09856	1.20559
2.00000	0.12504	0.18138	1.45054
2.50000	0.17359	0.29017	1.67158
3.00000	0.22665	0.42484	1.87439
3.50000	0.28366	0.58505	2.06246
4.00000	0.34416	0.77029	2.23816
4.50000	0.40777	0.97995	2.40317
5.00000	0.47417	1.21327	2.55874
5.50000	0.54305	1.46942	2.70584
6.00000	0.61418	1.74748	2.84522
6.50000	0.68732	2.04648	2.97749
7.00000	0.76224	2.36536	3.10315
7.50000	0.83876	2.70301	3.22261
8.00000	0.91669	3.05827	3.33622
8.50000	0.99584	3.42993	3.44425
9.00000	1.07605	3.81671	3.54696
9.50000	1.15716	4.21732	3.64454
10.00000	1.23901	4.63039	3.73717
10.50000	1.32145	5.05452	3.82499
11.00000	1.40432	5.48826	3.90812
11.50000	1.48749	5.93012	3.98667
12.00000	1.57080	6.37855	4.06071
12.50000	1.65410	6.83196	4.13031
13.00000	1.73727	7.28871	4.19550
13.50000	1.82014	7.74711	4.25632
14.00000	1.90258	8.20539	4.31278
14.50000	1.98443	8.66176	4.36486
15.00000	2.06554	9.11431	4.41256
15.50000	2.14575	9.56109	4.45583
16.00000	2.22490	10.00005	4.49460
16.50000	2.30283	10.42904	4.52880
17.00000	2.37934	10.84581	4.55832
17.50000	2.45427	11.24795	4.58301
18.00000	2.52741	11.63291	4.60271
18.50000	2.59853	11.99792	4.61719
19.00000	2.66742	12.33998	4.62618
19.50000	2.73382	12.65574	4.62933
20.00000	2.79743	12.94143	4.62619
20.50000	2.85793	13.19269	4.61618
21.00000	2.91493	13.40428	4.59848
21.50000	2.96800	13.56966	4.57199
22.00000	3.01655	13.68011	4.53502
22.50000	3.05984	13.72284	4.48483
23.00000	3.09680	13.67628	4.41626

GRAVITY FLOW

USING THE SMALLEST GRADE ON TENNYSON STREET OF 0.318%, A 24" Ø RCP WILL DISCHARGE ~13 cfs BY GRAVITY FLOW. A 100 YR STORM WILL DISCHARGE ~40 cfs

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
23.50000	3.12565	13.49214	4.31658
24.00000	3.14159	12.75710	4.06071



BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET _____ OF _____

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

1 - 24" DIAMETER CMP CULVERT ANALYSIS

CULVERT RATING TABLE

24. INCH DIAMETER PIPE

N = 0.02500 INCREMENT = 0.50 SLOPE = 0.02500

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
0.50000	0.01594	0.01365	0.85636
1.00000	0.04479	0.06048	1.35045
1.50000	0.08175	0.14370	1.75776
2.00000	0.12504	0.26445	2.11490
2.50000	0.17359	0.42307	2.43718
3.00000	0.22665	0.61942	2.73287
3.50000	0.28366	0.85300	3.00708
4.00000	0.34416	1.12309	3.26325
4.50000	0.40777	1.42877	3.50384
5.00000	0.47417	1.76895	3.73066
5.50000	0.54305	2.14242	3.94513
6.00000	0.61418	2.54785	4.14835
6.50000	0.68732	2.98379	4.34120
7.00000	0.76224	3.44871	4.52442
7.50000	0.83876	3.94101	4.69859
8.00000	0.91669	4.45898	4.86423
8.50000	0.99584	5.00086	5.02174
9.00000	1.07605	5.56480	5.17149
9.50000	1.15716	6.14888	5.31376
10.00000	1.23901	6.75114	5.44881
10.50000	1.32145	7.36953	5.57686
11.00000	1.40432	8.00193	5.69807
11.50000	1.48749	8.64616	5.81260
12.00000	1.57080	9.29997	5.92055
12.50000	1.65410	9.96105	6.02202
13.00000	1.73727	10.62699	6.11707
13.50000	1.82014	11.29534	6.20575
14.00000	1.90258	11.96353	6.28806
14.50000	1.98443	12.62891	6.36400
15.00000	2.06554	13.28873	6.43355
15.50000	2.14575	13.94014	6.49663
16.00000	2.22490	14.58015	6.55316
16.50000	2.30283	15.20562	6.60303
17.00000	2.37934	15.81327	6.64606
17.50000	2.45427	16.39960	6.68206
18.00000	2.52741	16.96087	6.71078
18.50000	2.59853	17.49306	6.73190
19.00000	2.66742	17.99178	6.74500
19.50000	2.73382	18.45216	6.74960
20.00000	2.79743	18.86870	6.74502
20.50000	2.85793	19.23504	6.73042
21.00000	2.91493	19.54354	6.70462
21.50000	2.96800	19.78467	6.66600
22.00000	3.01655	19.94570	6.61209
22.50000	3.05984	20.00801	6.53891
23.00000	3.09680	19.94012	6.43894

