City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 6, 2001

Bruce Stidworthy, P.E.
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, New Mexico 87109

RE: **Grading and Drainage Certification- COSTCO**
(L-21/D037) (Eubank Blvd SE)
Engineer's Stamp dated 4/18//2000
Engineers Certification dated 1/19/2001

Dear Mr. Stidworthy:

Based upon the information provided in your Engineers Certification submittal dated 1/19/2001, the above referenced site is approved for Permanent Certificate of Occupancy.

If I can be of further assistance, please contact me at 924-3986.

Sincerely,

Loren D. Meinz, PE
Senior Civil Engineer
Hydrology Section, PWD

C: Vickie Chavez, COA
Teresa Martin,COA
file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Costco Wholesale ZONE ATLAS/DRNG. FILE # L21-D37

DRB #: _____ EPC #: 99-136 WORK ORDER #: 6382

LEGAL DESCRIPTION: Tract A & 1-C Manzano Mesa

CITY ADDRESS: NE Corner of Southern & Eubank

ENGINEERING FIRM: BOHANNAN-HUSTON INC. CONTACT: Bruce Stidworthy

ADDRESS: 7500 JEFFERSON NE, ALB. NM 87109 PHONE: (505) 823-1000

OWNER: Costco CONTACT: _____

ADDRESS: _____ PHONE: _____

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN
- ____ FINAL GRADING & DRAINAGE PLAN
- ____ GRADING PLAN
- ____ EROSION CONTROL PLAN
- X ____ 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 SUBɔD. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- X ____ CERTIFICATE OF OCCUPANCY APPROVAL -final
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- ____ DRAINAGE REQUIREMENTS
- ____ SUBDIVISION CERTIFICATION
- ____ OTHER _____ (SPECIFY)

DATE SUBMITTED: January 19, 2001

BY: Bruce Stidworthy, Bohannan Huston, Inc.

RECEIVED
JAN 19 2001
HYDROLOGY SECTION

Revised 02/98

Bohannan ▲ Huston

CLIENT/COURIER TRANSMITTAL

BOHANNAN HUSTON
Courtyard One
7500 JEFFERSON NE
Albuquerque
NEW MEXICO 87109
voice 505.823.1000
fax 505.821.0892

To: Brad Bingham
Hydrology / Utility Development
City of Albuquerque
600 2nd Street NW

phone: 924-3986

Requested By: Bruce Stidworthy / am

Date: **January 19, 2001**

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

Job No.: 00 198

Job Name: Costco

DELIVERY VIA

☒ **Courier** ☐ **Federal Express**
☐ **Mail** ☐ **UPS**
☐ **Other** _____

PICK UP

Item: _____

_____

ITEM NO.	QUANTITY	DESCRIPTION
1	1	Final Drainage Certification.

COMMENTS / INSTRUCTIONS

Brad -

All of the issues mentioned in my previous letter have been addressed. Based on a site visit yesterday, the project appears to be complete and ready for final Certificate of Occupancy.

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

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 6, 2004

Pamela Thies, PE
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: Longford Village East Subdivision Revised Grading Plan
Engineer's Stamp dated 1-14-04 (L21/D37)

Dear Ms. Thies,

Based upon the information provided in your submittal dated 2-2-04, the above referenced plan is approved for Grading Permit. This is now the plan that must be certified for release of SIA and Financial Guarantee.

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

Sincerely,

Bradley L. Bingham, PE
City Hydrologist

C: file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(REV. 1/28/2003rd)

Costco site

PROJECT TITLE: Longford Village East ZONE MAP/DRG. FILE #: L-21/D37
DRB #: 1000262 EPC#: WORK ORDER#:

LEGAL DESCRIPTION:
CITY ADDRESS:

ENGINEERING FIRM: Bohannan Huston CONTACT: Pam Thies
ADDRESS: 7500 Jefferson NE PHONE: 823-1000
CITY, STATE: Alb. NM 87109 ZIP CODE: 87109

OWNER: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

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

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

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

CHECK TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN 1st SUBMITTAL, *REQUIRES TCL or equal*
- ____ DRAINAGE PLAN RESUBMITTAL
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- ✓ GRADING PLAN resubmittal
- ____ EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION (HYDROLOGY)
- ____ CLOMR/LOMR
- ____ TRAFFIC CIRCULATION LAYOUT (TCL)
- ____ ENGINEERS CERTIFICATION (TCL)
- ____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
- ____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SIA / FINANCIAL GUARANTEE RELEASE
- ____ 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 (PERM.)
- ____ CERTIFICATE OF OCCUPANCY (TEMP.)
- ✓ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ WORK ORDER APPROVAL
- ____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

RECEIVED
FEB 02 2004
HYDROLOGY SECTION

DATE SUBMITTED: Stephanie Stratton BY: 2-2-04

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

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

City of Albuquerque

May 2, 2000

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

Re: Costco Wholesale - Eubank Grading and Drainage Plan
Engineer's Stamp dated 4-18-00 (L21/D37)

Dear Mr. Stidworthy,

Based upon the information provided in your resubmittal dated 4-18-00, the above referenced site is approved for Building Permit.

Please attach a copy of this approved plan to the construction sets prior to sign-off by Hydrology.

Also, prior to Certificate of Occupancy release, Engineer Certification per the DPM checklist will be required.

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

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Hydrology Review Engineer

C: file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE REPORT FOR COSTCO WHOLESALE

BOHANNAN HUSTON

Courtyard One

7500 JEFFERSON NE

Albuquerque

NEW MEXICO 87109

voice 505.823 1000

fax 505 821 0892

MARCH 16, 2000

PREPARED FOR:

COSTCO WHOLESALE
c/o MULVANNY ARCHITECTS
11820 NORTHRUP WAY, #E300
BELLEVUE, WA 98005

DRAINAGE REPORT
FOR
COSTCO WHOLESALE

MARCH 16, 2000

PREPARED BY:

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

PREPARED FOR:

COSTCO WHOLESALE
c/o MULVANNY ARCHITECTS
11820 NORTHRUP WAY, #E300
BELLEVUE, WA 98005

PREPARED BY:

BRUCE J. STIDWORTHY
NEW MEXICO
14523
REGISTERED PROFESSIONAL ENGINEER

Bruce Stidworthy 3/16/00

Bruce Stidworthy, P. E. **Date**

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EXHIBIT 3: ONSITE 36" DIAMETER STORM DRAIN PLAN & PROFILE

EXHIBIT 4: FEMA MAP

EXHIBIT 5: PLAT

EXHIBIT 6: GRADING AND DRAINAGE PLAN

I. Site Location

The proposed Costco Wholesale site is located on Southern Boulevard SE, between Eubank and Elizabeth, within City of Albuquerque Zone Atlas Map No. L-21. The site is within Precipitation Zone 3 as defined in the DPM Section 22.2. The site is currently legally described as Manzano Mesa, Tracts A and 1C, and contains 30 acres. Proposed platting will change the legal description to Tracts A and B, Costco Development. The site has previously been used for temporary parking on the west end and Little League fields on the east end.

II. Purpose/Background

The purpose of the drainage analysis is to evaluate the total flow from the Costco Wholesale site to the proposed 54-inch storm drain trunk line in Eubank Boulevard, and to provide a comprehensive drainage plan for the site. The analysis includes detailed modeling of a detention pond facility and storm drain from the pond to the Eubank storm drain. The onsite storm drain will also collect runoff through inlets and laterals from various sections of the site. This report is submitted for Building Permit approval.

The Costco site consists of two tracts, the portion being developed by Costco (Tract A), and the residual parcel (Tract B). The entire site was included in the South Eubank Area Storm Drainage Analysis (South Eubank Analysis), prepared for the City of Albuquerque by Smith Engineering Company, November 1995. That report also includes analysis of the proposed Eubank storm drain. Amendment #1 to that report (Amendment #1) provides a more detailed analysis for the drainage basins adjacent to the Costco site which drain to the Eubank trunk line. A copy of Amendment #1 was submitted with the conceptual drainage plan for the Costco Site, the basin map from Amendment #1 is also included in this report.

This report details a drainage plan for the Costco site which is capable of sufficiently mitigating the peak flows so as not to adversely impact the Eubank trunk line, and which conforms with Amendment #1 and the approved conceptual drainage plan for the Costco Site.

ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

III. Existing Conditions

The site slopes from east to west at approximately 1.5%. It drains to the northwest corner and onto Eubank Boulevard. It is sparsely covered with grass and weeds, and there are no significant improvements. A drainage swale runs along the northern edge.

Tract A, is included as a portion of Basin 404 in Amendment #1. It receives runoff from Tract 2 to the west, which is the remainder of Basin 404. Basin 401, east of Elizabeth Street and northeast of Tract 2, flows to the west into Basin 405B. Basin 405B is directly north of Tract 2. The total runoff from these two basins flow south into the drainage swale. There is an existing floodplain, shown as Zone AO on FEMA Flood Insurance Rate Map # 35001C0359D (a copy is included with this report), where the offisite flow enters the swale. The total contributing flow to Eubank Boulevard from these basins is 228 cubic feet per second (cfs). The flow was calculated in the approved Conceptual Grading and Drainage Plan for the site by Bohannan Huston, Inc., February 2000, and was not re-calculated for this analysis.

IV. Proposed Conditions

The Drainage Report addresses two proposed conditions: interim and ultimate. Interim conditions is the development of Tract A, the Costco Wholesale site. Ultimate conditions includes the additional development of Tract B and the construction of the Elizabeth Street storm drain. Both development scenarios are discussed in more detail in the following sections.

The AHYMO hydrologic model (Version 1/94) was used to compute runoff and optimize a design to serve both conditions. The design storm is the 100-year, 24-hour event. The model used the rainfall from Amendment #1 and basins and land treatment factors from the Conceptual Grading Plan. Tables in the Appendix list the input parameters and runoff from each basin. Table 1 below lists the rainfall depths used in the model.

Table 1.

100-Year Cumulative Rainfall Depths

Time	Rainfall Depth (inches)
1-hour	2.07
6-hour	2.56
24-hour	3.17

ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

A. Interim Development

Flow characteristics in the interim condition are the same as for existing conditions, with the exception of the development of the Costco Wholesale site. A detention pond is proposed east of the site to collect offsite flows. The outlet pipe from the pond will replace the existing drainage swale along the northern edge. It will also serve as a storm drain to collect runoff from most of the site and will discharge to the Eubank storm drain. After City review and approval of the drainage plan for building permit, a submittal will be made to FEMA to redefine the floodplain. It will be confined to the proposed detention pond and storm drain.

Offsite flows from Basins 401 and 405B will be collected and conveyed to the pond. Flow from Tract 2 will naturally flow into the pond. The total inflow to the detention facility will be 157 cfs. The pond was modeled with a Type D inlet and a 36-inch outflow pipe. With a maximum storage volume of 4.3 acre-feet at a water surface elevation of 5.2 feet, the outflow will be 43 cfs. A six foot berm on the west side of the pond will allow one foot of freeboard.

Flow from most of the developed Costco Wholesale site was taken into the 36-inch storm drain (downstream of the pond) at four inlet points. The basins to each analysis point are listed in Table 2.

Table 2.

Basins Added at Analysis Points

Analysis Point	Onsite Basins
1	1C, 1G
2	1D
3	1B,1F
4	1E

The onsite basins were included in the AHYMO model so that the basin hydrographs would be added at the appropriate time steps to the pond outflow hydrograph. The basin flows were added at the analysis points and routed to the next analysis point through the proposed storm drain. The model analysis resulted in a total interim flow in the

36-inch storm drain of 66 cfs. The hydraulic gradient was also analyzed using a starting water surface elevation of 5463.5 feet in the Eubank storm drain. The hydraulic grade line will remain within the pipe and below the detention pond bottom elevation. The results are included in the Appendix.

Basin 1A is a large basin comprising the southwest quadrant of the site. The runoff from this area was added directly to the flow from the 36-inch storm drain at the outfall. Basin 506, from Amendment #1, includes the 150-foot-wide Southern Boulevard right-of-way from Eubank Boulevard to Elizabeth Street. It was also added at the outfall analysis point, resulting in a total flow of 112 cfs to the Eubank storm drain. The AHYMO Summary Table is included in the Appendix.

B. Ultimate Development

Ultimate conditions assume full build-out of public and private facilities, including construction of the proposed Elizabeth Street storm drain. This drainage system will collect runoff from Basin 401, so the basins draining to the detention pond will be 405B and Tract B. Ultimate conditions also assume development of Tract B.

The capacity of the 54-inch Eubank storm drain at the location of the site is 110 cfs, which includes runoff from the site, its offsite contributing basins and the Southern Boulevard basin, Basin 506. The South Eubank Analysis hydrologic model for ultimate conditions allowed a total flow of 87 cfs from Tracts 1 and 2 and Basin 405B.

An AHYMO model was generated for the ultimate development. The total inflow into the pond will be 128 cfs. Using the same size pond and outlet pipe as the interim conditions model, the outflow will be 36 cfs with a maximum storage volume of 2.85 acre-feet. The maximum water surface in the pond will be 3.63 feet, which will allow two feet of freeboard. The total flow in the 36-inch onsite storm drain will be 67 cfs. The hydraulic grade line will remain within the pipe and below the detention pond bottom elevation. The total flow to the Eubank storm drain, including runoff from Basins 1A and 506, will be 112 cfs, which is within the range of the maximum allowable runoff of 110 cfs. The hydraulic analysis and AHYMO Summary Table are included in the Appendix.

V. Summary

Development of the Costco Wholesale site and the adjacent Tract B, along with the proposed drainage facilities, will not adversely impact the Eubank storm drain trunk line. The detention facility will attenuate the peak flow to below the maximum allowable discharge. The modeling of the pond and the outlet storm drain was optimized to obtain the maximum benefit of size versus cost for interim and ultimate conditions. The maximum discharge from the site will be 85 cfs and 86 cfs for interim and ultimate conditions, respectively. The total flow in the Eubank storm drain, including Basin 506 (ultimate Southern Boulevard section) will be 112 cfs. These rates are equivalent to the maximum allowable discharge to the Eubank storm drain as required for ultimate conditions in Amendment #1. This report conforms to the drainage plan outlined in the approved conceptual grading and drainage plan for the site.

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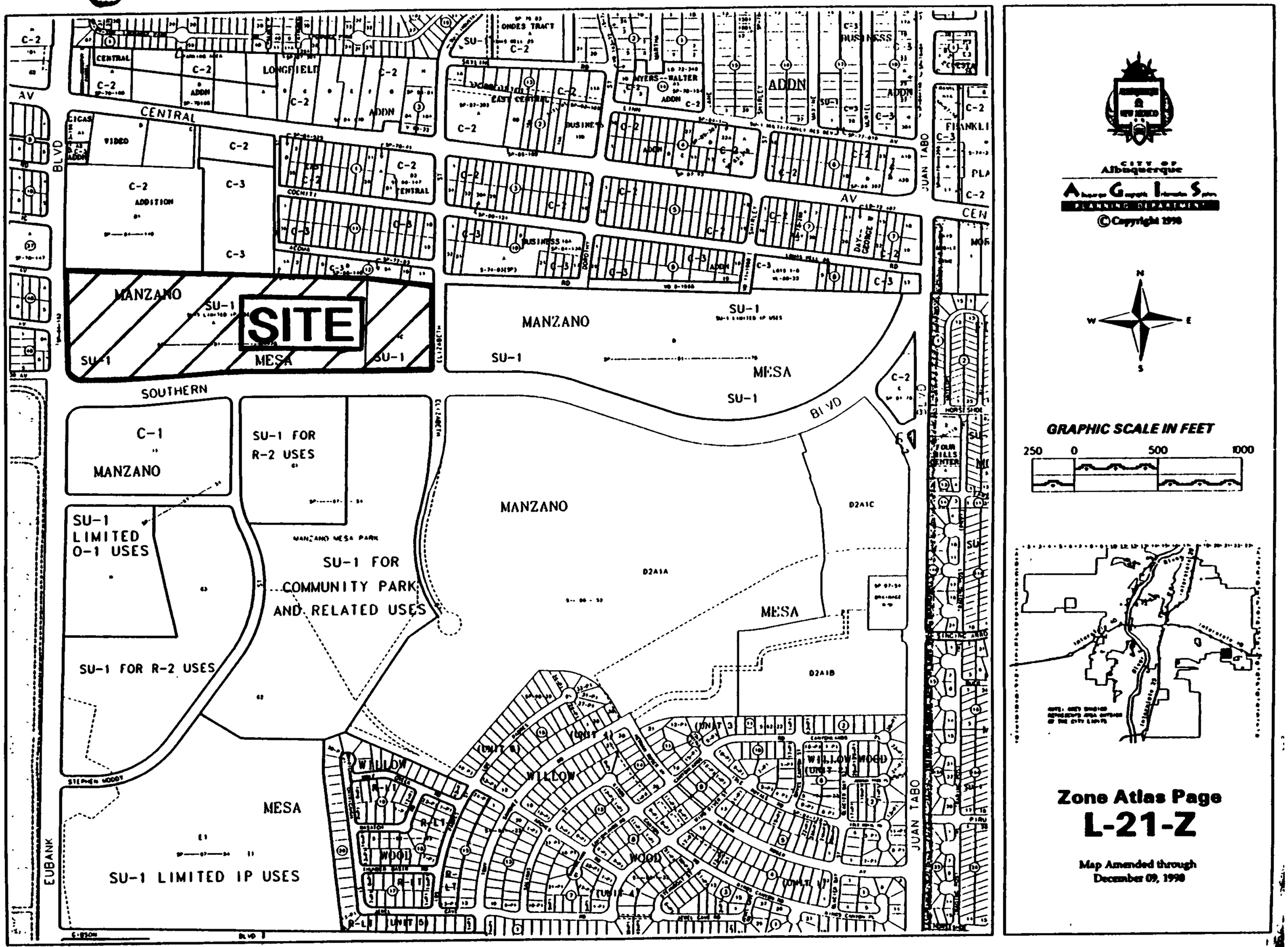

SITE
MANZANO
MESA
SU-1
SU-1 LIMITED IP USES
SU-1 LIMITED O-1 USES
SU-1 FOR R-2 USES
SU-1 FOR COMMUNITY PARK AND RELATED USES
MANZANO MESA PARK
C-1
MANZANO
CENTRAL
SOUTHERN
BLVD
EUBANK
JUAN TABO
STEPHEN MOORE
LONGFIELD
EAST CENTRAL
BUSINESS
ADDN
WILLOW
WOOD
WILLOWWOOD
D2A1A
D2A1B
D2A1C
FOUR HILLS CENTER
HORSESHOE
CITY OF Albuquerque
Planning Department
©Copyright 1990
N
S
E
W
GRAPHIC SCALE IN FEET
250
0
500
1000
Zone Atlas Page
L-21-Z
Map Amended through
December 09, 1990

FIGURE 1

AHYMO BASIN PARAMETERS

ULTIMATE CONDITION BASINS							
Basin	Area (Acres)	Time to Peak (hrs)	LAND TREATMENT TYPE				Q_{100}
			A	B	C	D	
405B (Offsite)	17	0.15	0	5%	5%	90%	74
Tract 2	15	0.16	0	15%	15%	70%	56
COSTCO SITE (Tract 1)							
1A	5.1	0.133	0	10%	10%	80%	24
1B	1.7	0.133	0	10%	10%	80%	8
1C	1.3	0.133	0	5%	5%	90%	6
1D	0.8	0.133	0	5%	5%	90%	4
1E	3.4	0.133	0	5%	5%	90%	16
1F	2	0.133	0	0%	0%	100%	10
1G	1.7	0.133	0	0%	0%	100%	9
INTERIM CONDITION BASINS							
405B	17	0.15	0	5%	5%	90%	74
401	21.6	0.251	0	5%	5%	90%	73
TRACT 2	15	0.169	50	0%	50%	0%	32
Basins for the Costco site are the same as under Ultimate Conditions							

FIGURE 2

00198\hydro\reports\cond_basins.xls\Ultimate

APPENDICES

APPENDIX A: AHYMO SUMMARIES AND TIME-TO-PEAK CALCULATIONS

APPENDIX B: HYDRAULIC GRADE LINE CALCULATIONS

APPENDIX C: POND #1 CALCULATIONS

APPENDIX D: STORM DRAIN CAPACITY CALCULATIONS

APPENDIX E: ONSITE INLET CAPACITY CALCULATIONS

APPENDIX F: SOUTHERN BOULEVARD INLET DESIGN CALCULATIONS

APPENDIX A

AHYMO SUMMARIES AND TIME-TO-PEAK CALCULATIONS

AHYMO BASIN PARAMETERS

ULTIMATE CONDITION BASINS							
Basin	Area (Acres)	Time to Peak (hrs)	LAND TREATMENT TYPE				Q_{100}
			A	B	C	D	
405B (Offsite)	17	0.15	0	5%	5%	90%	74
Tract B	15	0.16	0	15%	15%	70%	56
506	8	0.21	10	15%	0%	75%	26
COSTCO SITE (Tract A)							
1A	5.1	0.133	0	10%	10%	80%	24
1B	1.7	0.133	0	10%	10%	80%	8
1C	1.3	0.133	0	5%	5%	90%	6
1D	0.8	0.133	0	5%	5%	90%	4
1E	3.4	0.133	0	5%	5%	90%	16
1F	2	0.133	0	0%	0%	100%	10
1G	1.7	0.133	0	0%	0%	100%	9
INTERIM CONDITION BASINS							
405B	17	0.15	0	5%	5%	90%	74
401	21.6	0.251	0	5%	5%	90%	73
TRACT B	15	0.169	50	0%	50%	0%	32

Basins for the Costco site are the same as under Ultimate Conditions.
Land treatment factors for Basin 506 are assumed same as Ultimate Conditions.

Costco Detention Pond/Storm Drain Analysis
Calculation of Time to Peak

Description	Var	Unit								
Basin			**Tract B**	**Basin 1A**	**Basin 1B**	**Basin 1C**	**Basin 1D**	**Basin 1E**	**Basin 1F**	**Basin 1G**
Basin Area		Acres	15 00	5.10	1 70	1 30	0 80	3.40	2.00	1 70
Total Reach	L	Feet	1145 0	700 0	300 0	400 0	470 0	470.0	270 0	260 0
Overland Reach	L1	Feet	400.0	400 0	400 0	400 0	400.0	400.0	400.0	400 0
Overland K	K1		0 7	1	1	1	1	1	1	1
Overland Slope	S1	Percent	1 00	0 85	2 00	1 00	1.50	2 37	1.00	2 00
Adj Overland Slope	S1'	Percent	1 000	0 850	2 000	1 000	1 500	2 370	1 000	2 000
Gully Reach	L2	Feet	745 0	300 0	-100 0	0 0	70 0	70.0	-130 0	-140 0
Gully K	K2		2 000	2 000	2 000	2 000	1 500	2 200	2 000	2 000
Gully Slope	S2	Percent	1 200	1 400	1 200	1 200	1 200	1.200	1 200	1 200
Adj Gully Slope	S2'	Percent	1 200	1 400	1 200	1 200	1 200	1 200	1 200	1 200
Arroyo Reach	L3	Feet	0 0	0 0	0.0	0 0	0 0	0 0	0 0	0 0
Arroyo K	K3		3.000	3 000	3 000	3 000	3.000	3 000	3 000	3 000
Arroyo Slope	S3	Percent	1.000	1.000	1 000	1 000	1.000	1 000	1.000	1 000
Adj Arroyo Slope	S3'	Percent	1 000	1 000	1.000	1 000	1.000	1 000	1 000	1 000
Lca (to centroid)	Lca	Feet	0.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Base Discharge	Qb	cfs	0.0	0 0	0 0	0 0	0.0	0 0	0 0	0 0
Ground Slope S	S	Percent	1 130	1 086	2 267	1 000	1 455	2 196	0 904	2 431
Adjusted Slope S'	S'	Percent	1.130	1 086	2.267	1 000	1 455	2.196	0 904	2.431
K	K		1 182	1.198	0.840	1 000	1 055	1 098	0.834	0.762
K'	K'		1 182	1 198	0 840	1.000	1 055	1 098	0 834	0 762
K"	K"		0 000	0 000	0 000	0 000	0 000	0 000	0.000	0 000
K"'	K"'		0 000	0.000	0 000	0 000	0.000	0.000	0.000	0.000
Kn	Kn		0 033	0 033	0 033	0 033	0.033	0 033	0 033	0 033
Orig. TC	TC	Hrs	0 253	0 156	0 066	0.111	0 103	0 080	0.095	0 061
Adjusted TC	TC'	Hrs.	0 253	0.156	0.066	0 111	0.103	0.080	0 095	0.061
Time Lag	Lg	Hrs.	-	-	-	-	-	-	-	-
Time to Peak	TP	Hrs	**0.169**	**0.133**	**0.133**	**0.133**	**0.133**	**0.133**	**0.133**	**0.133**

Note· Times to peak for offsite basins were taken from Amendment #1.

```
 AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =03/16/2000
INPUT FILE = interim.hym                                                                   USER NO.= BOHN_HNM.STE

                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS      PAGE =   1
                   HYDROGRAPH   ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE     NOTATION

START                                                                                                          TIME=       .00
*S*    ANALYSIS OF DETENTION POND EAST OF COSTCO SITE, EUBANK AND SOUTHERN.
*S*    THIS FILE MODELS INTERIM CONDITIONS WITH POND FROM GRADING PLAN.
*S*    100 YEAR, 24 HOUR STORM
*S*
*S*
*S*    RAINFALL AND DRAINAGE BASINS FROM "SOUTH EUBANK AREA STORM DRAIN
*S*    ANALYSIS", SMITH ENGINEERING CO., NOV. 1995
*S*    BASINS TO POND IN INTERIM CONDITIONS:  405B, 401, PORTION OF 404
*S*    USE LAND TREATMENT FACTORS FROM BHI CONCEPTUAL GRADING & DRNG PLAN.
RAINFALL  TYPE= 2                                                                                              RAIN24=   3.170
*S*    1-HOUR = 2.07
*S*    6-HOUR = 2.56
*S*   24-HOUR = 3.17
*S*
*S*** COMPUTE HYD FOR BASIN 401 EAST OF ELIZABETH
COMPUTE NM HYD        401.10   -     1        .03380        73.05       4.931      2.73533    1.600    3.377 PER IMP=  90.00
*S*** ROUTE THROUGH BASIN 405B TO DETENTION POND INLET
ROUTE                401.1OR    1   11        .03380        76.30       4.931      2.73534    1.650    3.527
*S*** COMPUTE HYD FOR BASIN 405B WEST OF ELIZABETH
COMPUTE NM HYD        405.00   -     2        .02660        73.82       3.881      2.73533    1.500    4.336 PER IMP=  90.00
*S*** ADD BASIN 405B FLOW TO ROUTED FLOW AT POND
ADD HYD               405.AP 11& 2  12        .06040       127.75       8.811      2.73532    1.600    3.305
*S*** COMPUTE HYD FOR PORTION OF BASIN 404 EAST OF POND, TRACT 2 = 15 AC.
COMPUTE NM HYD          2.00   -     3        .02340        31.53       1.093       .87562    1.550    2.105 PER IMP=    .00
*S*** ADD TRACT 2 FLOW TO TOTAL FLOW AT POND
ADD HYD               TR2.AP  3&12  13        .08380       157.00       9.904      2.21602    1.600    2.927
*S*  ROUTE TOTAL FLOW THROUGH POND # 1 WITH 36" OUTFALL
ROUTE RESERVOIR       TR2.RR   13   16        .08380        43.09       9.904      2.21600    2.150     .803 AC-FT=    4.303
*S*** COMPUTE HYD FOR BASIN 1-C
COMPUTE NM HYD          1.00   -     1        .00200         5.89        .292      2.73533    1.500    4.603 PER IMP=  90.00
*S*** COMPUTE HYD FOR BASIN 1-G
COMPUTE NM HYD          1.00   -     2        .00270         8.26        .421      2.92382    1.500    4.781 PER IMP= 100.00
*S*** ADD BASINS 1-C AND 1-G
ADD HYD                 ADD1  1& 2   1        .00470        14.15        .713      2.84350    1.500    4.705
*S*** ADD TO POND DISCHARGE FOR TOTAL AT AP1
ADD HYD                  AP1  1&16   3        .08850        46.27      10.617      2.24933    1.950     .817
*S*** ROUTE TO AP2 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP1.SR    3   13        .08850        46.26      10.617      2.24933    1.950     .817
*S*** COMPUTE HYD FOR BASIN 1-D
COMPUTE NM HYD          1.00   -     1        .00130         3.84        .190      2.73533    1.500    4.611 PER IMP=  90.00
*S*** ADD TO TOTAL PIPE FLOW AT AP2
ADD HYD                  AP2  1&13   3        .08980        47.27      10.806      2.25636    1.950     .823
*S*** ROUTE TO AP3 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP2.SR    3   13        .08980        47.27      10.806      2.25636    1.950     .823
*S*** COMPUTE HYD FOR BASIN 1-B
COMPUTE NM HYD          1.00   -     8        .00270         7.62        .367      2.54685    1.500    4.411 PER IMP=  80.00
*S*** COMPUTE HYD FOR BASIN 1-F
COMPUTE NM HYD          1.00   -     2        .00310         9.48        .483      2.92382    1.500    4.780 PER IMP= 100.00
```

A.3/6

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S*** ADD BASINS 1-B AND 1-F										
ADD HYD	1BF.ADD	8& 2	2	.00580	17.11	.850	2.74823	1.500	4.608	
*S*** ADD TO TOTAL PIPE FLOW AT AP3										
ADD HYD	AP3	13& 2	3	.09560	55.18	11.657	2.28620	1.600	.902	
*S*** ROUTE TO AP4 THROUGH PROPOSED STORM DRAIN										
ROUTE	AP3.SR	3	13	.09560	55.12	11.657	2.28620	1.600	.901	
*S*** COMPUTE HYD FOR BASIN 1-E										
COMPUTE NM HYD	1.00	-	1	.00530	15.58	.773	2.73533	1.500	4.593	PER IMP= 90.00
*S*** ADD TO TOTAL PIPE FLOW AT AP4										
ADD HYD	AP4	1&13	3	.10090	65.88	12.430	2.30979	1.550	1.020	
*S*** ROUTE TO AP5 (EUBANK STORM DRAIN) THROUGH PROPOSED STORM DRAIN										
ROUTE	AP4.SR	3	13	.10090	65.89	12.430	2.30979	1.550	1.020	
*S*** COMPUTE HYD FOR BASIN 1-A										
COMPUTE NM HYD	1.00	-	1	.00800	22.55	1.087	2.54685	1.500	4.404	PER IMP= 80.00
*S*** ADD TO TOTAL PIPE FLOW AT AP5 (MANHOLE AT BELL AVE)										
ADD HYD	AP4	1&13	3	.10890	85.64	13.516	2.32720	1.550	1.229	
*S*** COMPUTE HYD FOR BASIN 506 - SOUTHERN BLVD. BASIN										
COMPUTE NM HYD	6.10	-	6	.01250	26.13	1.589	2.38405	1.550	3.266	PER IMP= 75.00
*S*** ADD TO TOTAL PIPE FLOW AT AP5										
ADD HYD	AP4	3& 6	3	.12140	111.77	15.106	2.33305	1.550	1.439	
FINISH										

```
 AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =03/16/2000
INPUT FILE = ultimate.hym                                                                  USER NO.= BOHN_HNM.STE

                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS      PAGE =   1
                   HYDROGRAPH   ID   ID        AREA     DISCHARGE      VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)     (CFS)        (AC-FT)    (INCHES)   (HOURS)   ACRE     NOTATION

START                                                                                                          TIME=       .00
*S*    ANALYSIS OF DETENTION POND EAST OF COSTCO SITE, EUBANK AND SOUTHERN.
*S*    THIS FILE MODELS ULTIMATE CONDITIONS POND ON GRADING PLAN.
*S*    100 YEAR, 24 HOUR STORM
*S*
*S*
*S*    RAINFALL AND DRAINAGE BASINS FROM "SOUTH EUBANK AREA STORM DRAIN
*S*    ANALYSIS", SMITH ENGINEERING CO., NOV. 1995
*S*    BASINS TO POND FOR ULTIMATE CONDITIONS:  405B AND PORTION OF 404
*S*    USE LAND TREATENT FACTORS FROM BHI CONCEPTUAL GRADING & DRNG PLAN.
RAINFALL  TYPE= 2                                                                                              RAIN24=   3.170
*S*    1-HOUR = 2.07
*S*    6-HOUR = 2.56
*S*   24-HOUR = 3.17
*S*
*S*** COMPUTE HYD FOR BASIN 405B WEST OF ELIZABETH
COMPUTE NM HYD        405.00   -     2        .02660        73.82       3.881      2.73533    1.500    4.336 PER IMP=  90.00
*S*** COMPUTE HYD FOR PORTION OF BASIN 404 EAST OF POND, TRACT 2 = 15 AC.
COMPUTE NM HYD          2.00   -     3        .02340        55.86       2.943      2.35836    1.550    3.730 PER IMP=  70.00
*S*** ADD TRACT 2 FLOW AND BASIN 405B
ADD HYD               TR2.AP  3& 2  13        .05000       127.91       6.824      2.55890    1.500    3.997
*S*  ROUTE TOTAL FLOW THROUGH POND # 1 WITH 36" OUTFALL
ROUTE RESERVOIR       TR2.RR   13   16        .05000        36.00       6.824      2.55888    2.000    1.125 AC-FT=    2.852
*S*** COMPUTE HYD FOR BASIN 1-C
COMPUTE NM HYD          1.00   -     1        .00200         5.89        .292      2.73533    1.500    4.603 PER IMP=  90.00
*S*** COMPUTE HYD FOR BASIN 1-G
COMPUTE NM HYD          1.00   -     2        .00270         8.26        .421      2.92382    1.500    4.781 PER IMP= 100.00
*S*** ADD BASINS 1-C AND 1-G
ADD HYD                 ADD1  1& 2   1        .00470        14.15        .713      2.84350    1.500    4.705
*S*** ADD TO POND DISCHARGE FOR TOTAL AT AP1
ADD HYD                  AP1  1&16   3        .05470        40.55       7.536      2.58333    1.650    1.158
*S*** ROUTE TO AP2 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP1.SR    3   13        .05470        40.51       7.536      2.58333    1.700    1.157
*S*** COMPUTE HYD FOR BASIN 1-D
COMPUTE NM HYD          1.00   -     1        .00130         3.84        .190      2.73533    1.500    4.611 PER IMP=  90.00
*S*** ADD TO TOTAL PIPE FLOW AT AP2
ADD HYD                  AP2  1&13   3        .05600        42.54       7.726      2.58685    1.650    1.187
*S*** ROUTE TO AP3 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP2.SR    3   13        .05600        42.56       7.726      2.58686    1.650    1.188
*S*** COMPUTE HYD FOR BASIN 1-B
COMPUTE NM HYD          1.00   -     8        .00270         7.62        .367      2.54685    1.500    4.411 PER IMP=  80.00
*S*** COMPUTE HYD FOR BASIN 1-F
COMPUTE NM HYD          1.00   -     2        .00310         9.48        .483      2.92382    1.500    4.780 PER IMP= 100.00
*S*** ADD BASINS 1-B AND 1-F
ADD HYD               1BF.ADD  8& 2   2        .00580        17.11        .850      2.74823    1.500    4.608
*S*** ADD TO TOTAL PIPE FLOW AT AP3
ADD HYD                  AP3 13& 2   3        .06180        53.61       8.576      2.60200    1.600    1.355
*S*** ROUTE TO AP4 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP3.SR    3   13        .06180        53.87       8.576      2.60200    1.600    1.362
```

A-5/6

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S*** COMPUTE HYD FOR BASIN 1-E										
COMPUTE NM HYD	1.00	-	1	.00530	15.58	.773	2.73533	1.500	4.593	PER IMP= 90.00
*S*** ADD TO TOTAL PIPE FLOW AT AP4										
ADD HYD	AP4	1&13	3	.06710	66.70	9.349	2.61252	1.550	1.553	
*S*** ROUTE TO AP5 (EUBANK STORM DRAIN) THROUGH PROPOSED STORM DRAIN										
ROUTE	AP4.SR	3	13	.06710	66.76	9.349	2.61252	1.550	1.555	
*S*** COMPUTE HYD FOR BASIN 1-A										
COMPUTE NM HYD	1.00	-	1	.00800	22.55	1.087	2.54685	1.500	4.404	PER IMP= 80.00
*S*** ADD TO TOTAL PIPE FLOW AT AP5 (MANHOLE AT BELL AVE)										
ADD HYD	AP4	1&13	3	.07510	86.51	10.436	2.60552	1.550	1.800	
*S*** COMPUTE HYD FOR BASIN 506 - SOUTHERN BLVD. BASIN										
COMPUTE NM HYD	6.10	-	6	.01250	26.13	1.589	2.38405	1.550	3.266	PER IMP= 75.00
*S*** ADD TO TOTAL PIPE FLOW AT AP5										
ADD HYD	AP4	3& 6	3	.08760	112.63	12.025	2.57392	1.550	2.009	
FINISH										

TOTAL ALLOWABLE FROM
AMENDMENT #1 = 110 CFS
THIS IS WITHIN RANGE.

A-6/6

APPENDIX B

HYDRAULIC GRADE LINE CALCULATIONS

COSTCO STORM DRAIN - INTERIM CONDITIONS

Storm & Sanitary SelectCAD Design Log
Drainage File: P:\00198\Hydro\design\Control\00198_36.sdb
Design File: P:\00198\HYDRO\DESIGN\DRAWING\00198DSGN.DWG
Display Log: P:\00198\HYDRO\DESIGN\DRAWING\ds36_int_hgl.log

Date: Wednesday, March 15, 2000 08:41:04

HGL/EGL Computations:

Table A:

Struct ID	D (in)	Q (cfs)	L (ft)	V (ft/s)	d (ft)	dc (ft)	$V^2/2g$ (ft)	Sf (ft/ft)	Dnstrm Soffit (ft)	EGLdn (ft)	HGLdn (ft)	Tot Loss (ft)	EGLup (ft)	HGLup (ft)	Rim Elev. (ft)
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	5463.50	-
P6	36	65.90	45.15	9.32	-	-	1.35	0.0099	5459.50	5464.85	5463.50	0.45	5465.30	5463.95	-
MH1	-	-	-	-	-	-	-	-	-	5465.30	5463.95	0.32	5465.62	5464.27	5470.29
(Alternate HGL Used)														5465.47	
P5	36	62.90	36.39	8.90	-	-	1.23	0.0090	5465.70	5466.83	5465.47	0.33	5467.15	5465.92	-
MH2	-	-	-	-	-	-	-	-	-	5467.15	5465.92	0.34	5467.49	5466.26	5470.26
P4	36	55.10	444.85	7.80	-	-	0.94	0.0069	5466.25	5467.49	5466.26	5.70	5473.19	5472.25	-
MH3	-	-	-	-	-	-	-	-	-	5473.19	5472.25	0.09	5473.28	5472.34	5476.71
(Alternate HGL Used)														5473.12	
P3	36	47.30	166.00	6.69	-	-	0.70	0.0051	5473.50	5474.06	5473.12	0.93	5475.00	5474.30	-
MH4	-	-	-	-	-	-	-	-	-	5475.00	5474.30	0.06	5475.06	5474.36	5479.82
(Alternate HGL Used)														5475.19	
P2	36	46.30	379.25	6.55	-	-	0.67	0.0049	5475.59	5475.89	5475.19	2.43	5478.32	5477.66	-
MH5	-	-	-	-	-	-	-	-	-	5478.32	5477.66	0.28	5478.60	5477.93	5484.34
(Alternate HGL Used)														5478.26	
P1	36	43.10	120.13	6.10	-	-	0.58	0.0042	5478.70	5478.93	5478.26	0.51	5479.44	5478.86	-

Table B:

	Losses							Loss Coefficients							
Str ID	Hf	Hb	Hstr	Hc	He	Hj	Total	Dstr	Ko	CD	Cd	Cq	Cp	Cb	K
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P6	0.45	-	-	-	-	-	0.45	-	-	-	-	-	-	-	-
MH1	-	-	0.32	-	-	-	0.32	1.95	0.622	1.000	0.386	1.000	1.000	1.000	0.240
P5	0.33	-	-	-	-	-	0.33	-	-	-	-	-	-	-	-
MH2	-	-	0.34	-	-	-	0.34	2.67	0.592	1.000	0.467	1.000	1.000	1.000	0.276
P4	3.08	-	-	-	-	-	3.08	-	-	-	-	-	-	-	-
MH3	-	-	0.09	-	-	-	0.09	1.75	0.258	1.000	0.362	1.000	1.000	1.000	0.093
P3	0.85	-	-	-	-	-	0.85	-	-	-	-	-	-	-	-
MH4	-	-	0.06	-	-	-	0.06	1.71	0.259	1.000	0.357	1.000	1.000	1.000	0.092
P2	1.85	-	-	-	-	-	1.85	-	-	-	-	-	-	-	-
MH5	-	-	0.28	-	-	-	0.28	1.96	1.072	1.000	0.387	1.000	1.000	1.000	0.415
P1	0.51	-	-	-	-	-	0.51	-	-	-	-	-	-	-	-

B-1/2

COSTCO STORM DRAIN - ULTIMATE CONDITIONS

Storm & Sanitary SelectCAD Design Log
Drainage File: P:\00198\Hydro\design\Control\00198_36.sdb
Design File: P:\00198\HYDRO\DESIGN\DRAWING\00198DSGN.DWG
Display Log: P:\00198\HYDRO\DESIGN\DRAWING\ds36_ult_hgl.log

Date: Wednesday, March 15, 2000 07:44:59

HGL/EGL Computations:

Table A:

Struct ID	D (in)	Q (cfs)	L (ft)	V (ft/s)	d (ft)	dc (ft)	$V^2/2g$ (ft)	Sf (ft/ft)	Dnstrm Soffit (ft)	EGLdn (ft)	HGLdn (ft)	Tot Loss (ft)	EGLup (ft)	HGLup (ft)	Rim Elev. (ft)
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	5463.50	-
P6	36	66.80	45.15	9.45	-	-	1.39	0.0102	5459.50	5464.89	5463.50	0.46	5465.35	5463.96	-
MH1	-	-	-	-	-	-	-	-	-	5465.35	5463.96	0.33	5465.68	5464.29	5470.29
(Alternate HGL Used)														5465.47	
P5	36	63.30	36.39	8.96	-	-	1.25	0.0091	5465.70	5466.86	5465.47	0.33	5467.20	5465.95	-
MH2	-	-	-	-	-	-	-	-	-	5467.20	5465.95	0.35	5467.54	5466.30	5470.26
P4	36	53.80	444.85	7.61	-	-	0.90	0.0066	5466.25	5467.54	5466.30	5.58	5473.12	5472.22	-
MH3	-	-	-	-	-	-	-	-	-	5473.12	5472.22	0.08	5473.21	5472.31	5476.71
(Alternate HGL Used)														5473.06	
P3	36	42.50	166.00	6.01	-	-	0.56	0.0041	5473.50	5473.96	5473.06	0.79	5474.75	5474.19	-
MH4	-	-	-	-	-	-	-	-	-	5474.75	5474.19	0.05	5474.80	5474.24	5479.82
(Alternate HGL Used)														5475.13	
P2	36	40.50	379.25	9.21	1.79	2.07	1.32	-	5475.59	5476.44	5475.13	-	5478.81	5477.49	-
MH5	-	-	-	-	-	-	-	-	-	5478.81	5477.49	-	5478.81	5477.49	5484.34
P1	36	36.00	120.13	8.31	1.77	1.95	1.07	-	5478.70	5478.54	5477.47	-	5479.34	5478.27	-

Table B:

	Losses							Loss Coefficients							
Str ID	Hf	Hb	Hstr	Hc	He	Hj	Total	Dstr	Ko	CD	Cd	Cq	Cp	Cb	K
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P6	0.46	-	-	-	-	-	0.46	-	-	-	-	-	-	-	-
MH1	-	-	0.33	-	-	-	0.33	1.96	0.622	1.000	0.387	1.000	1.000	1.000	0.241
P5	0.33	-	-	-	-	-	0.33	-	-	-	-	-	-	-	-
MH2	-	-	0.35	-	-	-	0.35	2.70	0.592	1.000	0.469	1.000	1.000	1.000	0.278
P4	2.93	-	-	-	-	-	2.93	-	-	-	-	-	-	-	-
MH3	-	-	0.08	-	-	-	0.08	1.72	0.258	1.000	0.358	1.000	1.000	1.000	0.093
P3	0.68	-	-	-	-	-	0.68	-	-	-	-	-	-	-	-
MH4	-	-	0.05	-	-	-	0.05	1.60	0.259	1.000	0.343	1.000	1.000	1.000	0.089
P2	-	-	-	-	-	-	SuperCrt	-	-	-	-	-	-	-	-
MH5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P1	-	-	-	-	-	-	SuperCrt	-	-	-	-	-	-	-	-

B-2/2

APPENDIX C

POND #1 CALCULATIONS

COSTCO DETENTION POND NO. 1
DETENTION POND VOLUME FOR 100-YEAR STORM

BOTTOM WIDTH = 120
BOTTOM LENGTH = 250
SIDE SLOPE = 3:1

ELEV. (FT)	AREA (AC)	VOLUME (AC-FT)
0.0	0.69	0.00
0.5	0.71	0.35
1.0	0.74	0.71
1.5	0.77	1.09
2.0	0.79	1.48
2.5	0.82	1.89
3.0	0.85	2.30
3.5	0.88	2.73
4.0	0.91	3.18
4.5	0.93	3.64
5.0	0.96	4.11
5.5	0.99	4.60
6.0	1.02	5.11
6.5	1.05	5.63
7.0	1.09	6.16

COSTCO WHOLESALE DETENTION POND NO. 1 OUTFLOW

Single D inlet, in sump condition with three edges capable of accepting flows:
Open Area (for orifice calc in sq. ft.): 3.931
Length of Weir (feet): 5.354 (see calculations below)

Orifice equation: $Q = CA \times (2gh)^{1/2}$
where C = 0.7
A = net area of openings in grate

Weir equation: $Q = 3.087Lh^{3/2}$
where L = sum of lengths of sides

Head (ft)	Head (in)	Weir Flow (cfs)	Orifice Flow (cfs)	Weir/Orifice Control Q (cfs)	Outflow (cfs)	36" Pipe Control Q (cfs)
0.50	6.00	5.07	13.39	5.07	5.00	5.00
1.00	12.00	14.35	18.93	14.35	7.50	7.50
1.50	18.00	26.36	23.18	23.18	11.80	11.80
2.00	24.00	40.59	26.77	26.77	19.50	19.50
2.50	30.00	56.72	29.93	29.93	28.00	28.00
3.00	36.00	74.56	32.79	32.79	38.00	32.79
3.50	42.00	93.96	35.41	35.41	43.00	35.41
4.00	48.00	114.79	37.86	37.86	53.00	37.86
4.50	54.00	136.98	40.16	40.16	62.00	40.16
5.00	60.00	160.43	42.33	42.33	70.00	42.33
6.00	72.00	210.89	46.37	46.37	78.00	46.37
7.00	84.00	265.75	50.08	50.08	88.00	50.08

Calculation of open area on grate:

	(in^2)	(ft^2)
Total Grate Area	1000	6.944
Cross Bar Area	-366	-2.542
Supports (ends)	-115.625	-0.803
Areas Counted Twice	47.75	0.332
	566.125	3.931

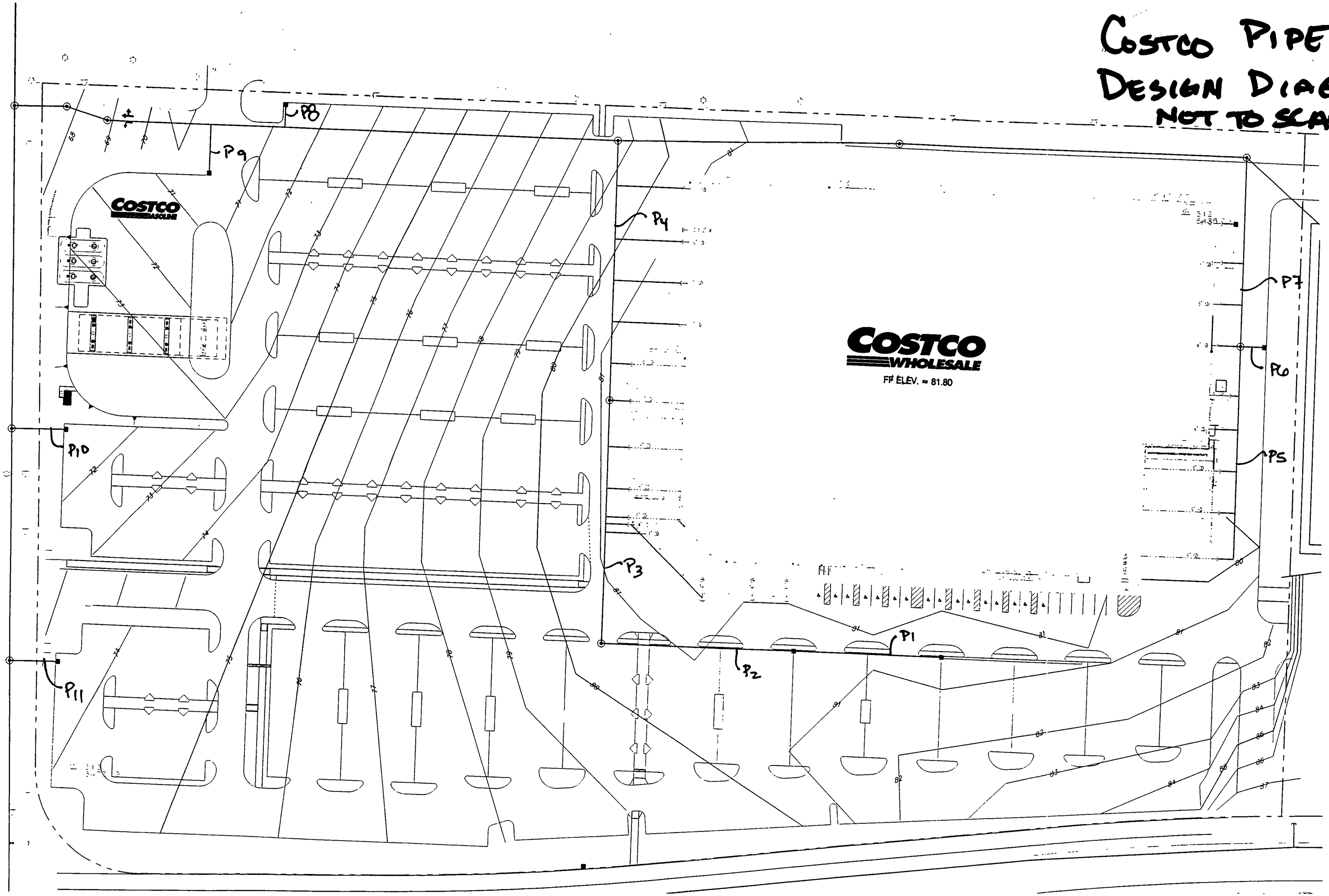
Calculation of Length of Weir (three sides open):

	(in)	(ft)
Total Perimeter of Grate	90	7.500
Short Cross Bars	-3.5	-0.292
End Supports	-9.25	-0.771
Bearing Bars	-13	-1.083
	64.25	5.354

APPENDIX D

STORM DRAIN CAPACITY CALCULATIONS

COSTCO PIPE
DESIGN DIAGRAM
NOT TO SCALE



D-1/11

COSTCO WHOLESALE STORM DRAIN CALCULATIONS - INTERIM CONDITIONS

Storm & Sanitary SelectCAD Design Log
Drainage File: P:\00198\Hydro\design\Control\00198_36.sdb
Design File: P:\00198\HYDRO\DESIGN\DRAWING\00198DSGN.DWG
Display Log: P:\00198\HYDRO\DESIGN\DRAWING\ds36_int.log

Date: Wednesday, March 15, 2000 08:41:04

Designing pipe P1

Results:

Total Flow:	43.1000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0068 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.9960 ft	Flow Status:	Partial
Critical Depth:	2.1300 ft	Capacity:	55.1235 cfs
Velocity:	8.6242 ft/s	Headloss:	See Below
Froude Number:	1.1447	Flow Regime:	SuperCritical