Maximum Flow In One 24" ϕ Pipe Is 19 cfs, By Gravity Flow Pipe Size OK.

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
23.50000	3.12565	19.67164	6.29361
24.00000	3.14159	18.59995	5.92055

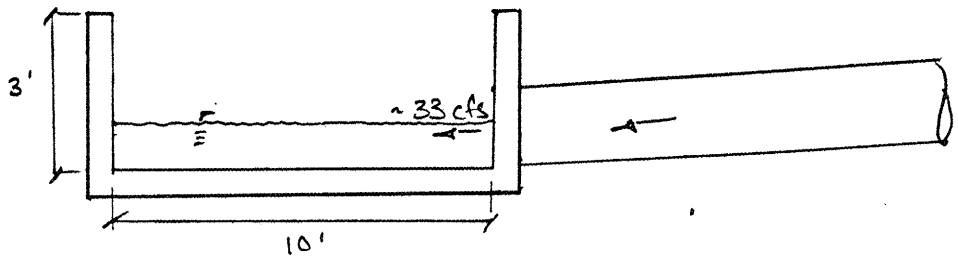
WIER ANALYSIS OF FLOW FROM CULVERTS WEST TENNYSON

WEIR COEFFICENT = 3.0000
CROSS SECTION DIVIDED INTO VERTICAL SLICES 1. FEET APART

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	23.00	3	10.00	19.90			
2	0.01	20.00	4	10.01	23.00			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA (SQ FT)	FLOW RATE (CFS)	FLOW VEL (FPS)	TOP WID PLUS OBSTRUCTIONS
20.10	0.20	1.50	1.77	1.18	9.99
20.30	0.40	3.50	6.22	1.78	9.99
20.50	0.60	5.50	12.24	2.23	9.99
20.70	0.80	7.49	19.48	2.60	9.99
20.90	1.00	9.49	27.77	2.92	10.00
21.10	1.20	11.49	36.98	3.22	10.00
21.30	1.40	13.49	47.03	3.49	10.00
21.50	1.60	15.49	57.86	3.73	10.00
21.70	1.80	17.49	69.42	3.97	10.00
21.90	2.00	19.49	81.65	4.19	10.00
22.10	2.20	21.49	94.53	4.40	10.00
22.30	2.40	23.49	108.03	4.60	10.01
22.50	2.60	25.50	122.12	4.79	10.01
22.70	2.80	27.50	136.77	4.97	10.01
22.90	3.00	29.50	151.96	5.15	10.01
23.00	3.10	30.50	159.76	5.24	10.01

Two 24" ϕ CMP's Discharging A Flow Of ~33 cfs



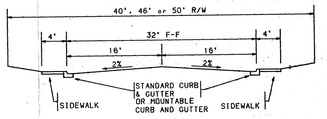
NOTES:

Total Acreage: - Total subdivision acreage is 13.91 acres.
Total Number of Lots: - 86 Lots (6.18 DU/AC)
Zoning: - Current zoning is SU for Planned C-1 development for Tract 2A of the Lands of Sandia Peak Tram Company and SU for PRD for Tract 1A-1.
Dwelling Units: - All dwelling units shall be single family dwelling units.
Lot Sizes: - Average lot size is 0.101 acres (4400 sq. ft.).
Drainage: - Final drainage plans and improvements must be approved by the County Public Works Department.
Minimum Lot Size: - Minimum lot size shall be 40' wide x 110' deep (approximately).
Setbacks: - Lot setbacks shall be:
Front Yard: 15 feet minimum
Rear Yard: 15 feet minimum
Side Yard: 3 feet minimum one side- 7 feet minimum on opposite side.
Driveway: 18 feet minimum
Corner Lots: 10 feet minimum on street side.
- There will be a distance of not less than 10 feet between all buildings.
Parking: - Off-street parking is provided on each lot for a minimum of 2 cars in addition to 2 parking spaces within each garage.
- Driveway locations may vary depending on housing model constructed and lot selected by buyer.
Roads: - All streets will be public, to be dedicated to the County of Bernalillo for County maintenance.
- No lot shall have direct access to either Tramway Boulevard, San Rafael Avenue or Tennyson Street.
- All streets have centerline radii of 75' minimum.
- All streets meet County Ordinance right-of-way standards with the exception of the 46' wide street adjacent to Tramway Boulevard. The 46' wide street right-of-way width has already been granted a variance by the County Public Works Department. The approval considered the findings that the proposed 46' right-of-way is only 4' less than the standard 50' right-of-way, the street is single-loaded (lots on only one side) and there still remains sufficient width for typical street appurtenances.
- Water services to these properties are to be provided by the Sandia Peak Utility Company.
- Sanitary sewer service to these properties will be provided by Sandia Peak Services, Inc.
Walls and Fences: - Walls/fences shall be constructed on side yard property lines between buildings without obstructing drainage.
- A 5'high (max.) privacy wall will be constructed around the perimeter of the subdivision with the possible exception of a portion of the east property line adjacent to Tramway (across from Lots 1-11, 27). An option to not construct a privacy wall along this reach is retained by the owner.
- Retaining walls, maximum 4' in height, may be required in the final grading plan.
Grading: - Final height and length will be determined at final grading plan.
Building Height: - Lot lines and street alignments on this site plan are approximate and may vary slightly from final plat. Refer to the final plat for actual dimensions.
Sidewalks: - No structure shall exceed 26 feet in height.
- 4' wide sidewalks shall be constructed within this subdivision at the back of curb, except on the east side of the street fronting Lots 1-11,27.
Grading: - Final grades for building pads will be determined on the final grading plan.

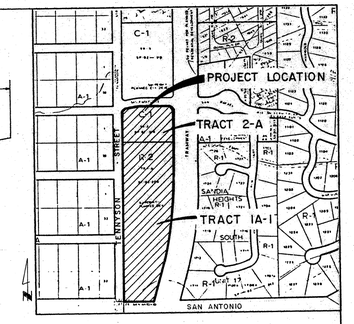
UPC #: 1-023-063-025-140-30615 (Tract 2A)
1-023-063-020-069-30605 (Tract 1A-1)