Designing pipe P2

Results:

Total Flow:	46.3000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0083 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.9570 ft	Flow Status:	Partial
Critical Depth:	2.2100 ft	Capacity:	60.8837 cfs
Velocity:	9.4748 ft/s	Headloss:	See Below
Froude Number:	1.2777	Flow Regime:	SuperCritical

Designing pipe P3

Results:

Total Flow:	47.3000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0131 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.7100 ft	Flow Status:	Partial
Critical Depth:	2.2400 ft	Capacity:	76.2335 cfs
Velocity:	11.3560 ft/s	Headloss:	See Below
Froude Number:	1.6913	Flow Regime:	SuperCritical

Designing pipe P4

Results:

Total Flow:	55.1000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0165 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.7490 ft	Flow Status:	Partial
Critical Depth:	2.4000 ft	Capacity:	85.7344 cfs
Velocity:	12.8714 ft/s	Headloss:	See Below
Froude Number:	1.8871	Flow Regime:	SuperCritical

Designing pipe P5

Results:

Total Flow:	62.9000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0181 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.8510 ft	Flow Status:	Partial
Critical Depth:	2.5500 ft	Capacity:	89.7436 cfs
Velocity:	13.7321 ft/s	Headloss:	See Below
Froude Number:	1.9325	Flow Regime:	SuperCritical

Designing pipe P6
WARNING: Full flow velocity is greater than maximum (15.00)

Results:

Total Flow:	65.9000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.1317 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.0690 ft	Flow Status:	Partial
Critical Depth:	2.5900 ft	Capacity:	242.0547 cfs
Velocity:	29.1311 ft/s	Headloss:	See Below
Froude Number:	5.7919	Flow Regime:	SuperCritical

COSTCO WHOLESALE STORM DRAIN CALCULATIONS - ULTIMATE CONDITIONS

Storm & Sanitary SelectCAD Design Log
Drainage File: P:\00198\Hydro\design\Control\00198_36.sdb
Design File: P:\00198\HYDRO\DESIGN\DRAWING\00198DSGN.DWG
Display Log: P:\00198\HYDRO\DESIGN\DRAWING\ds36_ult.log

Date: Wednesday, March 15, 2000 07:44:59

Designing pipe P1

Results:

Total Flow:	36.0000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0068 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.7670 ft	Flow Status:	Partial
Critical Depth:	1.9500 ft	Capacity:	55.1235 cfs
Velocity:	8.3064 ft/s	Headloss:	See Below
Froude Number:	1.2090	Flow Regime:	SuperCritical

Designing pipe P2

Results:

Total Flow:	40.5000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0083 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.7880 ft	Flow Status:	Partial
Critical Depth:	2.0700 ft	Capacity:	60.8837 cfs
Velocity:	9.2131 ft/s	Headloss:	See Below
Froude Number:	1.3297	Flow Regime:	SuperCritical

Designing pipe P3

Results:

Total Flow:	42.5000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0131 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.6000 ft	Flow Status:	Partial
Critical Depth:	2.1200 ft	Capacity:	76.2335 cfs
Velocity:	11.0762 ft/s	Headloss:	See Below
Froude Number:	1.7254	Flow Regime:	SuperCritical

Designing pipe P4

Results:

Total Flow:	53.8000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0165 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.7220 ft	Flow Status:	Partial
Critical Depth:	2.3800 ft	Capacity:	85.7344 cfs
Velocity:	12.8070 ft/s	Headloss:	See Below
Froude Number:	1.8982	Flow Regime:	SuperCritical

Designing pipe P5

Results:

Total Flow:	63.3000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.0181 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.8580 ft	Flow Status:	Partial
Critical Depth:	2.5500 ft	Capacity:	89.7436 cfs
Velocity:	13.7581 ft/s	Headloss:	See Below
Froude Number:	1.9307	Flow Regime:	SuperCritical

Designing pipe P6

WARNING: Full flow velocity is greater than maximum (15.00)

Results:

Total Flow:	66.8000 cfs	Flow From:	Injected Sanitary
Status:	Fixed	Slope:	0.1317 ft/ft
Pipe Width:	36.0000 in	Pipe Height:	36.0000 in
Depth of Flow:	1.0770 ft	Flow Status:	Partial
Critical Depth:	2.6100 ft	Capacity:	242.0547 cfs
Velocity:	29.2316 ft/s	Headloss:	See Below
Froude Number:	5.7873	Flow Regime:	SuperCritical

COSTCO-PIPE DESIGN
See Diagram for locations.

PIPE ID	100 YR FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	4.57	18	0.85%	10.53
P2	7.99	18	0.85%	10.53
P3	12.99	24	0.85%	22.68
P4	17.99	24	0.85%	22.68
P5	6.50	18	0.50%	7.45
P6	3.00	12	1.00%	3.57
P7	14.00	24	0.80%	22.68
P8	2.00	12	1.00%	3.57
P9	14.00	18	2.00%	14.90
P10	6.00	18	1.00%	10.53
P11	18.00	24	2.00%	32.08

COSTCO-PIPE DESIGN
See Diagram for locations.

PIPE ID	100 YR FLOW - (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	4.57	18	0.85%	10.53
P2	7.99	18	0.85%	10.53
P3	12.99	24	0.85%	22.68
P4	17.99	24	0.85%	22.68
P5	6.50	18	0.50%	7.45
P6	3.00	12	1.00%	3.57
P7	14.00	24	0.80%	22.68
P8	2.00	12	1.00%	3.57
P9	14.00	18	2.00%	14.90
P10	6.00	18	1.00%	10.53
P11	18.00	24	2.00%	32.08

COSTCO-PIPE DESIGN
See Diagram for locations.

PIPE ID	100 YR FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	4.57	18	0.85%	10.53
P2	7.99	18	0.85%	10.53
P3	12.99	24	0.85%	22.68
P4	17.99	24	0.85%	22.68
P5	6.50	18	0.50%	7.45
P6	3.00	12	1.00%	3.57
P7	14.00	24	0.80%	22.68
P8	2.00	12	1.00%	3.57
P9	14.00	18	2.00%	14.90
P10	6.00	18	1.00%	10.53
P11	18.00	24	2.00%	32.08

COSTCO-PIPE DESIGN
See Diagram for locations.

PIPE ID	100 YR FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	4.57	18	0.85%	10.53
P2	7.99	18	0.85%	10.53
P3	12.99	24	0.85%	22.68
P4	17.99	24	0.85%	22.68
P5	6.50	18	0.50%	7.45
P6	3.00	12	1.00%	3.57
P7	14.00	24	0.80%	22.68
P8	2.00	12	1.00%	3.57
P9	14.00	18	2.00%	14.90
P10	6.00	18	1.00%	10.53
P11	18.00	24	2.00%	32.08

COSTCO-PIPE DESIGN
See Diagram for locations.

PIPE ID	100 YR FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	4.57	18	0.85%	10.53
P2	7.99	18	0.85%	10.53
P3	12.99	24	0.85%	22.68
P4	17.99	24	0.85%	22.68
P5	6.50	18	0.50%	7.45
P6	3.00	12	1.00%	3.57
P7	14.00	24	0.80%	22.68
P8	2.00	12	1.00%	3.57
P9	14.00	18	2.00%	14.90
P10	6.00	18	1.00%	10.53
P11	18.00	24	2.00%	32.08

COSTCO-PIPE DESIGN
See Diagram for locations.

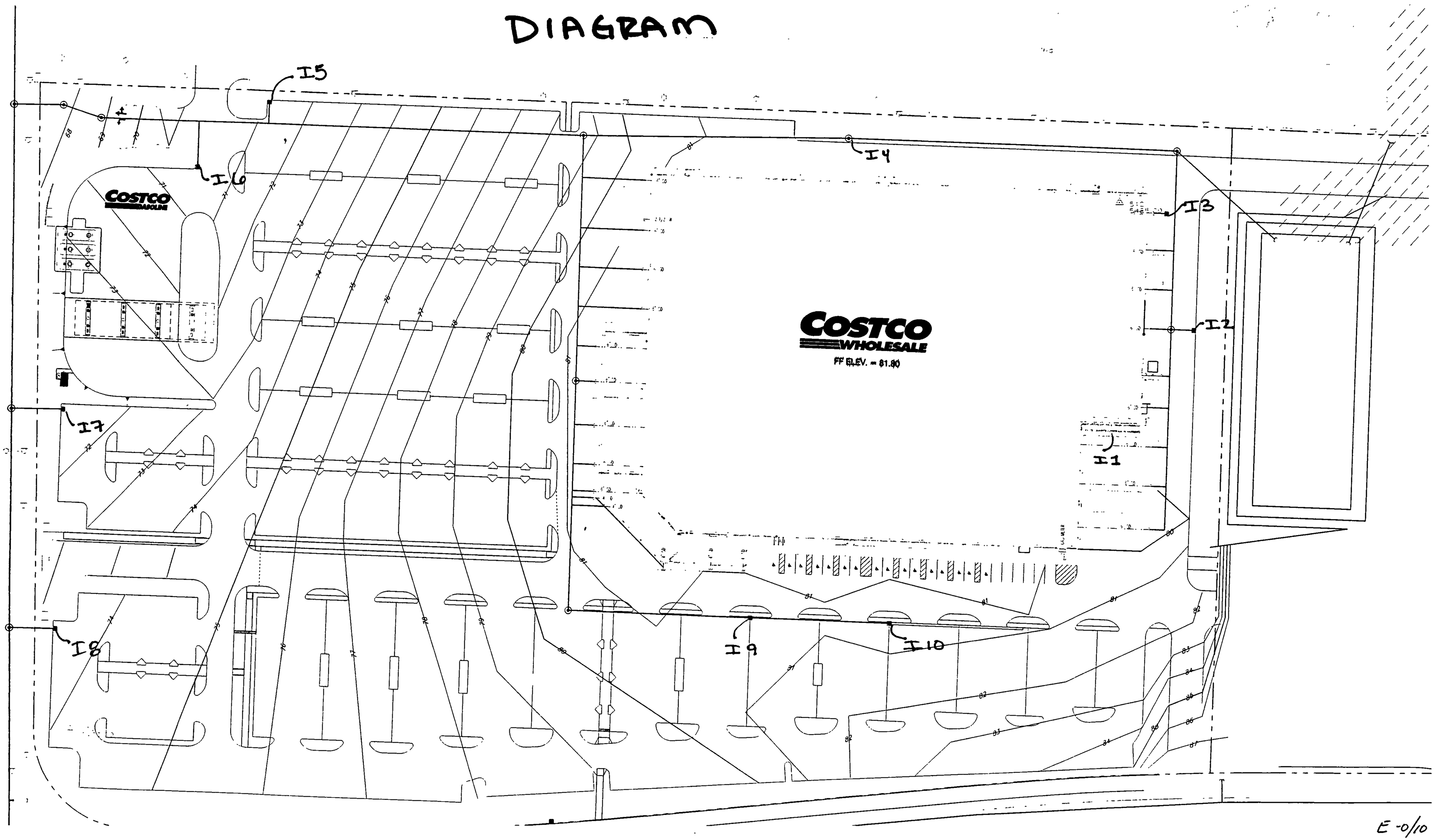
PIPE ID	100 YR FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	4.57	18	0.85%	10.53
P2	7 99	18	0.85%	10.53
P3	12.99	24	0.85%	22.68
P4	17.99	24	0.85%	22.68
P5	6.50	18	0.50%	7.45
P6	3.00	12	1.00%	3.57
P7	14.00	24	0.80%	22.68
P8	2.00	12	1.00%	3.57
P9	14.00	18	2.00%	14.90
P10	6.00	18	1.00%	10.53
P11	18.00	24	2.00%	32.08

APPENDIX E

ONSITE INLET CAPACITY CALCULATIONS

ONSITE INLETS
NOT TO SCALE

ONSITE INLET DIAGRAM



E-0/10

INLET #1 = 1/3 IC = 1/3(6) = 2CFS

R-4990 Heavy Duty Trench Frames with Grated or Solid Covers

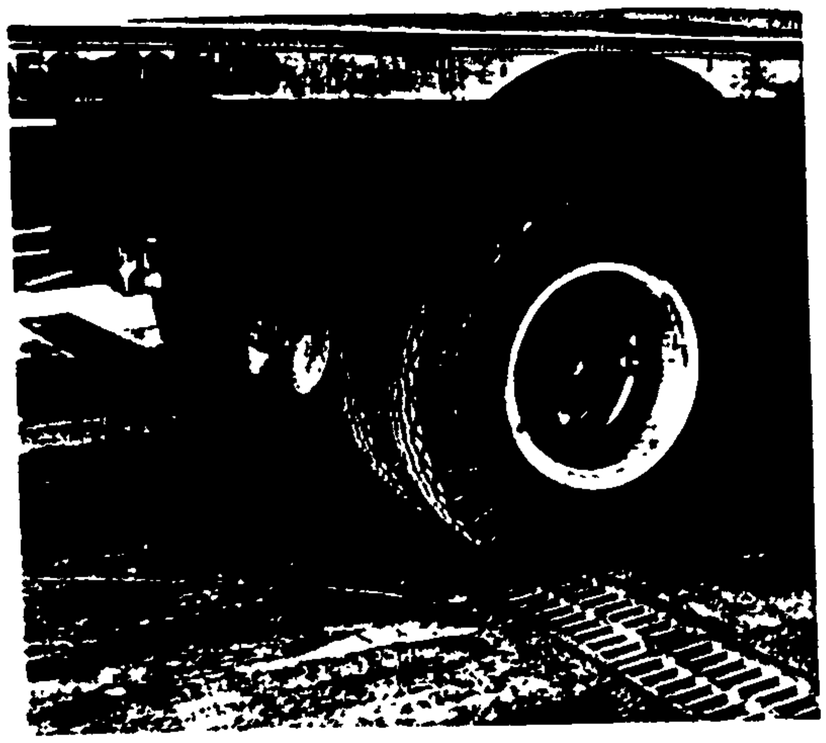
MATERIALS: All frames and grates are furnished standard in Gray Iron, Class 35, for heavy duty use. For extra heavy duty use, see page 170 for Airport Trenches.

p.229

Standard Cover Dimensions

Catalog No.	Dimensions in inches			Weight per lineal foot (without frame)					
	A	B	C	Type A	Type C	Type D	Type E	Type P	Frame**
R-4990-AX	8	1½	6	19	22	19	22	25	12
R-4990-BX	10	1½	8	24	27	29	27	31	12
R-4990-CX	12	1½	10	28	31	40	36	37	12
R-4990-DX	14	1½	12	33	35	52	47	45	12
R-4990-EX	17	1½	15	39	52	55	49	—	12
R-4990-FX	20	1½	18	54	67	70	70	—	12
R-4990-GX	23	1½	21	60	77	85	—	—	12
R-4990-HX	26	1½	24	71	100	85	—	—	12
R-4990-JX	30	2	27*	100	120	100	—	—	17
R-4990-KX	33	2	30*	110	140	150	—	—	17
R-4990-LX	36	2	33*	120	130	185	—	—	17
R-4990-MX	39	2	36*	130	200	180	—	—	17
R-4990-NX	45	2	42*	150	245	210	—	—	17
R-4990-OX	51	2	48*	190	—	215	—	—	17

*¼" Annular spacing **Weight per foot — includes both sides.



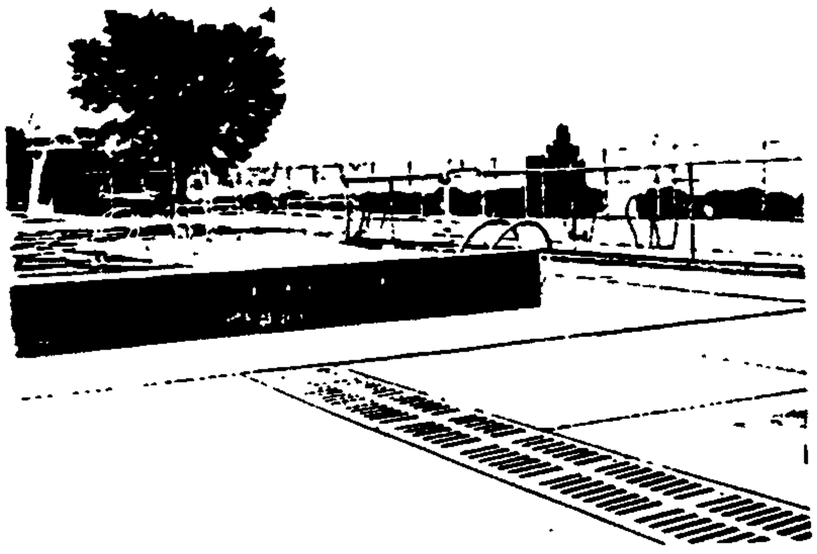
Illustrating heavy duty trench frames and Type A grates to drain loading ramp. Designs in this series are being used successfully in subway construction, intersecting elevated highways and underpasses, airport hangar doors, ramps and other special purposes.

R-4991 Light Duty Trench Frames with Grated or Solid Covers

Standard Cover Dimensions

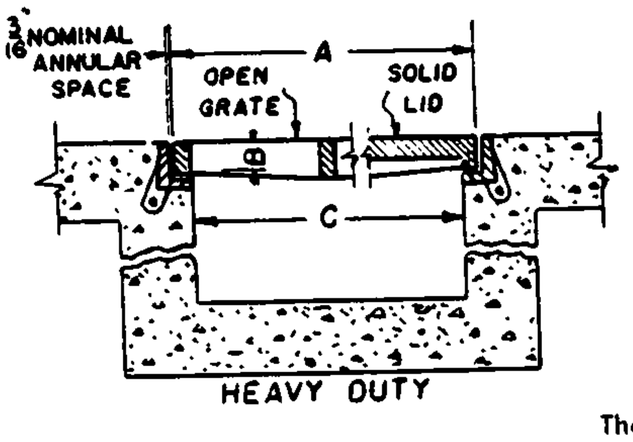
Catalog No.	Dimensions in inches			Weight per lineal foot (without frame)					
	A	B	C	Type A	Type C	Type D	Type E	Type P	Frame**
R-4991-AX	8	1½	6	12	15	22	17	—	12
R-4991-BX	10	1½	8	14	18	28	27	—	12
R-4991-CX	12	1½	10	13	23	34	23	—	12
R-4991-DX	14	1½	12	16	22	27	28	—	12
R-4991-EX	17	1½	15	29	29	37	38	—	12
R-4991-FX	20	1½	18	41	42	42	42	—	12
R-4991-GX	23	1½	21	51	51	55	51	—	12
R-4991-HX	26	1½	24	44	58	65	63	—	12
R-4991-JX	29	1½	27	71	79	74	74	—	12
R-4991-KX	32	1½	30	52	90	86	87	—	12
R-4991-LX	35	1½	33	120	—	100	105	—	12
R-4991-MX	38	1½	36	95	120	110	115	—	12
R-4991-NX	44	1½	42	115	155	120	115	—	12
R-4991-OX	50	1½	48	135	145	105	110	—	12

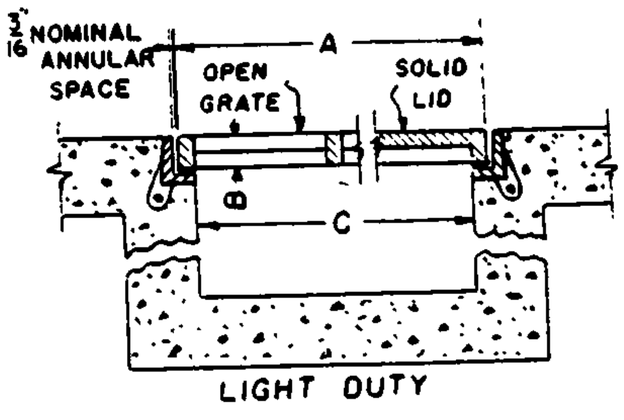
**Weight per foot — includes both sides.



Illustrating trench frames with grated covers in the deck area around a municipal pool.

grate capicity?





The above schematic drawings identify basic dimensions only and do not apply to all cover designs. Bar and rib depths, plate thicknesses, and seating widths, may vary on different sizes and styles. If your project has design restrictions, ask for approval drawings.

E-1/10

NEENAH FOUNDRY COMPANY

INLET 2, Q_{100} = ½ BASIN 1C = ½ (60CFS) = 30CFS
Head = 0.7'

Single D inlet, in sump condition:

Open Area (for orifice calc in sq. ft.): 3.93
Length of Weir (feet): 5.35

Head (ft)	Head (in)	Weir Q	Orifice Q	Control Q
0.05	0.6	0.16	4.23	0.16
0.1	1.2	0.45	5.99	0.45
0.15	1.8	0.83	7.33	0.83
0.2	2.4	1.28	8.47	1.28
0.25	3	1.79	9.46	1.79
0.3	3.6	2.36	10.37	2.36
0.35	4.2	2.97	11.20	2.97
0.4	4.8	3.63	11.97	3.63
0.45	5.4	4.33	12.70	4.33
0.5	6	5.07	13.39	5.07
0.55	6.6	5.85	14.04	5.85
0.6	7.2	6.67	14.66	6.67
0.65	7.8	7.52	15.26	7.52
0.7	8.4	8.40	15.84	8.40
0.75	9	9.32	16.39	9.32
0.8	9.6	10.27	16.93	10.27
0.85	10.2	11.24	17.45	11.24
0.9	10.8	12.25	17.96	12.25
0.95	11.4	13.29	18.45	13.29
1	12	14.35	18.93	14.35
1.05	12.6	15.44	19.40	15.44
1.1	13.2	16.55	19.85	16.55
1.15	13.8	17.70	20.30	17.70
1.2	14.4	18.86	20.74	18.86
4	48	114.79	37.86	37.86
5	60	160.43	42.33	42.33

CAPACITY > REQUIRED
√ OK

INLET 3; Q_{100} = 1/5 BASIN 1C = 1/5(6 CFS) = 1.2 CFS
Head = 0.2'

Single D inlet, in sump condition:

Open Area (for orifice calc in sq. ft.): 3.93
Length of Weir (feet): 5.35

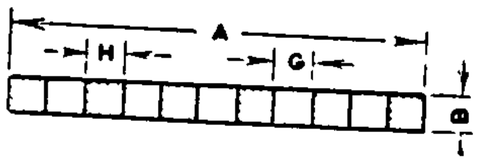
Head (ft)	Head (in)	Weir Q	Orifice Q	Control Q
0.05	0.6	0.16	4.23	0.16
0.1	1.2	0.45	5.99	0.45
0.15	1.8	0.83	7.33	0.83
0.2	2.4	1.28	8.47	1.28
0.25	3	1.79	9.46	1.79
0.3	3.6	2.36	10.37	2.36
0.35	4.2	2.97	11.20	2.97
0.4	4.8	3.63	11.97	3.63
0.45	5.4	4.33	12.70	4.33
0.5	6	5.07	13.39	5.07
0.55	6.6	5.85	14.04	5.85
0.6	7.2	6.67	14.66	6.67
0.65	7.8	7.52	15.26	7.52
0.7	8.4	8.40	15.84	8.40
0.75	9	9.32	16.39	9.32
0.8	9.6	10.27	16.93	10.27
0.85	10.2	11.24	17.45	11.24
0.9	10.8	12.25	17.96	12.25
0.95	11.4	13.29	18.45	13.29
1	12	14.35	18.93	14.35
1.05	12.6	15.44	19.40	15.44
1.1	13.2	16.55	19.85	16.55
1.15	13.8	17.70	20.30	17.70
1.2	14.4	18.86	20.74	18.86
4	48	114.79	37.86	37.86
5	60	160.43	42.33	42.33

CAPACITY > REQUIRED
✓ OK

INLET #4 Q100 = ID = 4CFS

R-4370 Series Heavy Duty Round Drainage Grates

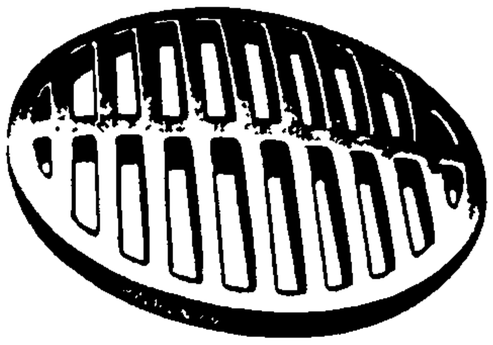
Most grates listed can be furnished with lightweight cast iron angle frames when specified. Frame is of ½" metal as shown on page 215. For severe-impacted loading conditions, inquire about these grates in Ductile Iron.



Catalog No.	Dimensions in inches A	B	G	H	Type	Wt. Lbs.
R-4370-1	6⅜	1¼	1 x 1	½	C	7
R-4370-2	9½	2½	1½ x 3½	⅝	G	12
R-4370-3	15	1¼	1 x 12¼	1	E	38 ⊘
R-4370-4	15	1¼	¾ x 2¼	¾	G	42
R-4370-5	18	1½	1 x 4½	1¼	G	68
R-4370-6	19½	1½	¾ x 5¼	¾	G	65
R-4370-7	20	1⅜	2 x 2	1	G	75
R-4370-8	21	1¼	¾ x 19½	¾	E	60
R-4370-9	22	1½	1⅛	1	C	76
R-4370-10	22	1½	1¼	1	D	95
R-4370-12	22	1½	1⅜ x 5	1	F	120
R-4370-13	22	1½	2 x 6	1¼	G	70*
R-4370-14A	22⅜	2½	1¼	1	G	115
R-4370-15	22½	1¾	1⅛	1	D	110
R-4370-17	22¾	1¾	1½	1	D	125
R-4370-18	22¾	1¾	1½	⅞	E	115 ⊘
R-4370-21	23	1½	1¼	1	D	115
R-4370-22	23	1¾	1	1⅛	D	133
R-4370-23	24	1½	2¼ x 2¼	1½	Special	116
R-4370-25	29	3	¾	1	G	215
R-4370-26	33	2	1½	1	G	220
R-4370-27A	38	1½	1	1	G	390

⊘ Not recommended for bicycle traffic. For safety standards see pages 88 to 93.
*Rated as Medium Duty — not Heavy Duty.