LEGEND

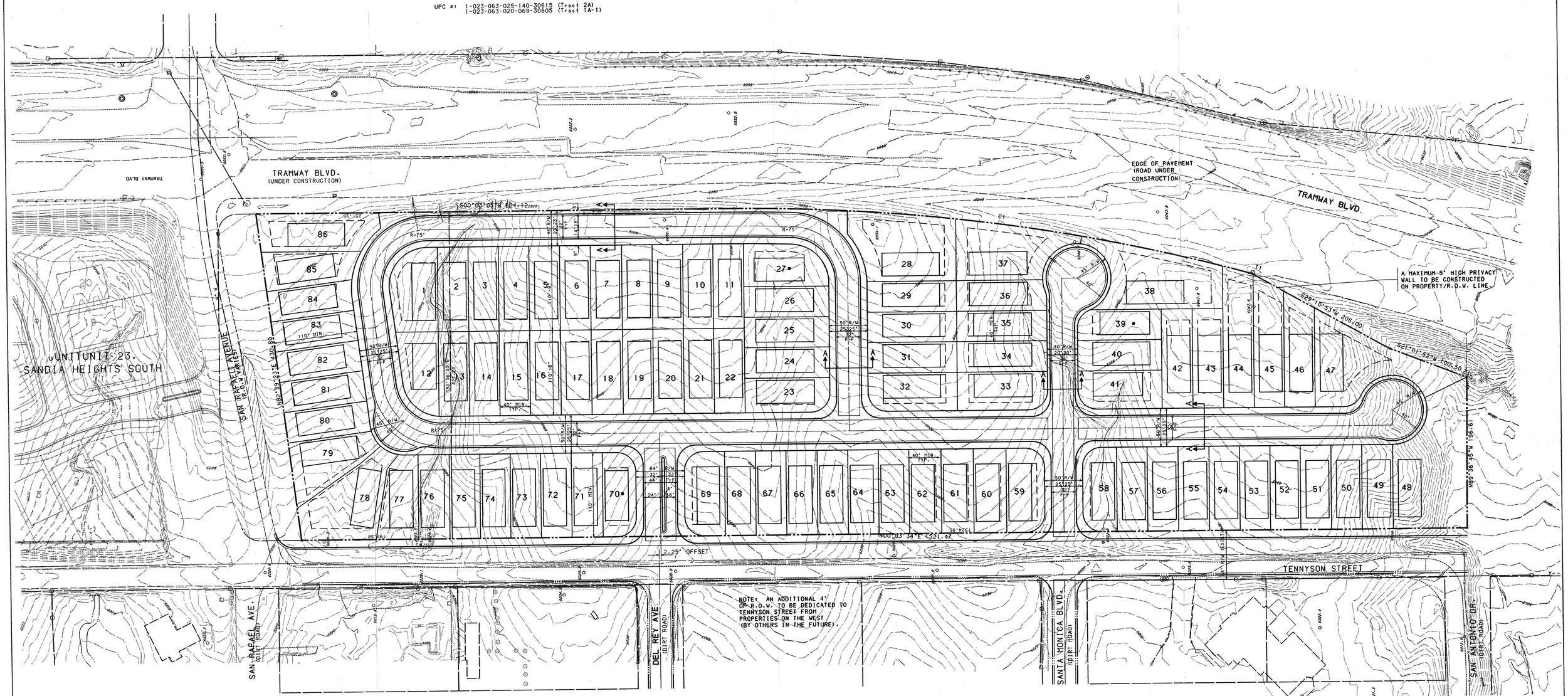
PROJECT BOUNDARY
PROPOSED CURB & GUTTER
EXISTING CURB & GUTTER
FUTURE SIDEWALK
EXISTING GUARD RAIL
PROPOSED PROPERTY LINE
EXISTING CONTOUR
EXISTING STORM DRAIN INLET
EXISTING STREET LIGHT



TYPICAL STREET SECTION A-A
NO SCALE



LOCATION MAP
ZONE ATLAS MAP NO. D-23
NO SCALE



SITE DEVELOPMENT PLAN
SANDIA HEIGHTS SOUTH, UNITS 21 AND 22
ALBUQUERQUE, NEW MEXICO
JUNE 1991

N
50 25 0 50
SCALE: 1" = 50'

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HYDROLOGY DIVISION

CURVE DATA

NUMBER	BEARING	DISTANCE
T1	S15°33'06"W	3.31
T2	S21°45'06"W	6.35

NUMBER	ARC	RADIUS	DELTA	CHORD	CHORD BEARING	TANGENT
C1	679.32	2511.07	15°30'01"	677.25	S07°48'05"W	341.75

NOTE: TRAMWAY BLVD. PAVED ROADWAY WILL DRAIN TO A CENTER DRAINAGE CHANNEL, THEN SOUTHERLY TO THE ARROYO DEL PINO.

TRAMWAY BLVD. (UNDER CONSTRUCTION)

TRAMWAY BLVD.

OFFSITE BASIN 2

S00°03'05"W 624.12

Q=0.944 cfs

OFFSITE BASIN 3

C1

Q=1.69 cfs

T1

S29°10'53"W 206.00

OFFSITE BASIN 4
Q=1.65 cfs

S21°01'52"W 100.30

OFFSITE BASIN 1
Q=2.44 cfs

SAN RAFAEL AVENUE (R.O.W. VARIES)

N82°39'23"E 439.80

BASIN A
Q=2.11 cfs

BASIN B
Q=6.81 cfs

BASIN C
Q=3.69 cfs

BASIN D
Q=5.54 cfs

BASIN E
Q=6.30 cfs

BASIN F
Q=2.41 cfs

BASIN H
Q=1.99 cfs

BASIN G
Q=0.74 cfs

N89°36'45"W 196.61

ARROYO DEL PINO (PINO ARROYO)