✓ OK



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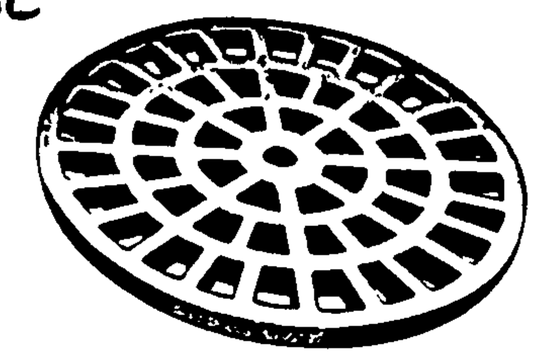

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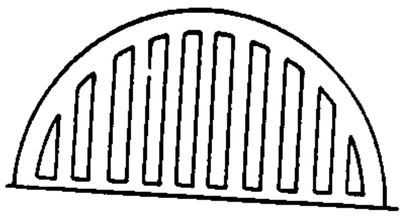

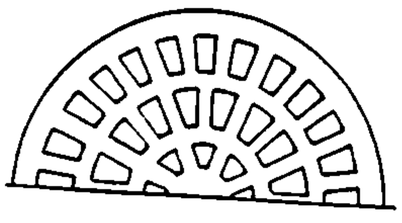

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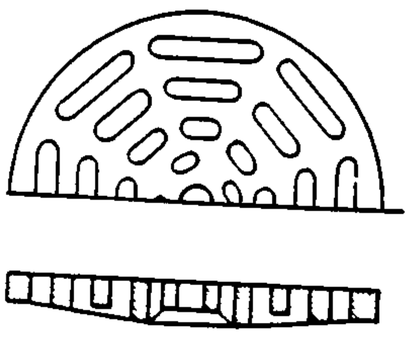

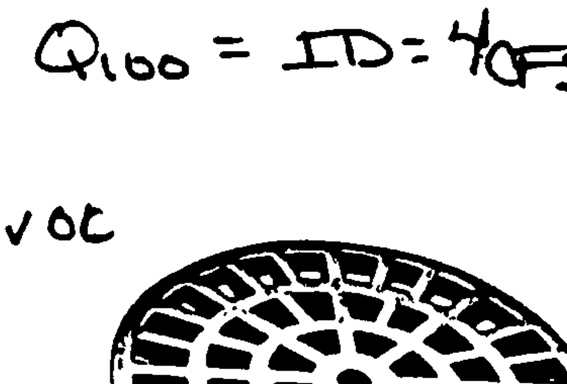

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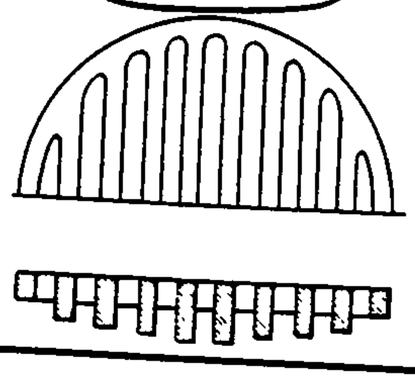
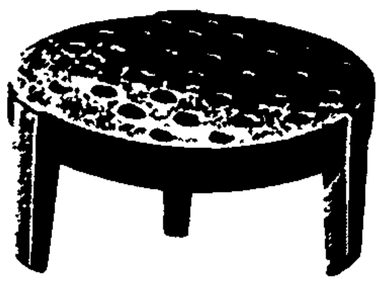
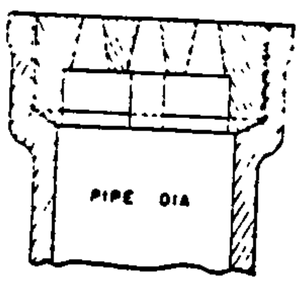


R-4373 Series Soil Pipe Grates

Heavy Duty





Catalog No.	Dimensions in inches Diameter of Grate	Depth of Grate	Pipe Size	Wt. Lbs.
R-4373-2*	2⅝	2½	2	2
R-4373-3	3¾	2½	3	3
R-4373-4	4¾	2⅞	4	4
R-4373-6	6¾	3	6	6
R-4373-8	9	3½	8	12
R-4373-10	11	3½	10	25
R-4373-12	13⅛	4¼	12	44
R-4373-15	16	4¼	15	58

*Slot openings.

R-4375 Series Perforated Lids for Drain or Vent

Medium Duty

Holes standard as shown; variations as specified. See R-4044, page 208, for method of setting. Since bell and spigot pipe is made under many specifications, dimensions will vary. Check the cover sizes in the table to be sure they will fit the pipe you are using.

Catalog No.	Dimensions in inches Dia.	Thickness	Number of Holes	Dia. Holes	To Fit Over Pipe Bell	Wt. Lbs.
R-4375-A	7⅛	½	12	¾	4	5
R-4375-B	9½	½	12	¾	6	7
R-4375-D	14¾	½	18	¾	10	26
R-4375-F	21¼	⅝	24	¾	15	60
R-4375-G	25½	⅝	24	¾	18	80
R-4375-K	33½	¾	36	1	24	165

NEENAH FOUNDRY COMPANY

E-4/10

INLET 5; $Q_{100} = 1/8$ BASIN 1E $= 1/8(16) = 2$ CFS
Head = 0.5'

Single D inlet, in sump condition:

Open Area (for orifice calc in sq. ft.): 3.93
Length of Weir (feet): 5.35

Head (ft)	Head (in)	Weir Q	Orifice Q	Control Q
0.05	0.6	0.16	4.23	0.16
0.1	1.2	0.45	5.99	0.45
0.15	1.8	0.83	7.33	0.83
0.2	2.4	1.28	8.47	1.28
0.25	3	1.79	9.46	1.79
0.3	3.6	2.36	10.37	2.36
0.35	4.2	2.97	11.20	2.97
0.4	4.8	3.63	11.97	3.63
0.45	5.4	4.33	12.70	4.33
0.5	6	5.07	13.39	5.07
0.55	6.6	5.85	14.04	5.85
0.6	7.2	6.67	14.66	6.67
0.65	7.8	7.52	15.26	7.52
0.7	8.4	8.40	15.84	8.40
0.75	9	9.32	16.39	9.32
0.8	9.6	10.27	16.93	10.27
0.85	10.2	11.24	17.45	11.24
0.9	10.8	12.25	17.96	12.25
0.95	11.4	13.29	18.45	13.29
1	12	14.35	18.93	14.35
1.05	12.6	15.44	19.40	15.44
1.1	13.2	16.55	19.85	16.55
1.15	13.8	17.70	20.30	17.70
1.2	14.4	18.86	20.74	18.86
4	48	114.79	37.86	37.86
5	60	160.43	42.33	42.33

CAPACITY > REQUIRED
✓ OK

INLET (2), $Q_{100} = 7/8$ BASIN 1E $\cdot \frac{7}{8}(16) = 14$ CFS
HEAD = 0.8 CFS

Double D inlet, in sump condition with short edges adjoined:

Open Area (for orifice calc in sq. ft.): 7.7977431
Length of Weir (feet): 13.645833

Head (ft)	Head (in)	Weir Q (cfs)	Orifice Q (cfs)	Control Q (cfs)
0.05	0.6	0.41	8.40	0.41
0.1	1.2	1.16	11.87	1.16
0.15	1.8	2.12	14.54	2.12
0.2	2.4	3.27	16.79	3.27
0.25	3	4.57	18.77	4.57
0.3	3.6	6.01	20.56	6.01
0.35	4.2	7.57	22.21	7.57
0.4	4.8	9.25	23.75	9.25
0.45	5.4	11.04	25.19	11.04
0.5	6	12.93	26.55	12.93
0.55	6.6	14.92	27.84	14.92
0.6	7.2	17.00	29.08	17.00
0.65	7.8	19.16	30.27	19.16
0.7	8.4	21.42	31.41	21.42
0.75	9	23.75	32.52	23.75
0.8	9.6	26.17	33.58	26.17
0.85	10.2	28.66	34.62	28.66
0.9	10.8	31.22	35.62	31.22
0.95	11.4	33.86	36.60	33.86
1	12	36.57	37.55	36.57
1.05	12.6	39.35	38.47	38.47
1.1	13.2	42.19	39.38	39.38
1.15	13.8	45.10	40.26	40.26
1.2	14.4	48.07	41.13	41.13
0.365	4.38	8.06	22.68	8.06

CAPACITY > REQUIRED
✓ OK.

INLET 7; $Q_{100} = \frac{1}{4}(1A) = \frac{1}{4}(24) = 6\,CFS$

HEAD = 0.5'

Single A inlet, in sump condition with curb openings on both sides:
Open Area (for orifice calc in sq. ft.): 3.9314236
Length of Weir (feet): 11.354167

Head (ft)	Head (in)	Weir Q	Orifice Q	Control Q
0.05	0.6	0.34	4.23	0.34
0.1	1.2	0.96	5.99	0.96
0.15	1.8	1.77	7.33	1.77
0.2	2.4	2.72	8.47	2.72
0.25	3	3.80	9.46	3.80
0.3	3.6	5.00	10.37	5.00
0.35	4.2	6.30	11.20	6.30
0.4	4.8	7.70	11.97	7.70
0.45	5.4	9.19	12.70	9.19
0.5	6	10.76	13.39	10.76
0.55	6.6	12.41	14.04	12.41
0.6	7.2	14.14	14.66	14.14
0.65	7.8	15.95	15.26	15.26
0.7	8.4	17.82	15.84	15.84
0.75	9	19.76	16.39	16.39
0.8	9.6	21.77	16.93	16.93
0.85	10.2	23.85	17.45	17.45
0.9	10.8	25.98	17.96	17.96
0.95	11.4	28.18	18.45	18.45
1	12	30.43	18.93	18.93

CAPACITY > REQUIRED

Calculation of open area:

	(in^2)	(ft^2)
Total Grate Area	1000	6.9444444
Cross Bar Area	-366	-2.541667
Supports (ends)	-115.625	-0.802951
Areas Counted Twice	47.75	0.3315972
	566.125	3.9314236

Calculation of Length of Weir:

	(in)	(ft)
Total Perimeter of Grate	90	7.5
Short Cross Bars	-3.5	-0.291667
End Supports	-9.25	-0.770833
Bearing Bars	-13	-1.083333
Curb Openings	72	6
	136.25	11.354167

E-7/10

INLET B; $Q_{100} = \frac{3}{4}(1A) = \frac{3}{4}(24CFS) = 18CFS$

HEAD = 0.67'

Double A inlet, in sump condition:

Open Area (for orifice calc in sq. ft.):	7.7977431
Length of Weir (feet):	7.9791667
Orifice Coeficient	0.6
Weir Coeficient	3

Head (ft)	Head (in)	1 Wing Weir Q (cfs)	Grate Weir Q (cfs)	Grate Orifice Q (cfs)	Control Q Sgl Wing (cfs)	Control Q Dbl Wing (cfs)
0.05	0.6	0.13	0.27	8.40	0.40	0.54
0.1	1.2	0.38	0.76	11.87	1.14	1.52
0.15	1.8	0.70	1.39	14.54	2.09	2.78
0.2	2.4	1.07	2.14	16.79	3.21	4.29
0.25	3	1.50	2.99	18.77	4.49	5.99
0.3	3.6	1.97	3.93	20.56	5.91	7.88
0.35	4.2	2.48	4.96	22.21	7.44	9.93
0.4	4.8	3.04	6.06	23.75	9.09	12.13
0.45	5.4	3.62	7.23	25.19	10.85	14.47
0.5	6	4.24	8.46	26.55	12.71	16.95
0.55	6.6	4.89	9.76	27.84	14.66	19.55
0.6	7.2	5.58	11.13	29.08	16.70	22.28
0.65	7.8	6.29	12.54	30.27	18.83	25.12
0.667	8.0	6.54	13.04	30.66	19.58	26.11
0.7	8.4	7.03	14.02	31.41	21.05	28.08
0.75	9	7.79	15.55	32.52	23.34	31.14
0.8	9.6	8.59	17.13	33.58	25.71	34.30
0.85	10.2	9.40	18.76	34.62	28.16	37.57
0.9	10.8	10.25	20.44	35.62	30.68	40.93
0.95	11.4	11.11	22.16	36.60	33.28	44.39
1	12	12.00	23.94	37.55	35.94	47.94
1.05	12.6	12.91	25.76	38.47	38.67	51.58
1.1	13.2	13.84	27.62	39.38	41.46	55.31
1.15	13.8	14.80	29.52	40.26	44.32	59.12
0.567	6.804	5.12	10.22	28.27	15.34	20.47

CAPACITY > REQUIRED ✓

Calculation of open area:

Total Grate Area	2000	13.888889
Cross Bar Area	-732	-5.083333
Supports (ends)	-115.625	-0.802951
(middle)	-100	-0.694444
Areas Counted Twice	70.5	0.4895833
	1122.875	7.7977431

Calculation of Length of Weir:

Total Perimeter of Grate	130	10.833333
Short Cross Bars	-7	-0.583333
Bearing Bars	-13	-1.083333
End Supports	-9.25	-0.770833
Middle Supports	-5	-0.416667
	110	7.9791667

E-8/10

INLET 9; $Q_{100} = \frac{3}{7}(1B) = \frac{3}{7}(8) = 3.42$ CFS

HEAD = 0.85'

Single D inlet, in sump condition:

Open Area (for orifice calc in sq. ft.): 3.93

Length of Weir (feet): 5.35

Head (ft)	Head (in)	Weir Q	Orifice Q	Control Q
0.05	0.6	0.16	4.23	0.16
0.1	1.2	0.45	5.99	0.45
0.15	1.8	0.83	7.33	0.83
0.2	2.4	1.28	8.47	1.28
0.25	3	1.79	9.46	1.79
0.3	3.6	2.36	10.37	2.36
0.35	4.2	2.97	11.20	2.97
0.4	4.8	3.63	11.97	3.63
0.45	5.4	4.33	12.70	4.33
0.5	6	5.07	13.39	5.07
0.55	6.6	5.85	14.04	5.85
0.6	7.2	6.67	14.66	6.67
0.65	7.8	7.52	15.26	7.52
0.7	8.4	8.40	15.84	8.40
0.75	9	9.32	16.39	9.32
0.8	9.6	10.27	16.93	10.27
0.85	10.2	11.24	17.45	11.24
0.9	10.8	12.25	17.96	12.25
0.95	11.4	13.29	18.45	13.29
1	12	14.35	18.93	14.35
1.05	12.6	15.44	19.40	15.44
1.1	13.2	16.55	19.85	16.55
1.15	13.8	17.70	20.30	17.70
1.2	14.4	18.86	20.74	18.86
4	48	114.79	37.86	37.86
5	60	160.43	42.33	42.33

CAPACITY > REQUIRED
✓ OK

INLET 10; $Q_{100} = \frac{4}{7}(18) = \frac{4}{7}(8\text{CFS}) = 4.57\text{CFS}$

HEAD = 0.77'

Single D inlet, in sump condition:

Open Area (for orifice calc in sq. ft.): 3.93

Length of Weir (feet): 5.35

Head (ft)	Head (in)	Weir Q	Orifice Q	Control Q
0.05	0.6	0.16	4.23	0.16
0.1	1.2	0.45	5.99	0.45
0.15	1.8	0.83	7.33	0.83
0.2	2.4	1.28	8.47	1.28
0.25	3	1.79	9.46	1.79
0.3	3.6	2.36	10.37	2.36
0.35	4.2	2.97	11.20	2.97
0.4	4.8	3.63	11.97	3.63
0.45	5.4	4.33	12.70	4.33
0.5	6	5.07	13.39	5.07
0.55	6.6	5.85	14.04	5.85
0.6	7.2	6.67	14.66	6.67
0.65	7.8	7.52	15.26	7.52
0.7	8.4	8.40	15.84	8.40
0.75	9	9.32	16.39	9.32
0.8	9.6	10.27	16.93	10.27
0.85	10.2	11.24	17.45	11.24
0.9	10.8	12.25	17.96	12.25
0.95	11.4	13.29	18.45	13.29
1	12	14.35	18.93	14.35
1.05	12.6	15.44	19.40	15.44
1.1	13.2	16.55	19.85	16.55
1.15	13.8	17.70	20.30	17.70
1.2	14.4	18.86	20.74	18.86
4	48	114.79	37.86	37.86
5	60	160.43	42.33	42.33

CAPACITY > REQUIRED

✓ OK.

APPENDIX F

SOUTHERN BOULEVARD INLET DESIGN CALCULATIONS

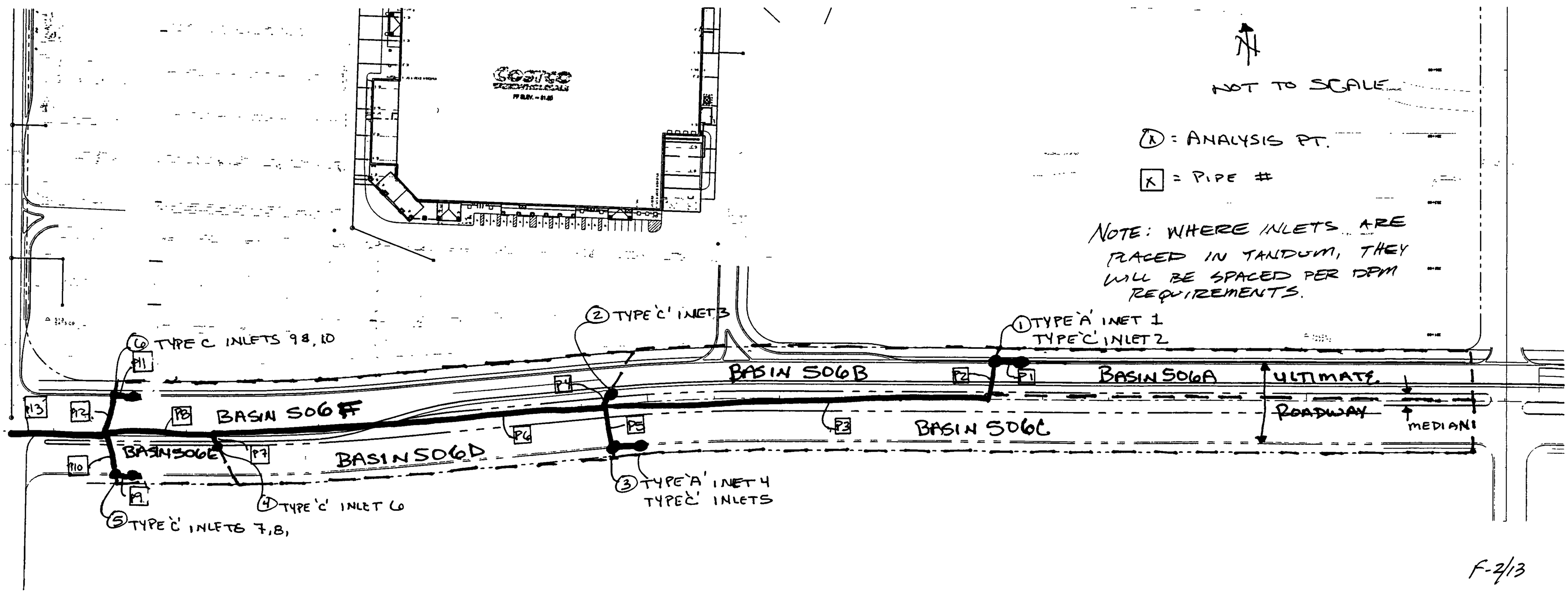
Southern Pipe Design Sheet.
See Diagram next sheet for locations.

PIPE ID	100 YR FLOW (CFS)	PIPE SIZE (IN)	PIPE SLOPE (%)	PIPE CAPACITY (CFS)
P1	2.3	18	1%	11.3
P2	4.6	18	1%	11.3
P3	4.6	18	1%	11.3
P4	2.3	18	1%	11.3
P5	6.4	18	1%	11.3
P6	13.3	24	1%	24.3
P7	2.3	18	1%	11.3
P8	15.6	24	1%	24.3
P9	3.0	18	1%	11.3
P10	5.9	18	1%	11.3
P11	3.4	18	1%	11.3
P12	6.8	18	1%	11.3
P13	28.3	18	1%	11.3

STORM DRAIN INLET & PIPE
ULTIMATE DESIGN FOR
SOUTHERN BLVD. (BASIN 506)
Q_{100} = 32.0 CFS

DUE TO CENTERLINE RADII & SPEED SOUTHERN WAS DESIGNED W/ SUPERELEVATION. A MEDIAN IS IN PLACE.

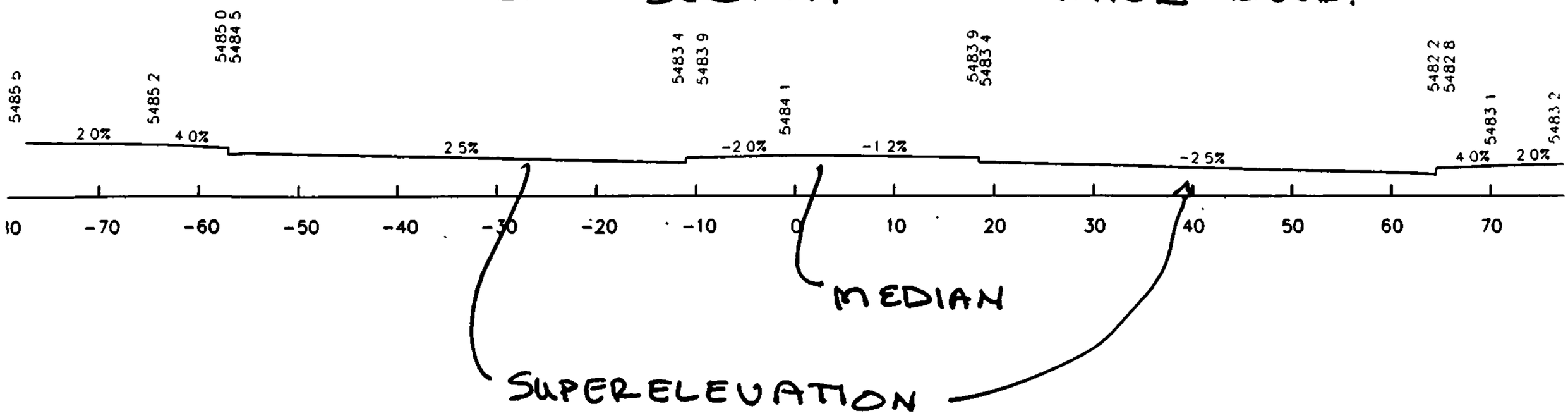
INLETS HAVE BEEN LOCATED AT THE TRANSTIONS OF THESE SUB-BASINS.



Southern Inlet Design Calculations Spreadsheet
See Diagram next sheet for Basin locations and Analysis points

Analysis Point	Basin	Flow from Basin (CFS)	Source of Residual	Residual Flow (CFS)	Total Flow (CFS)	Depth (FT)	Slope (%)	Capacity of Inlet	# of Inlets	Residual Flow (CFS)
1	506A	6.5	N/A	0	6.5	0.28	1.5	2.3	2	1.9
2	506B	4	506A	1.9	5.9	0.31	1.08	2.3	1	3.6
3	506C	10.5	N/A	0	10.5	0.38	1.08	3.2	2	4.1
4	506D	3.85	506C	4.1	7.95	0.31	1.08	2.3	1	5.65
5	506E	1.65	506D	5.65	7.3	0.37	1.08	2.95	3	0
6	506F	5.5	506B	3.6	9.1	0.33	1.08	3.4	3	0

CROSS-SECTION OF SOUTHER BLVD.



SUPERELEVATION VARIES ALONG SOUTHERN BLVD.