N00°03'34"E 1521.47

Q=2.11 cfs

Q=7.75 cfs

2-24" CMP CULVERTS

Q=3.69 cfs

Q=5.54 cfs

Q=7.99 cfs

Q=2.41 cfs

TENNYSON STREET

Q=4.38 cfs

Q=2.44 cfs

Q=10.00 cfs

SAN RAFAEL AVE. (DIRT ROAD)

DEL REY AVE. (DIRT ROAD)

SANTA MONICA BLVD. (DIRT ROAD)

SAN ANTONIO DR. (DIRT ROAD)

NOTE: ALL FLOW RATES (Q), ARE 100-YEAR, 6-HOUR STORM VALUES.

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EXISTING DRAINAGE CONDITIONS

SANDIA HEIGHTS SOUTH, UNITS 21 AND 22

ALBUQUERQUE, NEW MEXICO

JUNE 1991

N

50 25 0 50

SCALE: 1" = 50'

EXISTING DRAINAGE CONDITIONS

Project No.

SANDIA HEIGHTS SOUTH UNITS 21 & 22

Sheet

Drawn By: MZM | Date: 7-20-92

Checked By: KGP/JRT | Scale: 1"=50'

7-20-92

BOHANNAN HUSTON INC.

TO PINO/TRAMWAY DAM
(unimproved arroyo)
SOUTH ARROYO DEL PINO
42" RCP STORM DRAIN
ELECTRICAL TRANSMISSION LINES
MANHOLE #5
42" Ø RCP STORM DRAIN
MANHOLE #4
INLET #1
MANHOLE #3
24" Ø RCP JUNCTION CONNECTOR Sta. 6+25
18" Ø RCP JUNCTION CONNECTOR
24" Ø RCP STORM DRAIN
MANHOLE #2
TENNYSON STREET (48' F/F COLLECTOR STREET)
UNIT 21/22 (proposed subdivision)
JUNCTION Sta. 4+85
WINGWALL
ANCHOR WIRES (TYP.)
NEW R/W
EXIST R/W
5-10'x10' BOX CULVERTS
TRAMWAY BLVD
TENNYSON STREET
BASIN K
BASIN J
BASIN I
BASIN L
BASIN E
BASIN C
BASIN D
MH #5
MH #4
MH #3 (@ Tennyson & San Antonio)
MH #2
BEGINNING D/S ELEVATION 6014
BOX CULVERT WINGWALL
EXISTING GROUND
TIE-IN PROPOSED GROUND ELEVATION INTO EXISTING
END STREET GRADE
EXISTING GROUND
PROPOSED STREET GRADE (from County plans)
TO INLETS ON SANTA MONICA, EAST OF TENNYSON
HGL
42" Ø RCP
Q = 41.5 cfs
S = 0.16%
Q = 41.5 cfs
V = 4.313 fps
Q = 39.0 cfs
V = 4.05 fps
Q = 19.2 cfs
V = 1.99 fps
Q = 18 cfs
V = 5.73 fps
24" Ø RCP
S = 2.2%
HGL FOLLOWS WATER (FREE) SURFACE LEVEL IN STORM DRAIN
EXISTING 5-10'x10' BOX CULVERTS
6030
6020
6010
6000
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00

PLAN

PROFILE

Date	Revision
	Preliminary Proposed Storm Drain Plan

Project No.: Sandia Heights South Units 21 & 22

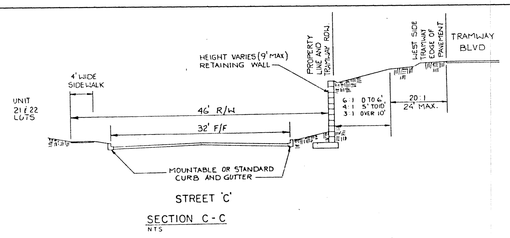
JAMES D. TOPMILLER, NEW MEXICO, 8354, REGISTERED PROFESSIONAL ENGINEER

Job No. 32182.03	Sheet 1 Of 1
Drawn By: K. Patton	Date: 7/27/92
Checked By:	Scale: 1" = 80'

RECEIVED AUG 5 1992 HYDROLOGY DIVISION

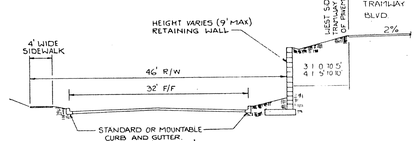
PLATE 1 SINGLE PLAN - PROFILE - DOTTED
CHARLES BRUNING COMPANY
MADE IN U.S.A.