ANALYSIS PT 1
BASIN 506 A Q_{100} = 6.5 CFS

STA. [redacted] & 15+25 SOUTHERN

MANNING'S N= .013 SLOPE= .0151

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5491.10	5	66.00	5491.40	9	140.00	5490.00
2	15.00	5490.60	6	77.00	5491.60	10	140.01	5490.60
3	15.01	5490.10	7	95.99	5491.40	11	155.00	5490.90
4	65.90	5490.90	8	96.00	5491.90	12	0.00	0.00

WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
5490.10	0.10	0.12	0.2	2.42	1.85	2.32	0.05	0.15
5490.20	0.20	0.78	1.8	11.29	2.37	10.99	0.09	0.29
5490.30	0.30	2.31	7.7	20.18	3.32	19.68	0.17	0.47
5490.40	0.40	4.72	19.7	29.06	4.18	28.36	0.27	0.67
5490.50	0.50	7.99	39.7	37.94	4.97	37.04	0.38	0.88
5490.60	0.60	12.12	69.2	46.82	5.71	45.72	0.51	1.11
5490.70	0.70	17.53	104.4	63.50	5.96	62.39	0.55	1.25
5490.80	0.80	24.60	157.2	80.18	6.39	79.07	0.63	1.43
5490.90	0.90	33.34	230.1	96.85	6.90	95.74	0.74	1.64
5491.00	1.00	43.19	341.4	102.28	7.91	101.08	0.97	1.97
5491.10	1.10	53.56	472.2	107.70	8.82	106.41	1.21	2.31

DEPTH = 0.28'
VEL = 3.21 ft/sec
ΣHEAD = 0.43'

AP2 = 5.9 CFS (INLET)
AP3 = 10 SCFS

9+40 SOUTHERN

MANNING'S N= .013 SLOPE= .0108

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5485.50	5	66.00	5483.90	9	140.00	5482.20
2	15.00	5485.00	6	77.00	5484.10	10	140.01	5482.80
3	15.01	5484.50	7	95.99	5483.90	11	155.00	5483.20
4	65.90	5483.40	8	96.00	5483.40	12	0.00	0.00

☐ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
5482.30	0.10	0.18	0.3	3.77	1.58	3.67	0.04	0.14
5482.40	0.20	0.73	1.8	7.54	2.51	7.34	0.10	0.30
5482.50	0.30	1.65	5.4	11.31	3.29	11.01	0.17	0.47
5482.60	0.40	2.94	11.7	15.08	3.99	14.68	0.25	0.65
5482.70	0.50	4.59	21.2	18.84	4.63	18.35	0.33	0.83
5482.80	0.60	6.60	34.5	22.63	5.23	22.03	0.42	1.02
5482.90	0.70	9.18	49.5	30.04	5.39	29.44	0.45	1.15
5483.00	0.80	12.49	71.4	37.46	5.71	36.85	0.51	1.31
5483.10	0.90	16.55	101.1	44.87	6.11	44.26	0.58	1.48
5483.20	1.00	21.35	139.5	52.28	6.54	51.68	0.66	1.66
5483.30	1.10	26.70	193.6	55.95	7.25	55.34	0.82	1.92
5483.40	1.20	32.41	256.5	59.63	7.91	59.01	0.97	2.17
5483.50	1.30	38.55	325.1	64.45	8.43	63.66	1.10	2.40
5483.60	1.40	45.15	403.1	69.28	8.93	68.31	1.24	2.64
5483.70	1.50	52.21	491.0	74.11	9.41	72.96	1.37	2.87
5483.80	1.60	59.74	589.3	78.94	9.86	77.61	1.51	3.11
5483.90	1.70	67.73	698.1	83.81	10.31	82.30	1.65	3.35
5484.00	1.80	76.94	750.4	103.42	9.75	101.90	1.48	3.28
5484.10	1.90	88.11	837.9	123.02	9.51	121.50	1.40	3.30
5484.20	2.00	100.49	1017.8	127.64	10.13	126.12	1.59	3.59
5484.30	2.10	113.34	1214.6	132.27	10.72	130.75	1.78	3.88
5484.40	2.20	126.64	1428.3	136.90	11.28	135.37	1.98	4.18
5484.50	2.30	140.41	1659.3	141.52	11.82	139.99	2.17	4.47
5484.60	2.40	154.41	1943.1	141.62	12.58	139.99	2.46	4.86
5484.70	2.50	168.41	2244.5	141.72	13.33	139.99	2.76	5.26
5484.80	2.60	182.41	2562.8	141.82	14.05	140.00	3.07	5.67
5484.90	2.70	196.41	2897.6	141.92	14.75	140.00	3.38	6.08
5485.00	2.80	210.41	3248.3	142.02	15.44	140.01	3.70	6.50
5485.10	2.90	224.56	3570.4	145.02	15.90	143.01	3.93	6.83
5485.20	3.00	239.01	3907.7	148.03	16.35	146.01	4.15	7.15
5485.30	3.10	253.76	4260.5	151.03	16.79	149.01	4.38	7.48
5485.40	3.20	268.81	4628.7	154.03	17.22	152.01	4.60	7.80
5485.50	3.30	284.13	5011.9	157.02	17.64	155.00	4.83	8.13

AP2

Depth = 0.31'
Vel = 3.34 ft/s
E HEAD = 0.48' ✓ OK

AP3

DEPTH = 0.38'
Vel = 3.86 ft/s
E HEAD = 0.62' ✓ OK

AP 4 ⇒ 506D + RESIDUAL 506C
= 7.95CFS

3+45 Southern

MANNING'S N= .013 SLOPE= .0108

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5477.40	5	66.00	5477.90	9	140.00	5478.40
2	15.00	5476.90	6	77.50	5478.20	10	140.01	5479.00
3	15.01	5476.40	7	95.99	5477.60	11	155.00	5479.40
4	65.90	5477.40	8	96.00	5477.40	12	0.00	0.00

☐ WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
5476.50	0.10	0.25	0.4	5.19	1.59	5.09	0.04	0.14
5476.60	0.20	1.02	2.6	10.38	2.53	10.18	0.10	0.30
5476.70	0.30	2.29	7.6	15.57	3.31	15.27	0.17	0.47
5476.80	0.40	4.07	16.3	20.76	4.01	20.36	0.25	0.65
5476.90	0.50	6.36	29.6	25.95	4.65	25.45	0.34	0.84
5477.00	0.60	9.31	46.6	34.04	5.01	33.54	0.39	0.99
5477.10	0.70	13.07	71.2	42.13	5.44	41.63	0.46	1.16
5477.20	0.80	17.64	104.3	50.22	5.91	49.72	0.54	1.34
5477.30	0.90	23.02	147.1	58.32	6.39	57.81	0.63	1.53
5477.40	1.00	29.20	200.6	66.41	6.87	65.90	0.73	1.73
5477.50	1.10	36.01	272.1	71.01	7.55	70.33	0.89	1.99
5477.60	1.20	43.27	354.3	75.61	8.19	74.75	1.04	2.24
5477.70	1.30	51.12	438.9	83.19	8.59	82.25	1.14	2.44
5477.80	1.40	59.72	536.6	90.78	8.99	89.75	1.25	2.65
5477.90	1.50	69.07	648.1	98.37	9.38	97.25	1.37	2.87
5478.00	1.60	79.36	759.7	109.68	9.57	108.56	1.42	3.02
5478.10	1.70	90.78	890.4	121.00	9.81	119.87	1.49	3.19
5478.20	1.80	103.33	1041.0	132.31	10.07	131.18	1.58	3.38
5478.30	1.90	116.67	1246.8	136.73	10.69	135.60	1.77	3.67
5478.40	2.00	130.45	1470.4	141.13	11.27	140.00	1.97	3.97
5478.50	2.10	144.45	1741.9	141.23	12.06	140.00	2.26	4.36
5478.60	2.20	158.45	2031.3	141.33	12.82	140.00	2.55	4.75
5478.70	2.30	172.45	2338.1	141.43	13.56	140.00	2.85	5.15
5478.80	2.40	186.45	2661.7	141.53	14.28	140.01	3.16	5.56
5478.90	2.50	200.45	3001.7	141.63	14.97	140.01	3.48	5.98
5479.00	2.60	214.45	3357.6	141.73	15.66	140.01	3.81	6.41
5479.10	2.70	228.64	3671.5	145.48	16.06	143.75	4.00	6.70
5479.20	2.80	243.20	4001.0	149.23	16.45	147.50	4.20	7.00
5479.30	2.90	258.14	4346.4	152.98	16.84	151.25	4.40	7.30
5479.40	3.00	273.45	4707.9	156.73	17.22	155.00	4.60	7.60

Depth = 0.31'
Velocity = 3.34 ft/s
E HEAD = 0.48' ✓ OK

APS = 506E + RESIDUAL 506D
= 7.3CFS

AP6 = 506F + RESIDUAL 506B
= 9.1CFS

1+90 Southern

MANNING'S N= .013 SLOPE= .0108

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5476.80	5	66.00	5476.40	9	140.00	5476.10
2	15.00	5475.70	6	77.52	5476.70	10	140.01	5476.60
3	15.01	5476.20	7	95.99	5476.40	11	155.00	5477.00
4	65.90	5475.90	8	96.00	5475.90			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
5475.80	0.10	0.07	0.1	1.47	1.54	1.37	0.04	0.14
5475.90	0.20	0.27	0.6	3.05	2.38	2.85	0.09	0.29
5476.00	0.30	2.57	4.6	43.65	1.80	43.16	0.05	0.35
5476.10	0.40	8.91	23.7	84.22	2.66	83.45	0.11	0.51
5476.20	0.50	18.17	67.9	102.94	3.74	101.79	0.22	0.72
5476.30	0.60	28.42	141.6	104.61	4.98	103.18	0.39	0.99
5476.40	0.70	38.80	235.4	106.31	6.07	104.59	0.57	1.27
5476.50	0.80	49.83	333.6	117.76	6.70	115.95	0.70	1.50
5476.60	0.90	61.99	451.3	129.22	7.28	127.30	0.82	1.72
5476.70	1.00	75.48	582.0	144.33	7.71	142.40	0.92	1.92
5476.80	1.10	89.97	762.1	149.44	8.47	147.51	1.11	2.21
5476.90	1.20	104.91	968.3	153.19	9.23	151.26	1.32	2.52
5477.00	1.30	120.19	1195.2	156.93	9.94	155.00	1.54	2.84

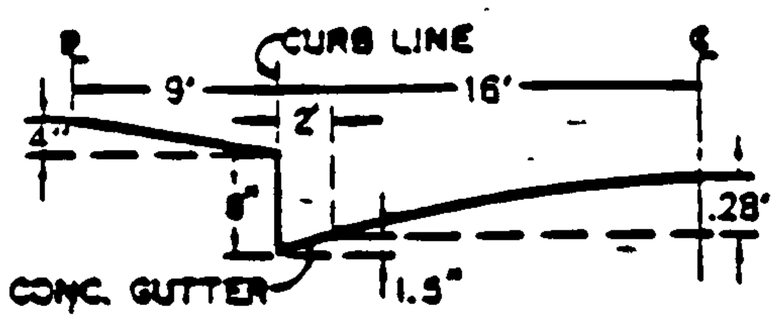
	APS	AP6
DEPTH	0.31'	0.33'
VELOCITY	1.84ft/s	2.08ft/s
ENERGY HEA	0.37'	0.39'

$Q_{100} = 6.5$ CFS
$S = 1.5\%$
Depth = 0.28'

$AP_1 = 6.5$ CFS

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

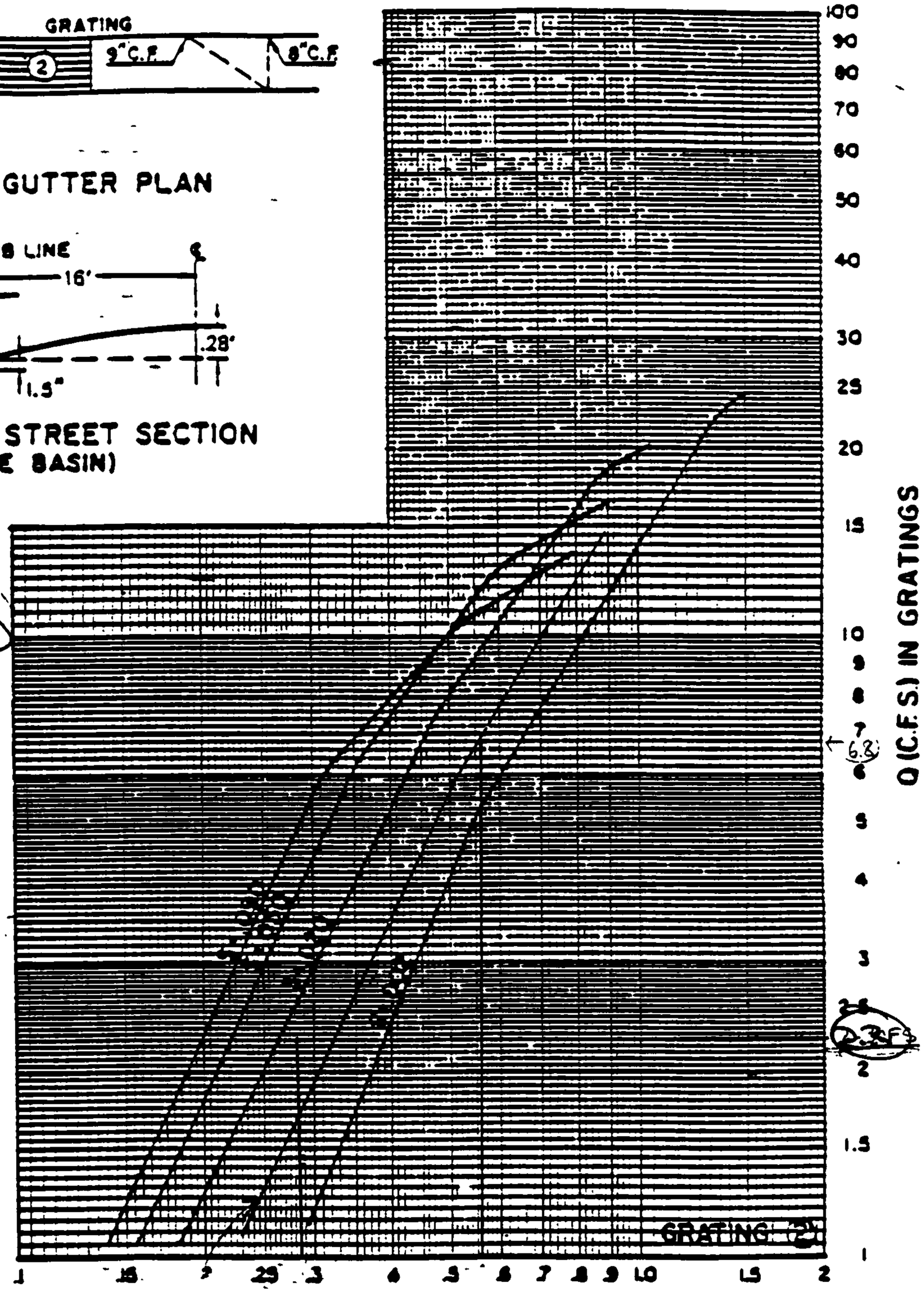
GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

RESIDUAL
$Q_{100} - Q_{CAPACITY}$
$6.5 - 2.3$ (2 INLETS)
$= 1.9$ CFS
RESIDUAL

9%
5%
2%
.2%

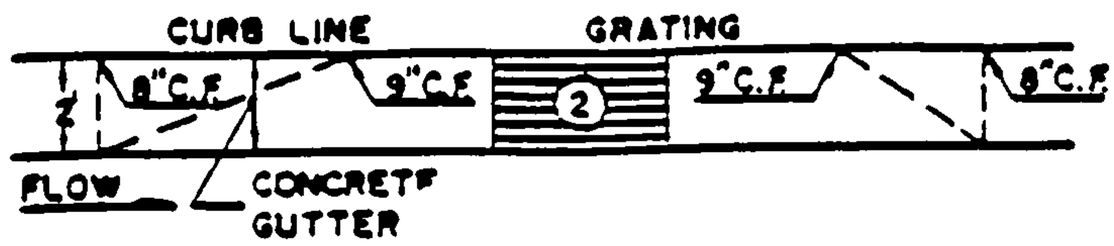


F-9/13

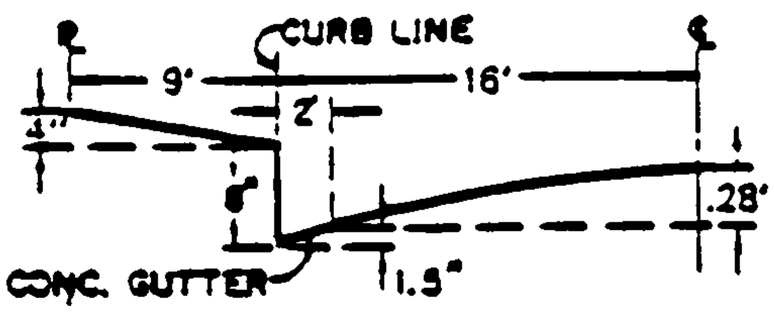
A_{P2} = 506B + RESDUAL FROM 506A
= 4.0 + 1.9
= 5.9 CFS

SLOPE = 1.08%
Depth = 0.34' 22.3

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



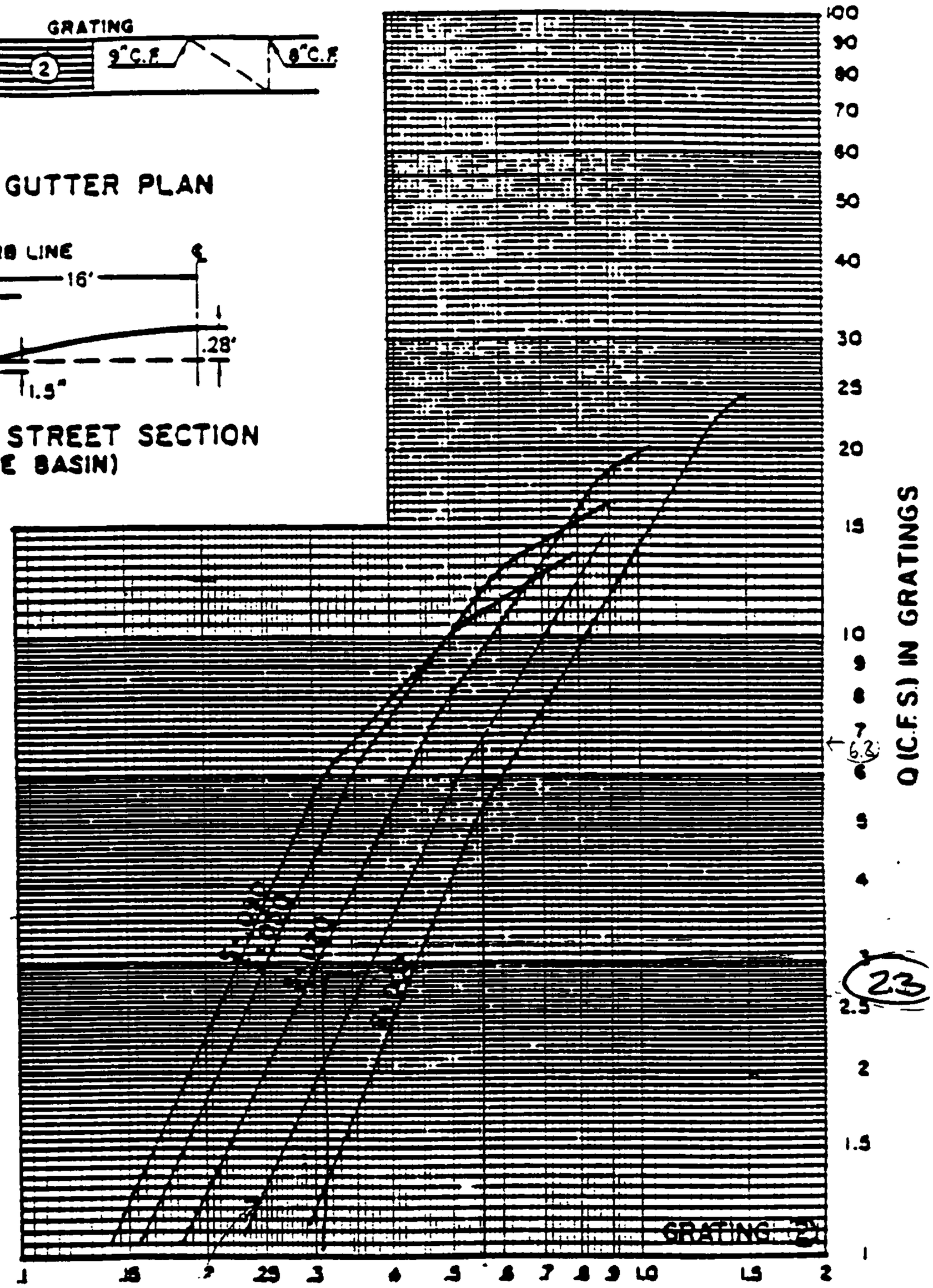
GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

RESIDUAL =
5.9 - 2.3 CFS
= 3.6 CFS

9%
5%
2%
.2%

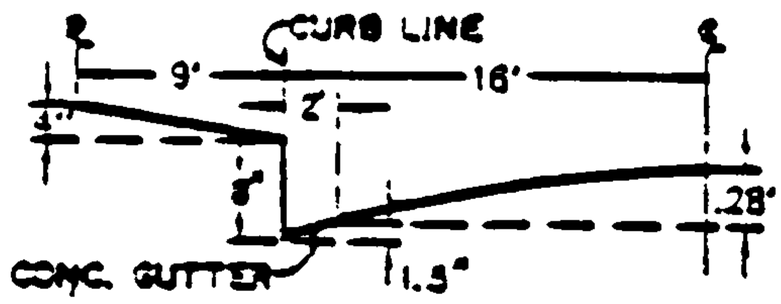


F-10/13

AP3 ≈ Q_{100} = 10.5CFS
depth = 0.38'
S = 1.08%

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

GRATING & GUTTER PLAN



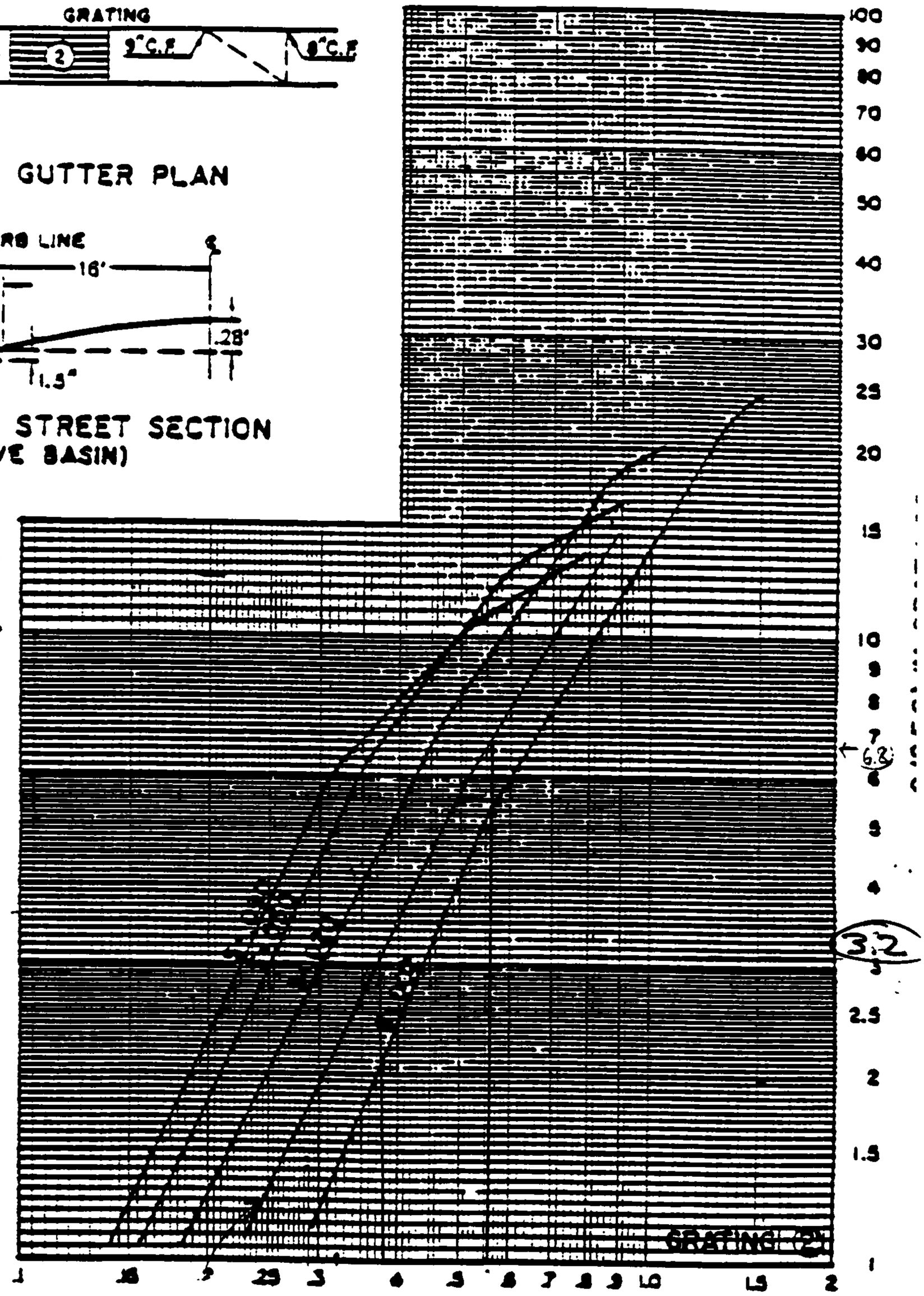
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

RESIDUAL
10.5CFS − 2(3.2)
= 4.1CFS

(2 INLETS)

9%
5%
2%
.2%

Δ = 1.8?



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

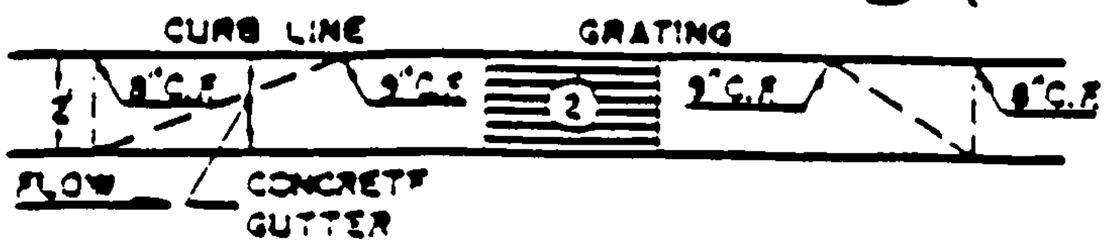
F-11/13

AP4 ⇒ SOCP + RESIDUAL SOCC
= 3.85 + 4.1 = 7.95

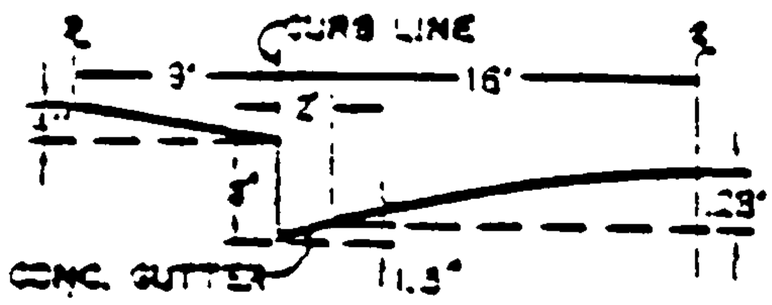
22.3

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

DEPTH = 0.31
S = 1.08%



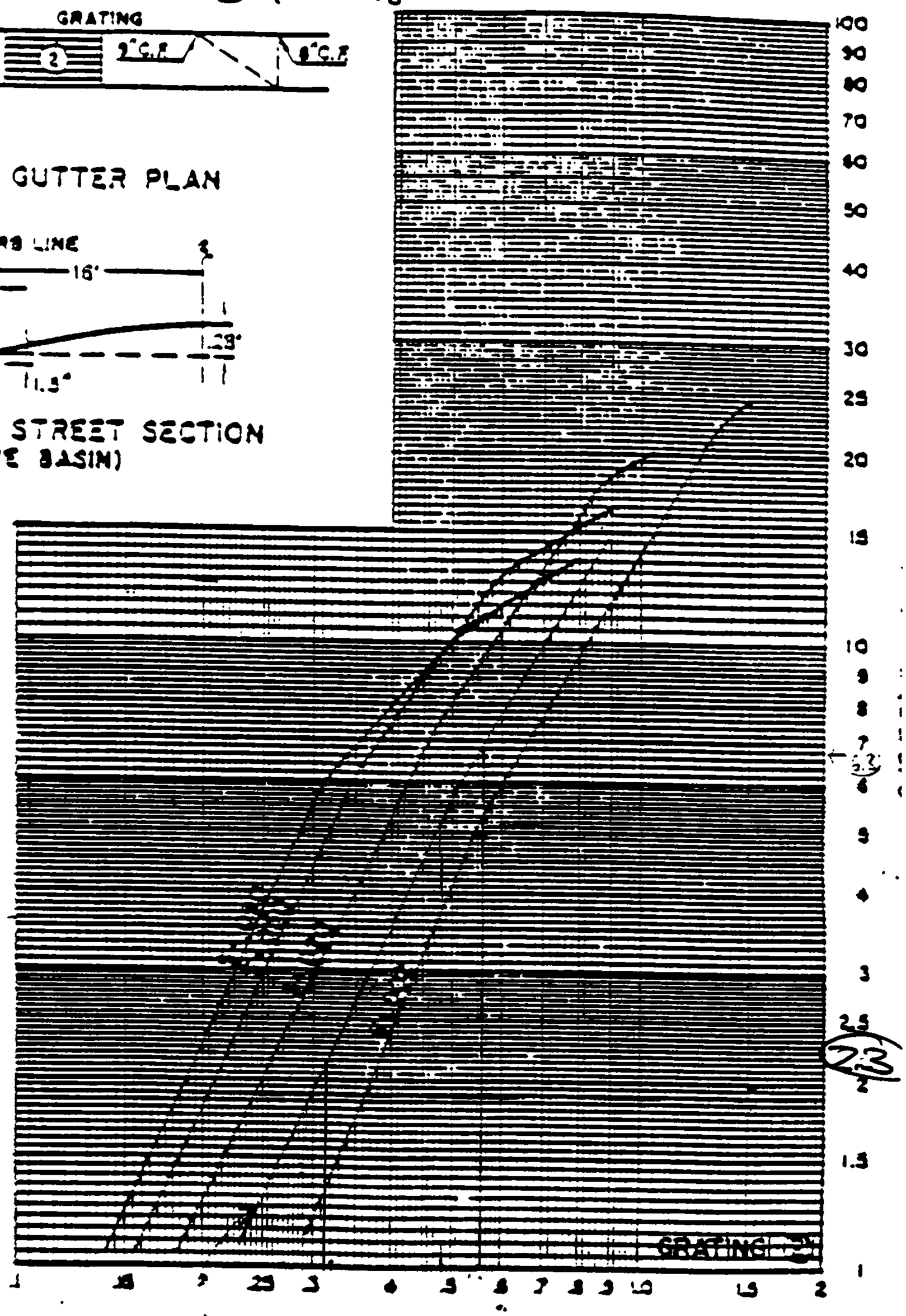
GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

RESIDUAL
7.95 - 2.3
= 5.65 CFS

7%
5%
2%
1%



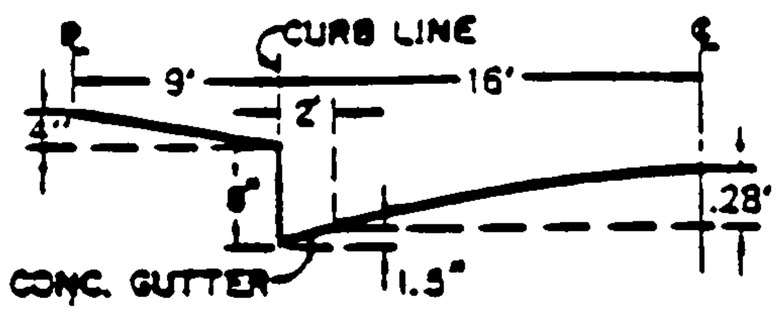
APS ⇒ SOG E + RESIDUAL SOG D = 1.65 + 5.65 = 7.3 q = 0.51 S = 1.08

AP6 ⇒ SOG F + RESIDUAL SOG B = 3.4 + 5.5 = 9.1 CFS 22.3

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

d = 0.33
S = 1.08%

GRATING & GUTTER PLAN



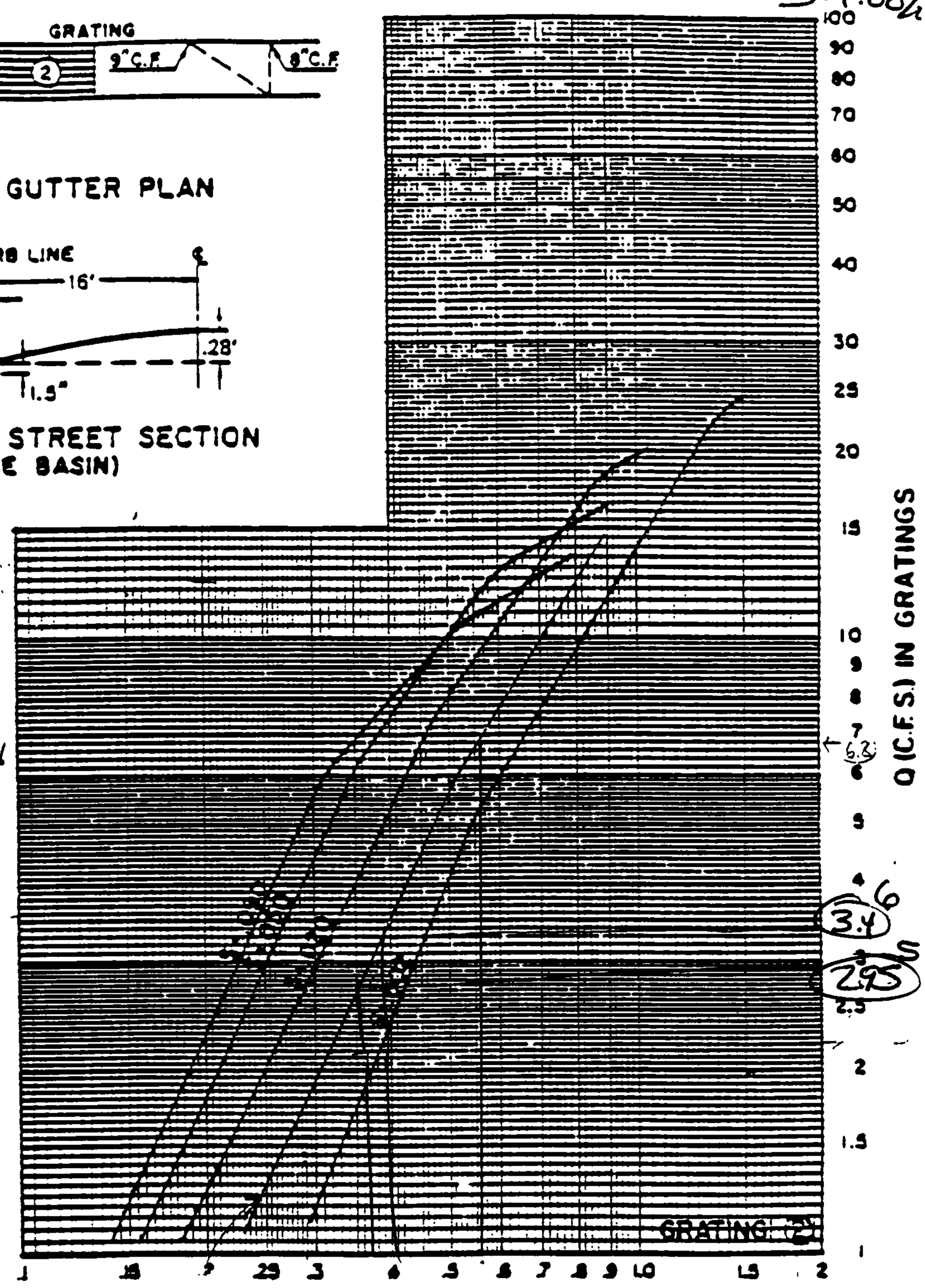
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

AP6 - 2(3.4) = 6.8 CFS

APS 2(2.95) = 5.9 CFS

AP6 9.1 - 6.8 = 2.3 residual
APS 7.3 - 5.9 = 1.4 residual
total = 3.7 CFS

9%
5%
2%
.2%



EXHIBITS

EXHIBIT 1: PROPOSED CONDITIONS BASIN MAP

EXHIBIT 2: BASIN MAP FROM AMENDMENT #1

EXHIBIT 3: ONSITE 36" DIAMETER STORM DRAIN PLAN & PROFILE

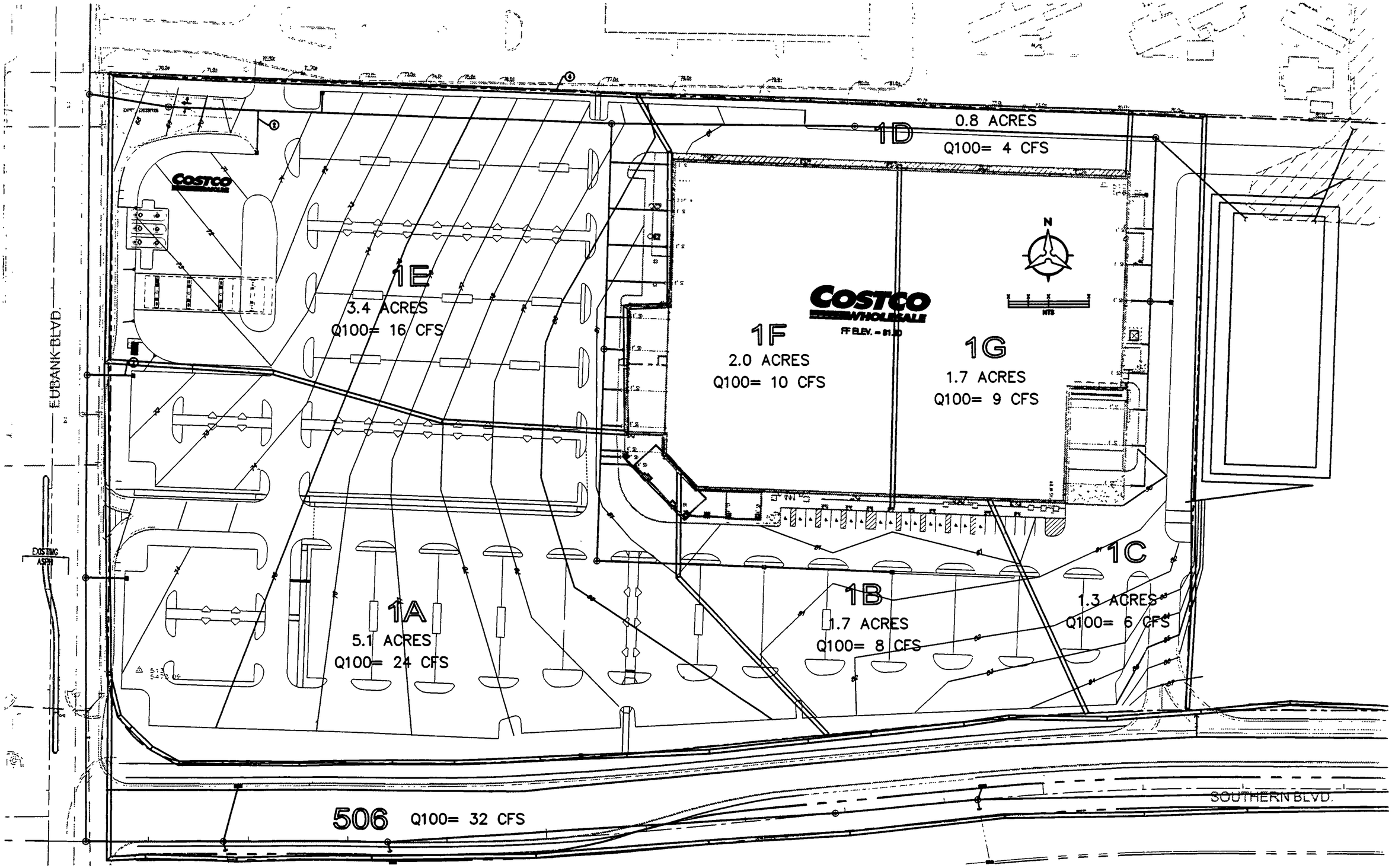
EXHIBIT 4: FEMA MAP

EXHIBIT 5: PLAT

EXHIBIT 6: GRADING AND DRAINAGE PLAN

EXHIBIT 1

PROPOSED CONDITIONS BASIN MAP



PROPOSED BASINS

PLATE 1

EXHIBIT 2

BASIN MAP FROM AMENDMENT #1

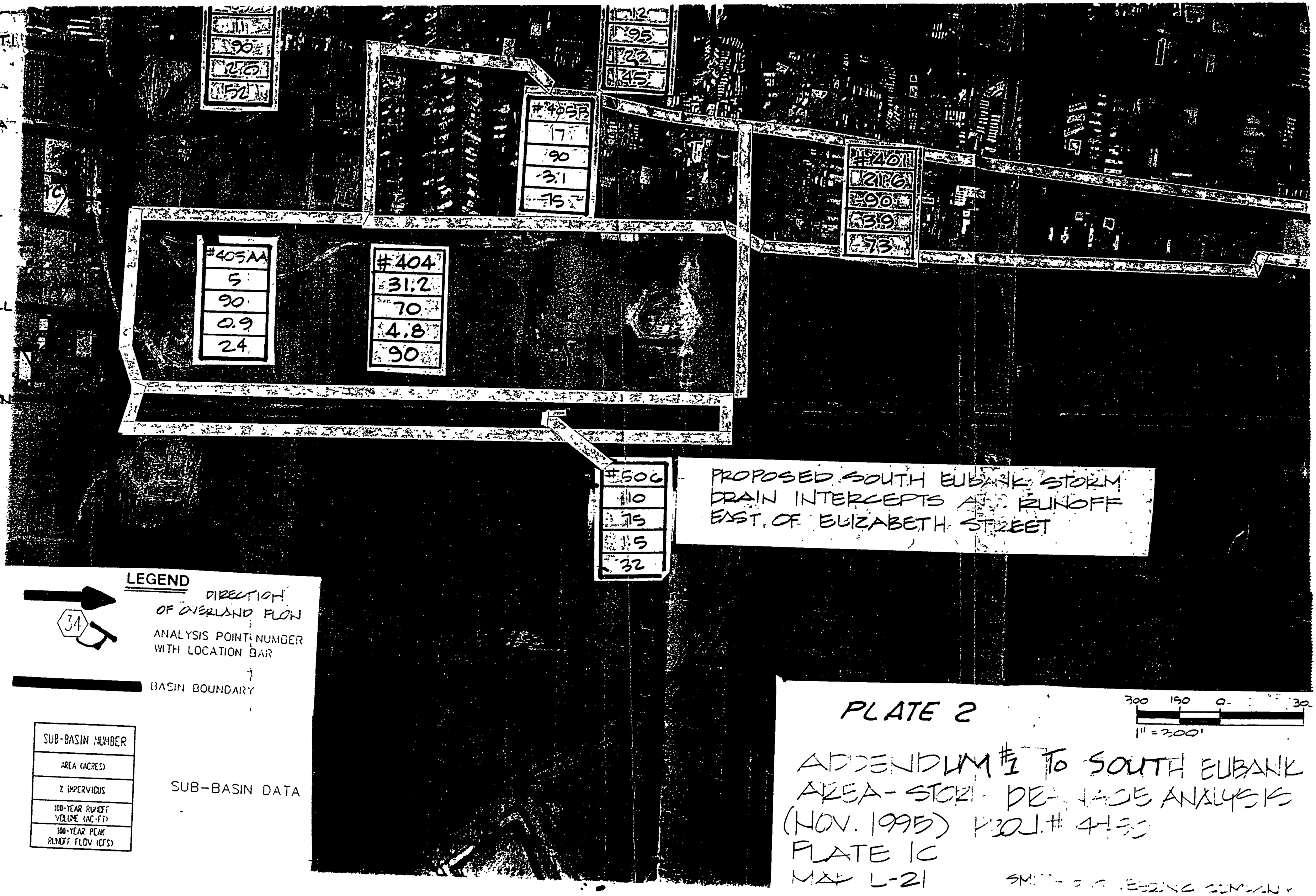


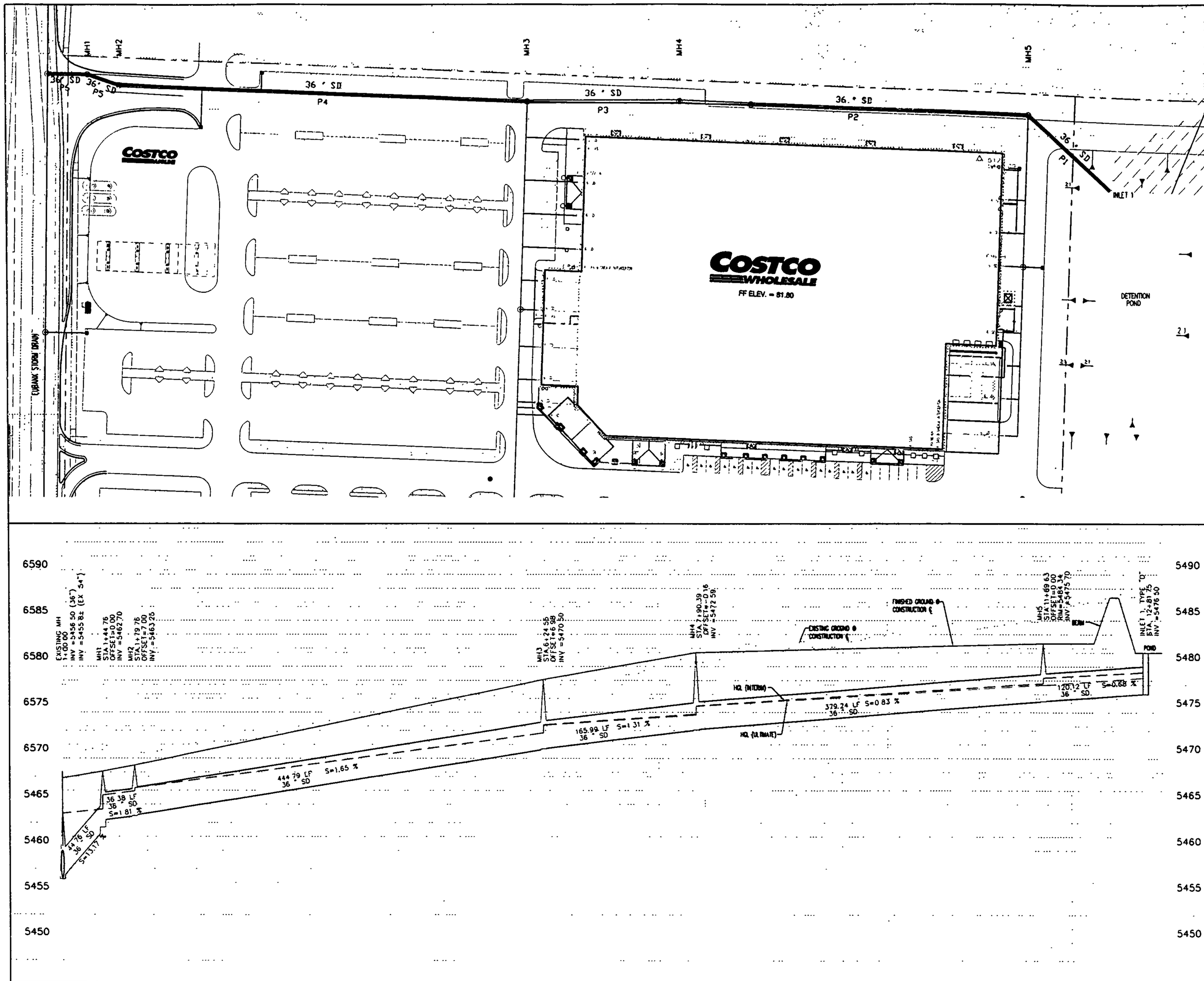
PLATE 2

ADDENDUM #1 TO SOUTH EUBANK AREA - STORM DRAIN ANALYSIS (NOV. 1995) PROJ. # 4455
PLATE 1C
MAP L-21

SMITH ENGINEERING COMPANY

EXHIBIT 3

ONSITE 36" DIAMETER STORM DRAIN PLAN & PROFILE



AS-BUILT INFORMATION

CONTRACTOR — DATE
STAKED BY — DATE
SURVEYED BY — DATE
FIELD VERIFIED BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE

MICRO-FILM INFORMATION
RECORDED BY — DATE
NO

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES

NO	BY	DATE

ENGINEER'S SEAL

No	Date	REMARKS	By

REVISIONS
DESIGN

Designed By L.M.M. DATE 03/09/00
Drawn By S.F.G. DATE 03/09/00
Checked By L.M.M. DATE 03/09/00

COSTCO WHOLESALE

ALBUQUERQUE
NEW MEXICO

Bohannan ▲ Huston
Courtyard One 7500 JEFFERSON NE Albuquerque NEW MEXICO 87109
ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

EXHIBIT 3

COSTCO WHOLESALE
DETENTION POND &
36" STORM DRAIN

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr	Mo./Day/Yr

City Project No | Zone Map No | Sheet | Of

A_BH_B01 00198 HYDRO DESIGN PLAN 00198UPNP01 DWG

BHI JOB NO 00198A7 05

Date 03/15/00

Copyright Bohannan Huston 2000

EXHIBIT 4

FEMA MAP

EXHIBIT 5

PLAT

EXHIBIT 6

GRADING AND DRAINAGE PLAN

BOHANNAN HUSTON, INC.

Courtyard One

7500 JEFFERSON NE

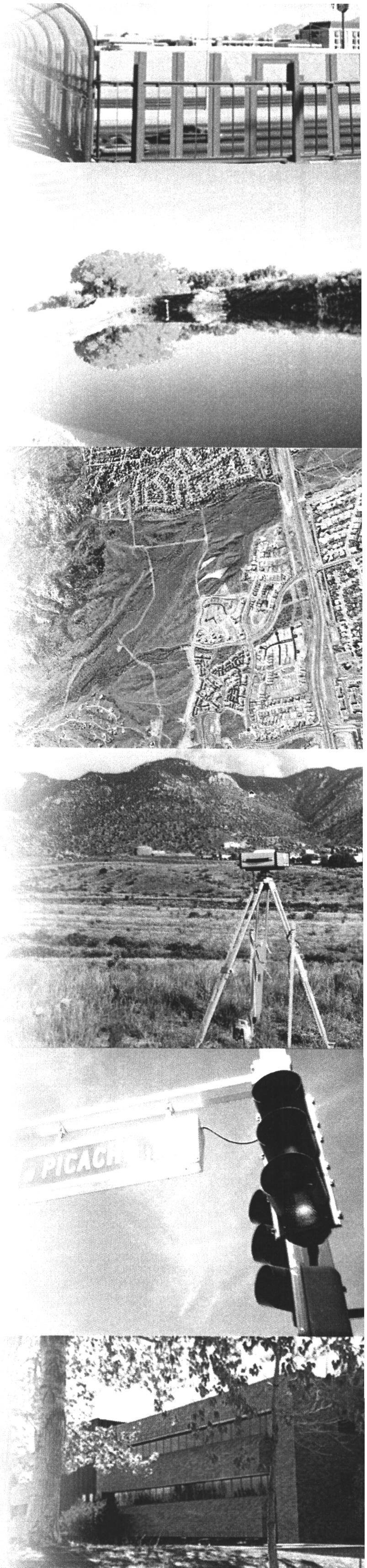
Albuquerque

NM 87109-4335

voice 505.823.1000

fax 505.821.0892

DRAINAGE REPORT FOR LONGFORD VILLAGE EAST SUBDIVISION (TRACT B-1 COSTCO DEVELOPMENT)



DECEMBER 3, 2003

Prepared for:

LONGFORD VILLAGE EAST, LLC

7301 JEFFERSON ST NE, STE G-H

ALBUQUERQUE, NM 87109

Bohannan ▲ Huston Inc.

- ENGINEERING
- ADVANCED TECHNOLOGIES
- SPATIAL DATA

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 5, 2004

Pamela Thies, PE
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: Longford Village East Subdivision Drainage Report
Engineer's Stamp dated 12-3-03 (L21/D37)

Dear Ms. Thies,

Based upon the information provided in your submittal dated 12-4-03, the above referenced report is approved for Preliminary Plat action by the DRB. Once that board approves the plan, please submit a mylar copy for my signature in order to obtain a Grading Permit.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. Refer to the attachment that is provided with this letter for details. If you have any questions please feel free to call the Municipal Development Department, Hydrology section at 768-3654 (Charles Caruso) or 768-3645 (Bryan Wolfe).

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

Sincerely,

Bradley L. Bingham, PE
City Hydrologist

C: Chuck Caruso, CoA
file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

L-21/D37

DRAINAGE INFORMATION SHEET
(REV. 11/01/2001)

PROJECT TITLE: Tract B-1 Costco Development ZONE MAP/DRG. FILE # L-21-Z
DRB #: EPC#: WORK ORDER#:

LEGAL DESCRIPTION: Tract B-1 Costco Development
CITY ADDRESS:

ENGINEERING FIRM: Bohannan Huston, Inc. CONTACT: Pam Thies
ADDRESS: 7500 Jefferson NE – Courtyard I PHONE: (505) 823-1000
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

OWNER: Longford Village East, LLC CONTACT: Kevin Daggett
ADDRESS: 7301 Jefferson St. NE, Ste G-H PHONE: 761-9911
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

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

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

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

CHECK TYPE OF SUBMITTAL:
- X DRAINAGE REPORT
- ___ DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEER'S CERTIFICATION (HYDROLOGY)
- ___ CLOMR/LOMR
- ___ TRAFFIC CIRCULATION LAYOUT (TCL)
- ___ ENGINEERS CERTIFICATION (TCL)
- ___ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
- ___ OTHER

CHECK TYPE OF APPROVAL SOUGHT:
- ___ SIA / FINANCIAL GUARANTEE RELEASE
- X 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 (PERM.)
- ___ CERTIFICATE OF OCCUPANCY (TEMP.)
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ WORK ORDER APPROVAL
- ___ OTHER (SPECIFY)

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

RECEIVED
DEC 04 2003
BY:
HYDROLOGY SECTION

DATE SUBMITTED: 12/4/03

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

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

DRAINAGE REPORT

FOR

LONGFORD VILLAGE EAST SUBDIVISION
(TRACT B-1, COSTCO DEVELOPMENT)

DECEMBER 3, 2003

Prepared for:

LONGFORD VILLAGE EAST, LLC
7301 JEFFERSON ST NE, SUITE G-H
ALBUQUERQUE, NM 87109

Prepared by:

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

RECEIVED
DEC 04 2003
HYDROLOGY SECTION

PREPARED BY:

PAMELA L THIES
NEW MEXICO
14674
REGISTERED PROFESSIONAL ENGINEER

Pamela Thies 12/03/03

Pamela Thies, P.E. **Date**

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EXHIBIT 1: BASIN MAP FROM AMENDMENT #1

EXHIBIT 2: PROPOSED DRAINAGE BASIN MAP

EXHIBIT 3: GRADING AND DRAINAGE PLAN

EXHIBIT 4: PRELIMINARY PLAT

I. SITE LOCATION

The proposed Longford Village East Subdivision site is located on Southern Boulevard SE, between the existing Costco Wholesale site (on the corner of Eubank and Southern) and Elizabeth, within City of Albuquerque Zone Atlas Map No. L-21. The site is within Precipitation Zone 3 as defined in the DPM Section 22.2. The site is currently legally described as Tract B-1, Costco Development, and contains 13.17 acres. The site has previously been used for Little League fields.