BRUNING 44-132 39593



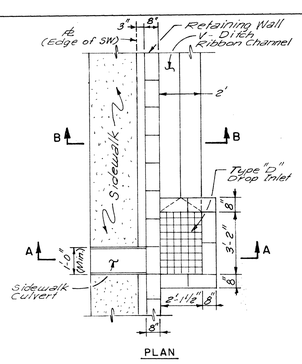
STREET 'C'

SECTION C-C
NTS

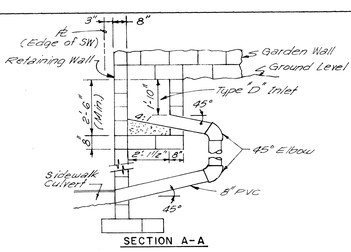


STREET 'C'

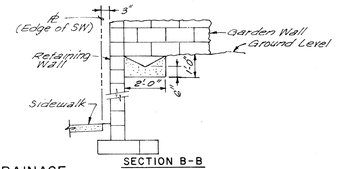
SECTION D-D
NTS



PLAN



SECTION A-A



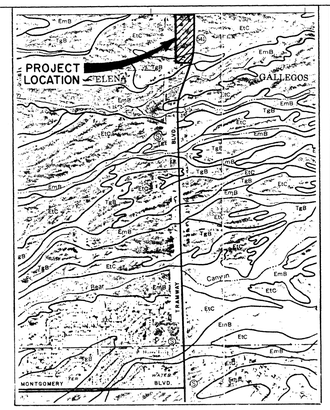
SECTION B-B

BACKYARD DRAINAGE INLET DETAILS
NTS

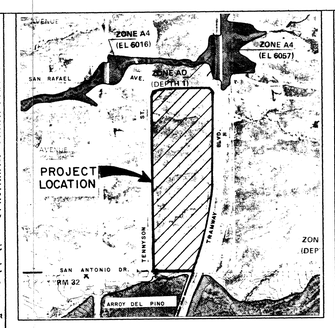
LEGEND

PROJECT BOUNDARY	
EXISTING CONTOUR	
EXISTING SPOT ELEVATION	025.42
PROPOSED SPOT ELEVATION	●25.42
DIRECTION OF FLOW	
BASIN BOUNDARY (DRAINAGE)	
SUB-BASIN BOUNDARY	
PROPOSED RETAINING WALL	
EXISTING STORM DRAIN LINE	SD
EXISTING STORM DRAIN MANHOLE	
PROPOSED SIDEWALK CULVERT	
PROPOSED STORM DRAIN LINE	SD
PROPOSED STORM DRAIN MANHOLE	
PROPOSED STORM DRAIN INLET	
EXISTING 24" DIA. CMP	
ANALYSIS POINT (AP)	▲

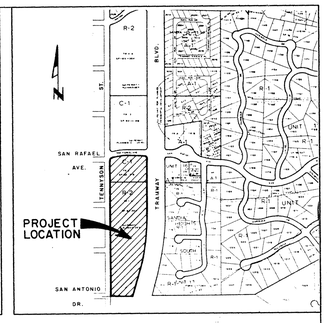
NOTE: ALL FLOW RATES (Q), ARE 100-YEAR, 6-HOUR STORM VALUES.