II. PURPOSE

The purpose of this report is to present the drainage management plan for Longford Village East Subdivision (Tract B-1, Costco Development) and to obtain approval of the preliminary plat and grading plan by the Development Review Board (DRB). The proposed development of Tract 29C consists of 122 single family detached residential lots on approximately 13.2 acres.

This report will reference the following City of Albuquerque and Federal Emergency Management Association (FEMA) approved studies prepared for the Costco Wholesale development:

1) *South Eubank Area Storm Drainage Analysis*, prepared by Smith Engineering Company, dated November 1995;
2) *Amendment #1 to the South Eubank Area Storm Drainage Analysis*, prepared by Smith Engineering Company;
3) *Drainage Report for Costco Wholesale*, dated March 2000.

III. METHODOLOGIES

Please refer to the above referenced reports for the specific methodologies used in preparing those individual reports or plans.

Site conditions will be analyzed for a 10-year and 100-year, 6-hour storm event in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM) Volume 2, Design Criteria, Section 22.2, Hydrology, for the City of Albuquerque, January 1993.

Since the site is approximately 13.2 acres, Part A of the DPM, Section 22.2, which provides a simplified procedure for projects with sub-basins smaller than 40 acres, was utilized.

The approved drainage report referenced in the preparation of this plan is the "Drainage Report for Costco Wholesale" prepared by Bohannan Huston (dated March 2000). This report includes the analysis of this site as a fully developed commercial site, including the existing detention pond located to the north and west of this tract.

Additional information was provided in "South Eubank Area Storm Drainage Analysis" prepared by Smith Engineering Company, dated November 1995, and its Amendment #1. This report includes analysis of the Eubank storm drain. Amendment #1 to that report provides a more detailed analysis for the drainage basins adjacent to this site and the Costco site which drain to the Eubank trunk line. A portion of the developed flows from this tract will ultimately drain into the Eubank Storm Drain.

IV. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

For additional assistance throughout this portion of the report, please refer to the Basin Map from Amendment #1 within the Exhibit section of this report (Exhibit 1).

The proposed subdivision is located within the existing Basin 404 and consists of terrain with a gradual slope from east to west of approximately 1.5%. There are no significant improvements, and it is slightly covered with grass and weeds. The existing detention pond, which was built with the Costco Wholesale development to the west, collects the undeveloped flows from this tract as well as the developed flows from Basin 405B, which is directly north of this tract. The total contributing flow to this detention pond from these basins is 106 cubic feet per second (cfs). The flow was calculated in the Drainage Report for Costco Wholesale by Bohannan Huston, Inc., March 2000, and was not re-calculated for this analysis. There are no recognized FEMA Floodplains within the proposed development.

V. PROPOSED HYDRAULIC AND HYDROLOGIC CONDITIONS

For additional assistance throughout this portion of the report, please refer to the Proposed Drainage Basin Map (Exhibit 2) and the Grading and Drainage Plan (Exhibit 3) enclosed in the Exhibit section of this report.

Developed flow (Q_{100}=xx.xx cfs) generated by Tract B-1 (13.2 ac) will travel through the proposed internal streets to a collection point located at the end of Street 2. All of the runoff will be collected by a proposed drainage system utilizing inlets and storm drain connected to the existing detention pond, which ultimately outfalls to the Eubank Storm Drain. The development of Tract B-1 does not change the terrain of the offsite basins north and west of the subdivision which includes the existing detention pond.

A. On-Site Basins

The proposed site is divided into twelve (12) major on-site basins. Each of the basins is discussed in further detail below. See the Proposed Drainage Basin Map for analysis point locations.

Basin 1 (0.51 Ac, Q_{100}=2.15 cfs) encompasses lots 1-3 in the northeast corner of Tract B-1. The developed flow from this basin will flow west down Jicama Way.

Basin 2 (1.42 Ac, Q_{100}=5.83 cfs) encompasses lots 4-12 and a 7-car parking lot on the west side of Pequin Trail. The developed flow from this basin will flow down the street and will turn west onto Habanero Way.

Basin 3 (1.51 Ac, Q_{100}=5.88 cfs) encompasses lots 71-78, and lots 113-122 on both sides of the east end of Jicama Way. The developed flow from this basin will combine with the flows from Basin 1 and will flow west down the street. The total flow at the west end of this basin is analyzed with Analysis Point 5 (AP5).

Basin 4 (1.31 Ac, Q_{100}=5.12 cfs) encompasses lots 53-60 and lots 63-70 on both sides of Tomatillo Lane. The developed flow split with half draining to the north and half draining south along Tepin Trail.

Basin 5 (1.40 ac, Q_{100}=5.57 cfs) encompasses lots 13-21 and lots 47-52 on both sides of the east end of Habanero Way. The developed flow from this basin will combine with the flows from Basin 2 and will flow west down the street. The total flow at the west end of this basin is analyzed with Analysis Point 1 (AP1).

Basin 6 (1.37 Ac, Q_{100}=5.28 cfs) encompasses lots 79-86 and lots 104-112 on both sides of the west end of Jicama Way. The developed flow from this basin will combine with the flows from Basins 1, 3, ½ of 4, and 7 and will flow west down the street, and then turn south down Cascabel Trail. The total flow at the west end of this basin is analyzed with Analysis Point 6 (AP6).

Basin 7 (0.33 Ac, Q_{100}=1.17 cfs) encompasses the north half of Tepin Trail, lot 62 as well as a half of the 16-car parking lot on the west side of Tepin Trail. The developed flow from this basin will combine with ½ of the flows from Basin 4 and will flow north along the street. The total flow at the north end of this basin is analyzed with Analysis Point 4 (AP4).

Basin 8 (0.93 Ac, Q_{100}=4.47 cfs) encompasses Tract D, which is an open space area that will contain landscaping, a meandering sidewalk and some type of playground facility. The developed flow from this basin will flow to the southwest corner of the tract and then onto Cascabel Trail.

Basin 9 (1.51 Ac, Q_{100}=5.78 cfs) encompasses lots 87-103 on both sides of Cascabel Trail. The developed flow from this basin will combine with the flows from Basins 1, 3, ½ of 4, 6, 7 and 8 and will flow south down the street. The total flow at the south end of this basin is analyzed with Analysis Point 7 (AP7). This flow will then turn west along Habanero Way, will combine with the flows from AP3, and will then be collected by inlets located west of the intersection of Habanero Way and Cascabel Trail. This flow is analyzed with Analysis Point 8 (AP8).

Basin 10 (1.49 Ac, Q_{100}=5.40 cfs) encompasses lots 22-30 and lots 37-44 on both sides of the west end of Habanero Way. The developed flow from this basin will combine with the flows from Basins 2, ½ of 4, 5, and 11 and will flow west down the street. The total flow at the west end of this basin is analyzed with Analysis Point 3 (AP3). This flow will continue west along the street, will combine with the flows from AP7, and will then be collected by inlets located west of the intersection of Habanero Way and Cascabel Trail. This flow is analyzed with Analysis Point 8 (AP8).

Basin 11 (0.49 Ac, Q_{100}=1.74 cfs) encompasses the south half of Tepin Trail, lots 45-46 and lot 61 as well as a half of the 16-car parking lot on the west side of the street. The developed flow from this basin will combine with ½ of the flows from Basin 4 and will flow south along the street. The total flow at the south end of this basin is analyzed with Analysis Point 2 (AP2).

Basin 12 (0.88 Ac, Q_{100}=3.53 cfs) encompasses lots 31-36 on the south side of Habanero Way. The developed flow from this basin will combine with the bypass flows from AP8, and will then be picked up by an inlet which is in sump condition on the north side of the cul-de-sac. The total flow at the sump condition is analyzed with Analysis Point 9 (AP9).

In summary, all of the developed flow from Tract B-1 (13.15 Ac, Q_{100}=51.94 cfs) will be collected by a proposed drainage system utilizing inlets and storm drain and will outlet into the existing detention pond located northwest of the subdivision.

B. Off-Site Basin

The proposed development contains one off-site basin, Basin A, which contains the existing detention pond. This development will not change the size of this pond, therefore the flows will remain as they are in the existing conditions (1.41 Ac, Q_{100}=5.42 cfs).

VI. EXISTING DETENTION POND/STORM DRAIN

The proposed primary function of the detention pond is to collect runoff for this site and the existing basin of 405B. An existing 36" outflow storm drain pipe with a Type D inlet allows an outflow of 43 cfs in the existing condition. An existing six foot berm on the west side of the pond allows one foot of freeboard. This outfall pipe connects to a 36-inch storm drain which travels through the Costco Wholesale development and ultimately outfalls to the Eubank Storm Drain.

In the proposed condition, the total inflow to the pond will be 57.36 cfs, which is within acceptable range as was planned for with the "Drainage Report for Costco Wholesale" in the ultimate conditions. Without changing the size of the pond or the outlet pipe as in the existing condition, the outflow will be 36 cfs with a maximum storage volume of 2.85 acre-feet. The maximum water surface in the pond will be 3.63 feet, which will allow two feet of freeboard. The total flow in the 36-inch storm drain across the Costco Wholesale development will be 67 cfs, which is well within the range of the maximum allowable runoff as described in the "Drainage Report for Costco Wholesale", and the "South Eubank Area Storm Drainage Analysis". This amount of flow will keep the hydraulic grade line within the pipe and below the elevation of the bottom of the detention pond. The pond calculations from the "Drainage Report for Costco Wholesale" are included in the Appendix.

VII. CONCLUSION

The "South Eubank Area Storm Drainage Analysis" and its "Amendment #1" govern the development of Tract B-1, Costco Development. Increases in runoff, depth and velocity due to proposed development are within parameters anticipated within the previously approved "Drainage Report for Costco Wholesale" for this area. These flows can be safely conveyed by the improvements proposed in this drainage plan to existing drainage facilities, which have adequate capacity to accept such runoff. Erosion and dust control, consisting of erosion control berms, snow fencing and sedimentation basins, are proposed to prevent soil washing or blowing into paved streets, storm drains, and existing development areas. This report supports the preliminary/final plat and grading plan submittals and should be approved as requested.

APPENDICES

APPENDIX A: BASIN SUMMARY

APPENDIX B: SUMMARY OF THE ROADWAY CAPACITY ANALYSIS

APPENDIX C: INLET CAPACITY CALCULATIONS

APPENDIX D: STORM DRAIN CAPACITY CALCULATIONS

APPENDIX E: POND CALCULATIONS

APPENDIX A

BASIN SUMMARY

BASIN SUMMARY FOR LONGFORD VILLAGE EAST (TRACT B-1, COSTCO DEVELOPMENT)

	BASIN I.D.	AREA (AC)	UNITS #	% LAND TREATMENT * A	B	C	D	DISCHARGE (CFS) 100YR **
	HYDROLOGICAL VOLUMETRIC & DISCHARGE DATA (EXISTING CONDITIONS)							
	UNDEVELOPED BASINS							
	Tract B	15		50.00%	0.00%	50.00%	0.00%	32.00
	Tract 405B (offsite)	17		0.00%	5.00%	5.00%	90.00%	74.00
TOTAL		**32**						**106.00**
	HYDROLOGICAL VOLUMETRIC & DISCHARGE DATA (ASSUMED PROPOSED CONDITIONS)							
	DEVELOPED BASINS (FROM DRAINAGE REPORT FOR COSTCO WHOLESALE, MARCH 2000)							
	Tract B	15		0.00%	15.00%	15.00%	70.00%	56.00
	Tract 405B (offsite)	17		0.00%	5.00%	5.00%	90.00%	74.00
TOTAL		**32**						**130.00**
	HYDROLOGICAL VOLUMETRIC & DISCHARGE DATA (PROPOSED CONDITIONS)							
	DEVELOPED BASINS							
	1	0.51	3	0.00%	19.61%	19.61%	60.78%	2.15
	2	1.42	9	0.00%	22.54%	22.54%	54.93%	5.83
	3	1.51	18	0.00%	27.82%	27.82%	44.37%	5.88
	4	1.31	16	0.00%	27.48%	27.48%	45.04%	5.12
	5	1.40	15	0.00%	25.72%	25.72%	48.57%	5.57
	6	1.37	17	0.00%	28.83%	28.83%	42.34%	5.28
	7	0.33	1	0.00%	36.37%	36.37%	27.27%	1.17
	8	0.93	0	0.00%	4.84%	4.84%	90.32%	4.47
	9	1.51	17	0.00%	29.47%	29.47%	41.06%	5.78
	10	1.49	17	0.00%	34.57%	34.57%	30.87%	5.40
	11	0.49	3	0.00%	36.74%	36.74%	26.53%	1.74
	12	0.88	6	0.00%	25.00%	25.00%	50.00%	3.53
SUBTOTAL		**13.15**	**122**					**51.94**
	POND							
	A	1.80		0.00%	50.00%	50.00%	0.00%	5.42
SUBTOTAL		**1.80**						**5.42**
TOTAL		**14.95**						**57.36**

NOTES: 1) Impervious percentages were calculated for each of the basins separately, with the remaining percentages distributed evenly between land treatment types B & C, due to the relatively flat terrain.

N=UNITS/ACRES = 9.2

*Table A-4
**Tables A-10 & A-11

APPENDIX B

SUMMARY OF THE ROADWAY CAPACITY ANALYSIS

SUMMARY OF THE ROADWAY CAPACITY ANALYSIS FOR LONGFORD VILLAGE EAST (TRACT B-1, COSTCO DEVELOPMENT)

Analysis Points	Roadway Grade (%)	Roadway Cross-Slope (%)	Q(100 YR) in Roadway (cfs)	Curb Type	Depth of Water in Roadway (ft)	Velocity of Storm Water in Roadway(ft/s)	$V^2/2*g$	EGL	ROW Elevation (ft)	Comments
AP1	1.7%	2.00 (Crown)	11.40	STD	0.41	2.08	0.067	0.477	0.85	OK
=Basin 2 + Basin 5										
AP2	1.0%	2.00 (Crown)	4.30	STD	0.31	1.60	0.040	0.350	0.85	OK
=1/2 Basin 4 + Basin 11										
AP3	1.5%	2.00 (Crown)	21.10	STD	0.49	2.63	0.107	0.597	0.85	OK
=AP1 + AP2 + Basin 10										
AP4	0.8%	2.00 (Crown)	3.73	STD	0.29	1.57	0.038	0.328	0.85	OK
=1/2 Basin 4 + Basin 7										
AP5	1.3%	2.00 (Crown)	8.04	STD	0.37	1.87	0.054	0.424	0.85	OK
=Basin 1 + Basin 3										
AP6	1.3%	2.00 (Crown)	17.05	STD	0.46	2.45	0.093	0.553	0.85	OK
=AP4 + AP5 + Basin 6										
AP7	0.6%	2.00 (Crown)	27.31	STD	0.53	2.88	0.129	0.659	0.85	OK
=AP6 + Basin 8 + Basin 9										
AP8	0.8%	2.00 (Crown)	48.41	STD	0.65	3.70	0.213	0.863	0.85	OK
=AP3 + AP7										
AP9	0.8%	2.00 (Cross)	20.62	STD	0.55	0.00	0.000	0.550	0.85	OK
=Q(bypass)IN1 + Q(bypass)IN3 + Basin 12										

B-1

32 F-F - 2 percent cross - 0.6.out
32' F-F, 50' R/W @ 2% cross-slope

MANNING'S N=0.017 SLOPE=0.006

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.0	0.85	4	11.0	0.125	7	41.0	0.81
2	8.8	0.67	5	25.0	0.405	8	41.2	1.48
3	9.0	0.00	6	39.0	0.685	9	50.0	1.66

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID PLUS OBSTRUCTIONS
0.05	0.05	0.0	0.0	0.9	0.6	0.8
0.10	0.10	0.1	0.1	1.7	0.9	1.6
0.15	0.15	0.2	0.2	3.4	1.0	3.3
0.20	0.20	0.4	0.5	6.0	1.2	5.8
0.25	0.25	0.8	1.1	8.5	1.4	8.3
0.30	0.30	1.3	2.0	11.1	1.6	10.8
0.35	0.35	1.9	3.3	13.6	1.8	13.3
0.40	0.40	2.6	5.2	16.2	2.0	15.8
0.45	0.45	3.4	7.5	18.7	2.2	18.4
0.50	0.50	4.4	10.5	21.3	2.4	20.9
0.55	0.55	5.5	14.1	23.8	2.6	23.4
0.60	0.60	6.8	18.5	26.4	2.7	25.9
0.65	0.65	8.1	23.6	28.9	2.9	28.4
0.70	0.70	9.6	29.0	32.4	3.0	31.9
0.75	0.75	11.3	35.5	35.7	3.1	35.1
0.80	0.80	13.1	43.1	38.9	3.3	38.4

32' F-F, 50' R/W @ 0.6% slope

MANNING'S N=0.017 SLOPE=0.006

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.85	4	11.00	0.125	7	41.00	0.00
2	8.84	0.67	5	25.00	0.405	8	41.16	0.67
3	9.00	0.00	6	39.00	0.125	9	50.00	0.85

WSEL FT.	DEPTH INC	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID PLUS OBSTRUCTIONS
0.05	0.05	0.0	0.0	1.7	0.6	1.6
0.10	0.10	0.2	0.1	3.4	0.9	3.2
0.15	0.15	0.4	0.4	6.8	1.0	6.6
0.20	0.20	0.8	1.0	11.9	1.2	11.6
0.25	0.25	1.5	2.1	17.0	1.4	16.6
0.30	0.30	2.5	4.0	22.1	1.6	21.6
0.35	0.35	3.7	6.7	27.2	1.8	26.7
0.40	0.40	5.2	10.3	32.3	2.0	31.7
0.45	0.45	6.8	16.0	32.9	2.4	32.2
0.50	0.50	8.4	22.8	33.0	2.7	32.2
0.55	0.55	10.0	30.5	33.1	3.0	32.3
0.60	0.60	11.6	39.0	33.2	3.4	32.3
0.65	0.65	13.2	48.4	33.3	3.7	32.3
0.70	0.70	14.9	55.6	36.3	3.7	35.3
0.75	0.75	16.8	62.4	41.3	3.7	40.2
0.80	0.80	18.9	70.6	46.2	3.7	45.1

APPENDIX C

INLET CAPACITY CALCULATIONS

SUMMARY OF THE ON-GRADE DOUBLE GRATE TYPE "A" INLET ANALYSIS FOR LONGFORD VILLAGE EAST (TRACT B-1, COSTCO DEVELOPMENT)

Longford Village East

HYDRAULIC EVALUATION OF INLETS - HEC12 METHOD
100-YEAR STORM - 1/2 STREET FLOWS W/ 20% CLOGGING FACTOR
15% REDUCTION IN ROUTED Q'S FOR ATTENUATION

Qi = Intercepted Flow
Qb = Bypass Flow
S = Longitudinal Slope
Sx = Cross Slope
Vo = Gutter Velocity where splash-over first occurs

Eo = Ratio of frontal flow to total gutter flow
Rf = Ratio of frontal flow intercepted to total frontal flow
Rs = Ratio of side flow intercepted to total side flow
E = Efficiency

Inlet ID	Total Rtd Q (cfs)	Inlet Width (ft)	Inlet Length (ft)	Ponding Width (ft)	Pond Depth (ft)	Qi (cfs)	Qb (cfs)	S (ft/ft)	Sx (ft/ft)	Vo (fps)	V (fps)	Eo	Rf	Rs	E
ANALYSIS POINT 8															
1 (South)	10.55	1.54	5.32	18.21	0.36	5.86	4.69	0.0080	0.0200	9.5	3.2	0.21	1.0	0.4	0.56
2 (North)	37.86	1.54	5.32	29.38	0.59	15.02	22.84	0.0080	0.0200	9.5	4.4	0.13	1.0	0.3	0.40
2 (North)	22.84	1.54	5.32	24.32	0.49	10.44	12.40	0.0080	0.0200	9.5	3.9	0.16	1.0	0.4	0.46

SUMMARY OF THE SUMP CONDITION DOUBLE GRATE TYPE "A" INLET ANALYSIS FOR LONGFORD VILLAGE EAST (TRACT B-1, COSTCO DEVELOPMENT)

ANALYSIS POINT 9

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

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

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR "A" OPENING	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.85	12.47	1.61	Weir controls on grate analysis
	0.20	0.20	1.07	2.40	17.64	4.55	
	0.30	0.30	1.97	4.41	21.60	8.35	
	0.40	0.40	3.04	6.78	24.94	12.86	
	0.50	0.50	4.24	9.48	27.88	17.97	
	0.60	0.60	5.58	12.46	30.55	23.62	Q(100 yr) = 20.62 cfs is provided at this depth
TOP OF CURB	0.70	0.70	7.03	15.71	32.99	29.76	
	0.80	0.80	8.59	19.19	35.27	36.36	
	0.90	0.90	10.25	22.90	37.41	43.39	Q(2*100 yr) = 41.24 cfs is provided at this depth
ROW LIMIT	1.00	1.00	12.00	26.82	39.43	50.82	

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

Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].

THE 100 YR STORM EVENT = 20.62 cfs at the sump condition

THE 2 x 100 YR STORM EVENT 41.24 cfs at the sump condition

C-2

SUMMARY OF THE PIPE ANALYSIS AT AN INLET
FOR LONGFORD VILLAGE EAST (TRACT B-1, COSTCO DEVELOPMENT)

ORIFICE:

36" RCP Q=CA(2GH)^.5

C=0.6

DEPTH OF INLET 4.00

AREA (SF) = 7.07

WS ELEVATION	HEIGHT ABOVE ABOVE C.L. OF PIPE	Q (CFS) ORIFICE DOUBLE GRATE	COMMENTS
0.00	0.00	0.00	
3.00	1.50	41.66	
3.20	1.70	44.35	
3.40	1.90	46.89	
3.60	2.10	49.30	
3.80	2.30	51.59	
4.00	2.50	53.79	Q(100 yr) = 51.94 cfs is provided at this depth
4.20	2.70	55.90	
4.40	2.90	57.93	
4.60	3.10	59.89	
4.80	3.30	61.80	

C-3/3

APPENDIX D

STORM DRAIN CAPACITY CALCULATIONS

Analyzer Report

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

Pipe Hydraulic Analysis

Date: Tuesday, December 02, 2003 3:19:38 PM
==========

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	5.8600 cfs
Slope	1.0000%
Size (W x T):	18.00 x 2.5000

Output Results

Flow Rate	5.8600 cfs
Slope	1.0000%
d/D	0.5333
Capacity	10.5043 cfs
Velocity	6.1136 ft/s
Depth	0.8000 ft
Critical Depth	0.9300 ft
Size (W x T):	18.00 x 2.5000

Analyzer Report

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

Pipe Hydraulic Analysis

Date: Tuesday, December 02, 2003 3:21:53 PM
==========

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	51.9400 cfs
Slope	1.0000%
Size (W x T):	36.00 x 4.7500

Output Results

Flow Rate	51.9400 cfs
Slope	1.0000%
d/D	0.6633
Capacity	66.6984 cfs
Velocity	10.4345 ft/s
Depth	1.9900 ft
Critical Depth	2.3400 ft
Size (W x T):	36.00 x 4.7500

Analyzer Report

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

Pipe Hydraulic Analysis

Date: Tuesday, December 02, 2003 3:20:26 PM
==========

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	20.8700 cfs
Slope	1.0000%
Size (W x T):	24.00 x 3.0000

Output Results

Flow Rate	20.8700 cfs
Slope	1.0000%
d/D	0.7575
Capacity	22.6224 cfs
Velocity	8.1739 ft/s
Depth	1.5150 ft
Critical Depth	1.6300 ft
Size (W x T):	24.00 x 3.0000

Analyzer Report

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

Pipe Hydraulic Analysis

Date: Tuesday, December 02, 2003 3:22:27 PM
==========

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	31.3200 cfs
Slope	1.0000%
Size (W x T):	30.00 x 3.5000

Output Results

Flow Rate	31.3200 cfs
Slope	1.0000%
d/D	0.6540
Capacity	41.0171 cfs
Velocity	9.2079 ft/s
Depth	1.6350 ft
Critical Depth	1.9000 ft
Size (W x T):	30.00 x 3.5000

D-4/4

APPENDIX E

POND CALCULATIONS

COSTCO DETENTION POND NO. 1
DETENTION POND VOLUME FOR 100-YEAR STORM

BOTTOM WIDTH = 120
BOTTOM LENGTH = 250
SIDE SLOPE = 3:1

ELEV. (FT)	AREA (AC)	VOLUME (AC-FT)
0.0	0.69	0.00
0.5	0.71	0.35
1.0	0.74	0.71
1.5	0.77	1.09
2.0	0.79	1.48
2.5	0.82	1.89
3.0	0.85	2.30
3.5	0.88	2.73
4.0	0.91	3.18
4.5	0.93	3.64
5.0	0.96	4.11
5.5	0.99	4.60
6.0	1.02	5.11
6.5	1.05	5.63
7.0	1.09	6.16

COSTCO WHOLESALE DETENTION POND NO. 1 OUTFLOW

Single D inlet, in sump condition with three edges capable of accepting flows:
Open Area (for orifice calc in sq. ft.): 3.931
Length of Weir (feet): 5.354 (see calculations below)