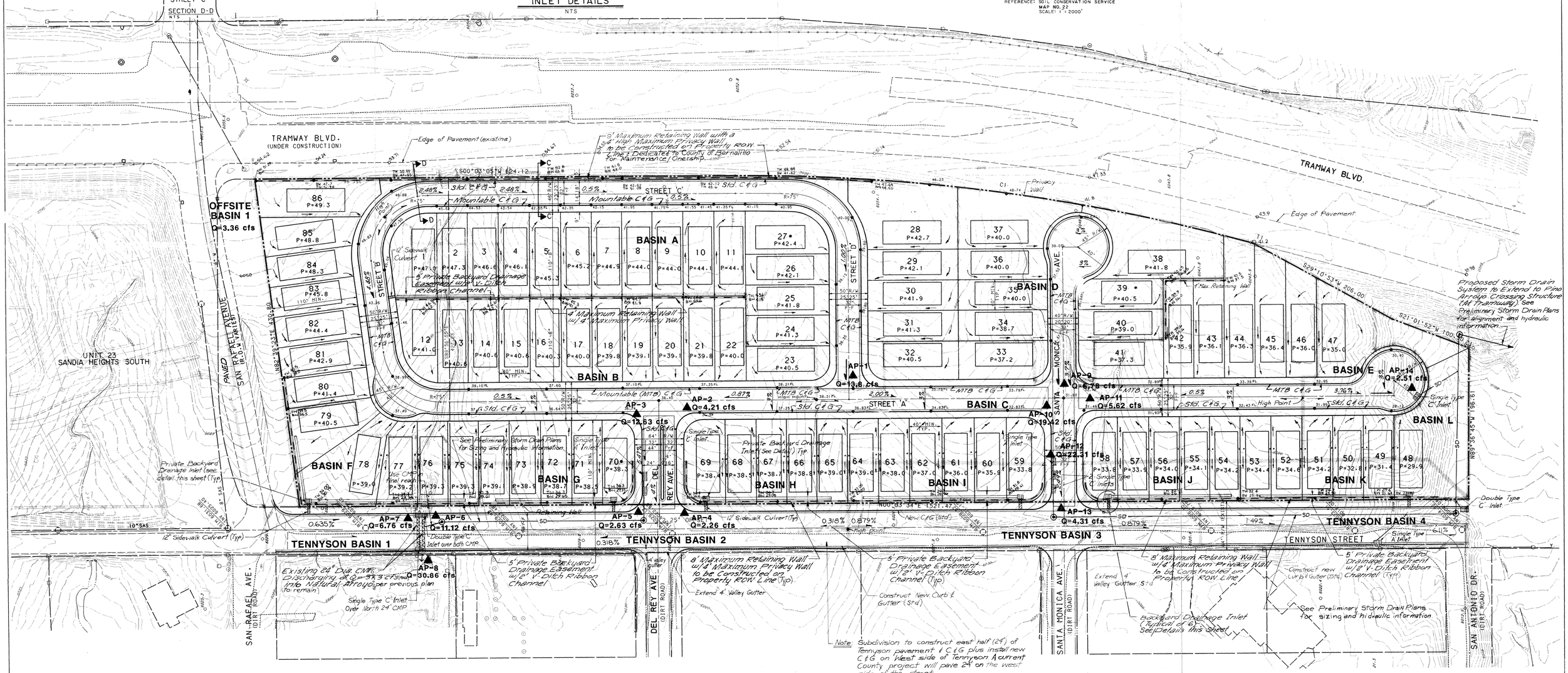
SOILS MAP
REFERENCE: SOIL CONSERVATION SERVICE
MAP NO. 22
SCALE: 1" = 2000'



FLOOD INSURANCE MAP
REFERENCE: FLOOD INSURANCE STUDY
PANEL NOS. 350002 0011 & 0018
SCALE: 1" = 500'



LOCATION MAP
ZONE ATLAS MAP NO. D-23-Z
NO SCALE



PROPOSED TERRAIN MANAGEMENT AND PRELIMINARY GRADING PLAN/SOILS MAP

SANDIA HEIGHTS SOUTH, UNITS 21 AND 22

ALBUQUERQUE, NEW MEXICO

JULY 1991

N

50 25 0 50

SCALE: 1" = 50'

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TERRAIN MANAGEMENT AND PRELIMINARY GRADING PLAN

Project No.

SANDIA HEIGHTS SOUTH UNITS 21 & 22

Seal

Job No. 92182.03 | Sheet
Drawn By MZM | Date 7-20-92
Checked By KGP/JRT | Scale 1"=50'

BOHANNAN HUSTON INC.

7.20.92

USERNAME = CDP:EC9218201.PADJ