Orifice equation: $Q = CA \times (2gh)^{1/2}$
where C = 0.7
A = net area of openings in grate

Weir equation: $Q = 3.087Lh^{3/2}$
where L = sum of lengths of sides

Head (ft)	Head (in)	Weir Flow (cfs)	Orifice Flow (cfs)	Weir/Orifice Control Q (cfs)	36" Pipe Outflow (cfs)	Control Q (cfs)
0.50	6.00	5.07	13.39	5.07	5.00	5.00
1.00	12.00	14.35	18.93	14.35	7.50	7.50
1.50	18.00	26.36	23.18	23.18	11.80	11.80
2.00	24.00	40.59	26.77	26.77	19.50	19.50
2.50	30.00	56.72	29.93	29.93	28.00	28.00
3.00	36.00	74.56	32.79	32.79	38.00	32.79
3.50	42.00	93.96	35.41	35.41	43.00	35.41
4.00	48.00	114.79	37.86	37.86	53.00	37.86
4.50	54.00	136.98	40.16	40.16	62.00	40.16
5.00	60.00	160.43	42.33	42.33	70.00	42.33
6.00	72.00	210.89	46.37	46.37	78.00	46.37
7.00	84.00	265.75	50.08	50.08	88.00	50.08

Calculation of open area on grate:

	(in^2)	(ft^2)
Total Grate Area	1000	6.944
Cross Bar Area	-366	-2.542
Supports (ends)	-115.625	-0.803
Areas Counted Twice	47.75	0.332
	566.125	3.931

Calculation of Length of Weir (three sides open):

	(in)	(ft)
Total Perimeter of Grate	90	7.500
Short Cross Bars	-3.5	-0.292
End Supports	-9.25	-0.771
Bearing Bars	-13	-1.083
	64.25	5.354

EXHIBITS

EXHIBIT 1: BASIN MAP FROM AMENDMENT #1

EXHIBIT 2: PROPOSED DRAINAGE BASIN MAP

EXHIBIT 3: GRADING AND DRAINAGE PLAN

EXHIBIT 4: PRELIMINARY PLAT

EXHIBIT 1

BASIN MAP FROM AMENDMENT #1

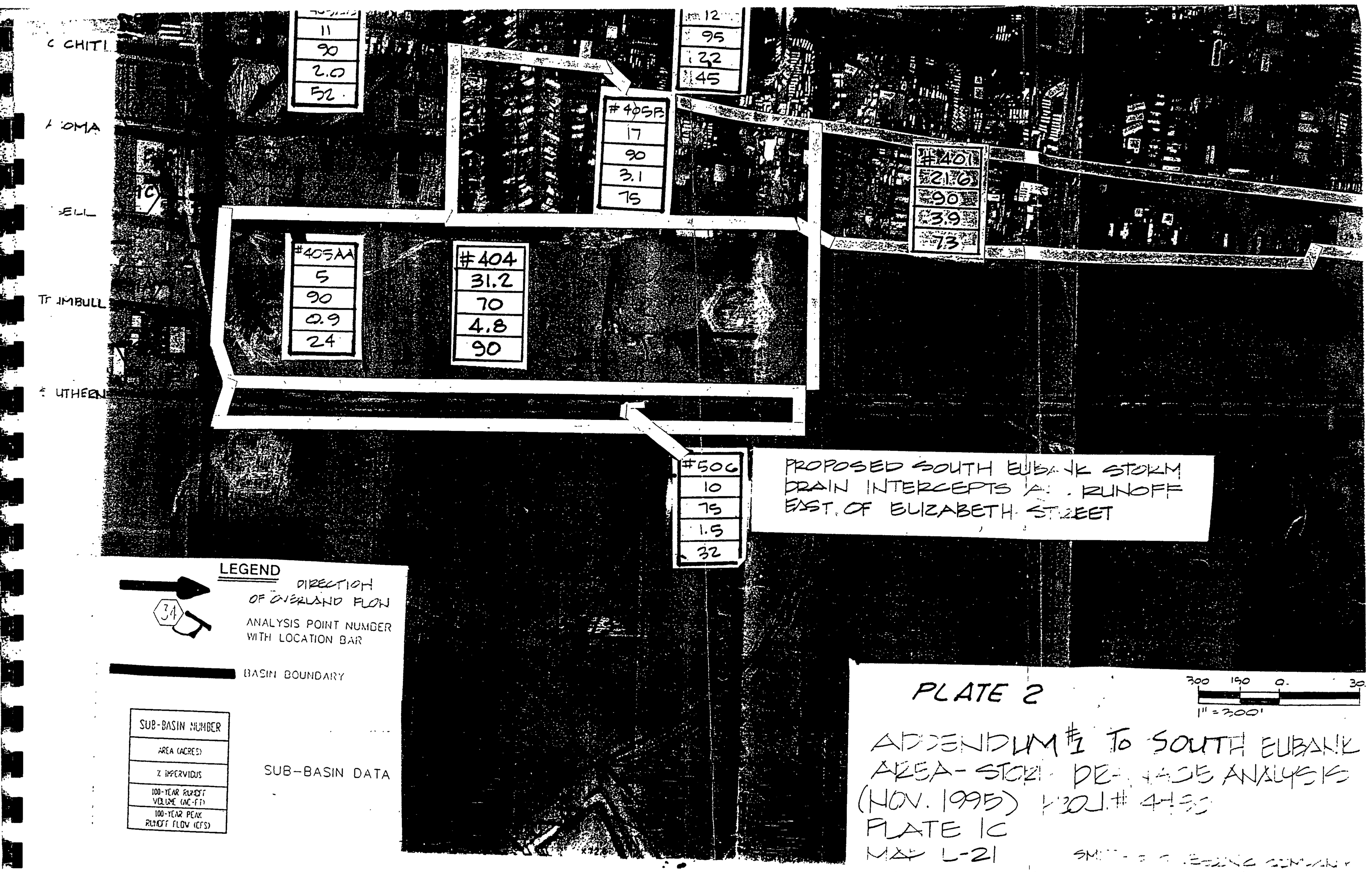

PLATE 2

ADDENDUM #1 TO SOUTH EUBANK AREA-STORM DRAIN ANALYSIS (NOV. 1995) PROJ. # 4455
PLATE 1C
MAP L-21

SMITH ENGINEERING COMPANY

EXHIBIT 2

PROPOSED DRAINAGE BASIN MAP

EXHIBIT 3

GRADING AND DRAINAGE PLAN

EXHIBIT 4

PRELIMINARY PLAT

Bohannan ▲ Huston INC.

Courtyard I
7500 Jefferson St. NE
Albuquerque, NM
87109-4335

www.bhinc.com

voice: 505.823.1000
facsimile: 505.798.7988
toll free: 800.877.5332

J

21.00

#63828/

L21/D037

PERMANENT EASEMENT

(10-20-00)

Grant of Permanent Easement, between The Price Company, a California corporation ("Grantor"), whose address is 999 Lake Drive, Issaquah, Washington 98027 and the City of Albuquerque, a New Mexico municipal corporation ("City"), whose address is P.O. Box 1293, Albuquerque, New Mexico 87103.

Grantor grants to the City an exclusive, permanent easement (the "Detention Pond Easement") in, over, upon and across the real property described on Exhibit "A - Description 2" attached hereto (the "Detention Pond Property") for the construction, installation, maintenance, repair, modification, replacement and operation of public a detention pond (the "Detention Pond"), pursuant to the Drainage Plan No. L21/D37 approved by the City (the "Drainage Plan") together with the right to remove trees, bushes, undergrowth and any other obstacles upon the "Property" (as defined below) if the City determines they interfere with the appropriate use of this Detention Pond Easement.

Grantor grants to the City a non-exclusive, permanent easement (the "Access Easement") in, over, upon and across the real property described on Exhibit "A - Description 1" attached hereto (the "Access Property") for ingress, egress and access to the Detention Pond Property for the construction, installation, maintenance, repair, modification, replacement and operation of the Detention Pond.

Grantor grants to the City a non-exclusive, permanent easement (the "Storm Drain Easement") in, over, upon and across the real property described on Exhibit "B" attached hereto (the "Storm Drain Property") for the construction, installation, maintenance, repair, modification, replacement and operation of an underground storm drain facility pursuant to the Drainage Plan and for ingress, egress and access to the same.

The Detention Pond Property, the Access Property and the Storm Drain Property are sometimes referred to herein together as the "Property."

The purpose of the Detention Pond Easement, Access Easement and the Storm Drain Easement is to provide the City, in addition to Grantor, the right to utilize the Detention Pond and the storm drain facility pursuant to the terms of the Drainage Plan.

Notwithstanding anything to the contrary contained herein, Grantor (i) expressly reserves the right to use and improve the Property for all purposes that do not unreasonably interfere with the City's rights, hereunder, including, without limitation, construct concrete curb and gutters, landscaping and irrigation, paving, utility lines, and fire service water lines, and (ii) shall be permitted to relocate or re-define the Property, the Detention Pond Easement, the Access Easement and the Storm Drain Easement, subject to the prior written approval of the City Engineer, which approval shall not be unreasonably delayed or withheld.

Judy D. Woodward Bern. Co. EASE R 21.00
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In the event Grantor constructs any improvements (the "Improvements") within the Property, the City has the right to enter upon the Property at reasonable times (in order to minimize the impact of the Work on Grantor's business operations) and perform whatever inspection, installation, maintenance, repair, modification or removal (the "Work") it deems appropriate, without liability to the City. If the Work affects any of the Improvements made by the Grantor, the City will not be financially or otherwise responsible for rebuilding or repairing the Improvements. If the Work to be performed by the City could endanger the structural integrity or otherwise damage the Improvements, the Grantor shall, at its own expense, take whatever protective measures are required to safeguard the Improvements. Notwithstanding anything to the contrary contained herein, the City shall not perform any Work at the Property during any period from November 15 to January 15, except in the case of an emergency as determined by the City Engineer.

Grantor covenants and warrants that Grantor is the owner in fee simple of the Property, the Grantor has a good lawful right to convey the Property or any part thereof and that Grantor will forever warrant and defend the title to the Property against all claims from all persons or entities.

The grant and other provisions of this Easement constitute covenants running with the Property for the benefit of the City and its successors and assigns until terminated.

This Easement shall not be effective until approved by the City Engineer in the signature block below.

WITNESS my hand and seal this 28th day of September, 2000.

GRANTOR:

The Price Company,
a California corporation

By:_____
Its: RICHARD J. OLIN
Vice President/Assistant Secretary

APPROVED:

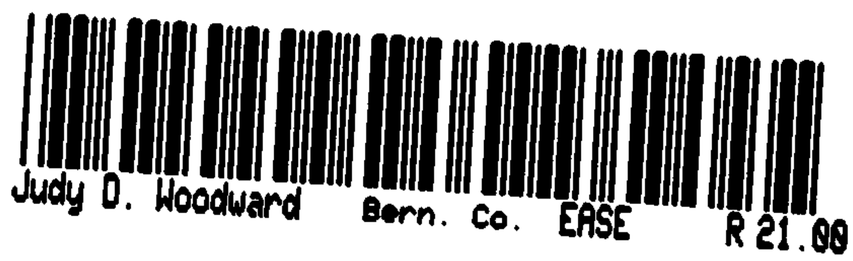
10/20/00

_____
City Engineer

10:40

10/17/00

_____
Dated



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STATE OF WASHINGTON)
) SS:
COUNTY OF KING)

On September 26, 2000, before me, Stephanie R Gardner, a Notary Public, personally appeared Richard T. Olin, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person/s whose name/s is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity/ies, and that by his/her/their, signature/s on the instrument the person/s, or the entity upon behalf of which the person/s acted, executed the instrument.

WITNESS my hand and official seal.

STEPHANIE R. GARDNER
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES

Signature Stephanie R Gardner
(Seal)

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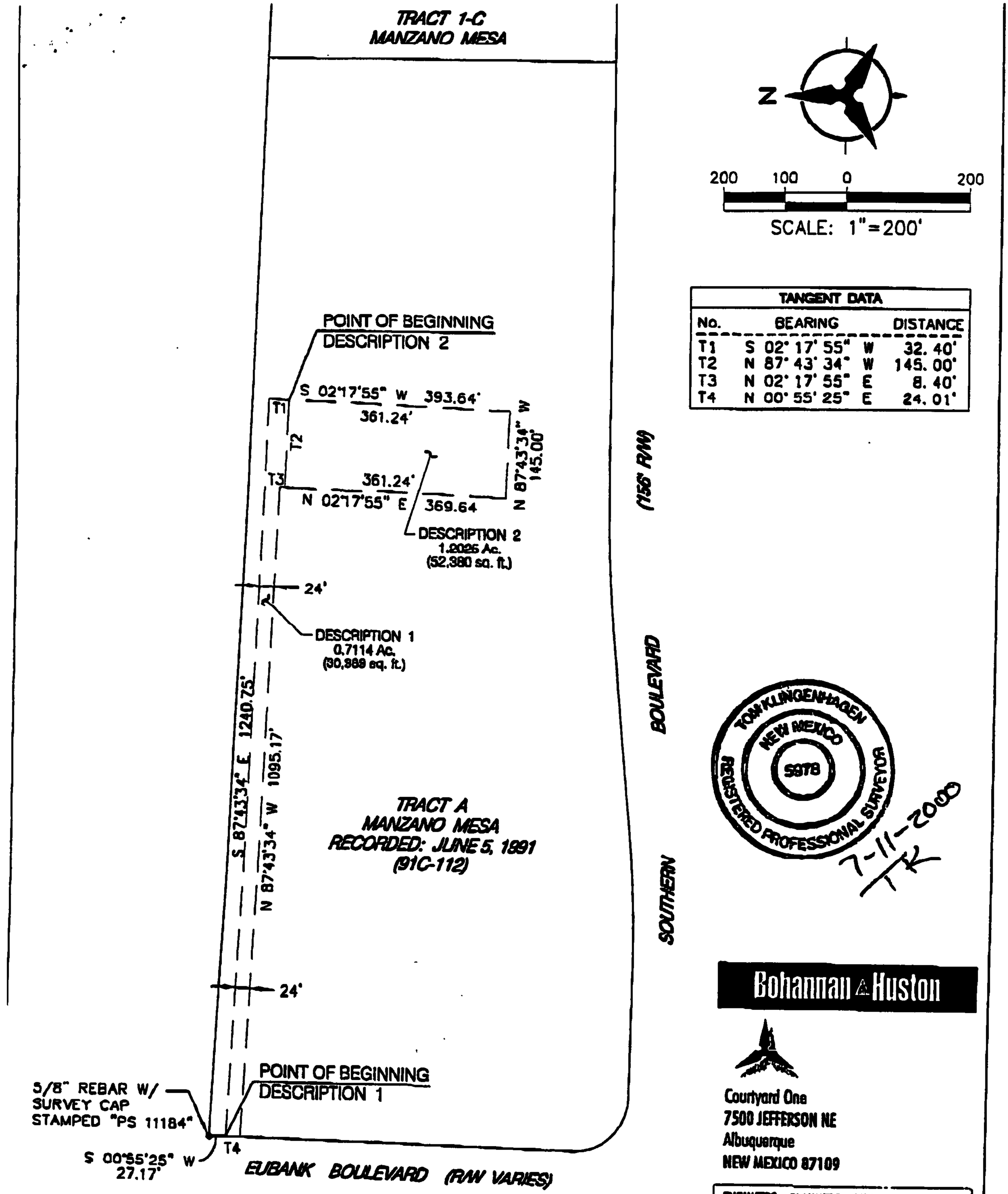

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Judy D. Woodward Bern. Co. EASE R 21.00

EXHIBIT A

DESCRIPTION 1

A certain tract of land situate within Section 28, Township 10 North, Range 4 East, New Mexico Principal Meridian, within the City of Albuquerque, Bernalillo County, New Mexico, being a portion of Tract A of Plat of MANZANO MESA, Albuquerque, New Mexico, as the same is shown and designated on the plat thereof, recorded in the office of the County Clerk of Bernalillo County, New Mexico on June 5, 1991 in Volume 91C, Folio 112 as Document No. 91044235, and being more particularly described by New Mexico State Plane Grid Bearings (Central Zone) and ground distances as follows:

BEGINNING at the northwest corner of the tract herein described, being a point on the east right-of-way line of Eubank Boulevard, whence a 5/8" rebar with a survey cap stamped "PS 11184 at the northwest corner of said Tract A bears N00°05'25"E a distance of 27.17 feet; thence along the northerly boundary line of the tract herein described,
S87°43'34"E a distance of 1240.75 feet to the northeast corner of the tract herein described; thence,
S02°17'55"W a distance of 32.40 feet to the southeast corner of the tract herein described; thence along the southerly boundary line of the tract herein described,
N87°43'34"W a distance of 145.00 feet; thence,
N02°17'55"E a distance of 8.40 feet; thence,
N87°43'34"W a distance of 1095.17 feet to a point on the said the east right-of-way line of Eubank Boulevard; thence along said right-of-way line,
N00°55'25"E a distance of 24.01 feet to the point and place of beginning.

This tract contains 0.7114 of acre (30,989 sq. ft.), more or less.

I, Thomas G. Klingenhagen, registered New Mexico Surveyor No. 5978, hereby certify that this description and Site Map are true and accurate to the best of my knowledge and belief.

Bohannan-Huston Inc.
Courtyard I
7500 Jefferson St. NE
Albuquerque, NM 87109
(505)823-1000

Tom Klingenhagen
Thomas G. Klingenhagen
NM Surveyor No. 5978

Date: 7-11-2000

TOM KLINGENHAGEN
NEW MEXICO
5978
REGISTERED PROFESSIONAL SURVEYOR

Judy D. Woodward Bern. Co. EASE R 21.00
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Page: 5 of 8
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EXHIBIT A

DESCRIPTION 2

A certain tract of land situate within Section 28, Township 10 North, Range 4 East, New Mexico Principal Meridian, within the City of Albuquerque, Bernalillo County, New Mexico, being a portion of Tract A of Plat of MANZANO MESA, Albuquerque, New Mexico, as the same is shown and designated on the plat thereof, recorded in the office of the County Clerk of Bernalillo County, New Mexico on June 5, 1991 in Volume 91C, Folio 112 as Document No. 91044235, and being more particularly described by New Mexico State Plane Grid Bearings (Central Zone) and ground distances as follows:

BEGINNING at the northeast corner of the tract herein described, whence a 5/8" rebar with a survey cap stamped "PS 11184 at the northwest corner of said Tract A bears: N02°17'55"E a distance of 32.40 feet; N87°43'34"W a distance of 1240.75 feet: and N00°55'25"E a distance of 27.17 feet: thence from said point of beginning along the east boundary line of the tract herein described.
S02°17'55"W a distance of 361.24 feet to the southeast corner of the tract herein described;
thence,
N87°43'34"W a distance of 145.00 feet to the southwest corner of the tract herein described;
thence,
N02°17'55"E a distance of 361.24 feet to the northwest corner of the tract herein described;
thence,
S87°43'34"E a distance of 145.00 feet to the point and place of beginning.

This tract contains 1.2025 acres (52,380 sq. ft.), more or less.

I. Thomas G. Klingenhagen, registered New Mexico Surveyor No. 12807, hereby certify that this description and Site Map are true and accurate to the best of my knowledge and belief.

Bohannan-Huston Inc.
Courtyard I
7500 Jefferson St. NE
Albuquerque, NM 87109
(505)823-1000

Tom Klingenhagen
Thomas G. Klingenhagen
NM Surveyor No. 5978

Date: 7-11-2000

TOM KLINGENHAGEN
NEW MEXICO
5978
REGISTERED PROFESSIONAL SURVEYOR

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Page: 6 of 8
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Judy D. Woodward Bern. Co. EASE R 21.00

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EXHIBIT A

CONTRACT CONTROL FORM

PRELIMINARY REVIEW

Project # 638281
CCN# 200001106
~~New or~~ Ext. #

Contact Person Teri
Phone No. 924-3996

Type of Agreement: Permanent Easement

Description/Project Name: Costco Development
Public Works Dept./Div.: Project Review Section
Developer: Costco Wholesale Corp.
Contract Amount $ -0- SIA Contract Period: 10-20-00 - ~~Perp.~~ 12-31-202
Contract Amount $ SIA Contract Period: -
Contract Amount $ S/W Contract Period: -

DRAFT CONTRACT:
Rec'd by Legal: Rejected/Returned to Dept.: /
Returned to Legal: / Appproved: Initials:

FINANCIAL GUARANTY:
Letter of Credit No.: Date: Attached: Yes___ No.___ Initial
Other: Type Date: Attached: Yes___ No.___ Initial

FINAL CONTRACT REVIEW

APPROVALS REQUIRED:

	Date Delivered	Returned to Dept.	Approved By	Approval Date
Utilitiy Div				
Hydrology Div	10-3-00		[illegible]	10/20/00
Transportation Div				
DRC Chairman	10-4-00			
Legal Dept	10-13-00		[illegible]	10/17/00
City Engineer	10-20-00			
PWD Director				
Finance				
City Clerk				
CAO				

DISTRIBUTION:

	Date:	By:
User Department.	10-23-00	[illegible]
Vendor		
City Clerk	11-1-00	[illegible]
Treasury		
Other:		

ADDENDUM TO COVER PAGE

10-3-00
(Date)

TO: Kevin Curran, Assistant City Attorney, Legal Department

FROM: Project Administrator, Project Review Sec., PWD

SUBJECT: PROJECT TITLE: Costco Development PROJECT # 638281

The attached documents have been review, approved, initialed and/or signed by the DRC Chairman and are submitted for your action as noted.

ITEM	ACTION: Review & Approval	ACTION: Reference	Comments
Procedure "A"	☐☐☐	☐☐	
Procedure "B"	☐☐☐	☐☐	
Procedure "B" Modified Non Work Order	☐☐☐	☐☐	
Procedure "C"	☐☐☐	☐☐	
Procedure "C" Modified	☐☐☐	☐☐	
Special Agreement	☐☐☐	☐☐	
Sidewalk Deferral Agreement	☐☐☐	☐☐	
Amendment	☐☐☐	☐☐	
Assignment	☐☐☐	☐☐	
Financial Guarantee	☐☐☐	☐☐	
Construction Paperwork:			
Contractors Proposal	☐☐☐	☐☐	
Performance/Warranty Bonds	☐☐☐	☐☐	
Labor/Material Bonds	☐☐☐	☐☐	
Certificate of Insurance	☐☐☐	☐☐	
Engineers Cost Estimate	☐☐☐	☐☐	
Extension	☐☐☐	☐☐	
Release/Agreement	☐☐☐	☐☐	
Release/Financial Guarantee	☐☐☐	☐☐	
Calling Notice	☐☐☐	☐☐	
Letter of Commitment	☐☐☐	☐☐	
Reduction Letter	☐☐☐	☐☐	
License Agreement	☐☐☐	☐☐	
Monitoring Well Permit	☐☐☐	☐☐	
Agreement & Covenant	☐☐☐	☐☐	
Drainage Covenant	☐☐☐	☐☐	
Revocable Permit	☐☐☐	☐☐	
Encroachment	☐☐☐	☐☐	
Permanent Easement	☑☐☐	☐☐	
Temporary Easement	☐☐☐	☐☐	

Other:

Please Call Toni at 924-3996 if you have any questions regarding the above or when the documents are ready to be picked up.

No. of Attachments (1)

City of Albuquerque

August 28, 2000

Lynn Mazur, PE
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: Costco Wholesale - Drainage Report Addendum #2
Engineer's Stamp dated xxxxxxx (L21/D37)

Dear Ms. Mazur,

Based upon the information provided in your submittal dated 8-10-00 and subsequent site visit, the above referenced Addendum is acceptable once the document is stamped and signed.

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

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Sr. Engineer, Hydrology

C: file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Costco Wholesale ZONE ATLAS/DRNG. FILE # L-21 / D-37

DRB #: _____ EPC #: 99-136 WORK ORDER #: 6382.81

LEGAL DESCRIPTION: Tract A & 1C Manzano Mesa

CITY ADDRESS: NE Corner of Southern and Eubank

ENGINEERING FIRM: Bohannan Huston, Inc. CONTACT: Lynn Mazur, P.E.

ADDRESS: 7500 Jefferson NE, Albuquerque, NM 87109 PHONE: (505) 823-1000

OWNER: Costco Wholesale CONTACT: Peter Kahn

ADDRESS: _____ PHONE: _____

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN
- ____ FINAL GRADING & DRAINAGE PLAN
- ____ GRADING PLAN
- ____ EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION
- X OTHER: Addendum No. 2 to Drainage Report

PRE-DESIGN MEETING:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SKETCH PLAT APPROVAL
- ____ PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUBD. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- ____ CERTIFICATE OF OCCUPANCY APPROVAL
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- ____ DRAINAGE REQUIREMENTS
- ____ SUBDIVISION CERTIFICATION
- X OTHER For information only (SPECIFY)

DATE SUBMITTED: 08/09/00

BY: Bohannan Huston, Inc.

Lynn Mazur

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AUG 1 0 2000
PWD/DESIGN REVIEW

Revised 02/98

August 9, 2000

BOHANNAN-HUSTON, INC
Courtyard One
7500 JEFFERSON NE
Albuquerque
NM 87109-4335
voice 505 823 1000
fax 505 821 0892

Brad Bingham, P.E.
City of Albuquerque
Public Works Department, Hydrology
400 Marquette Avenue NW
First Floor
P.O. Box 1293
Albuquerque, NM 87103

Re: Addendum No. 2 for "Drainage Report for Costco Wholesale" dated March 16, 2000
Project No. 6382.81

Dear Mr. Bingham:

We are issuing Addendum No. 2 to the referenced Drainage Report for your information. It addresses additional revisions and calculations for the offsite drainage to the proposed Costco Wholesale retail store.

Hydrology

The hydrologic model was revised to reflect a reduction in the amount of offsite flow to the detention pond. The revision is a result of field visits to verify the flow patterns in Basin 405B. It was determined that only the portion of the basin between Britt Street and Elizabeth Street drains to pond (see Attachment 1). There is a concrete block wall on the west side of Britt Street that prevents flow from continuing west. The flow arrows in Basin 405B in Amendment #1 for the South Eubank Area Storm Drainage Analysis (Smith Engineering, February 1998) show correctly that runoff drains down Britt Street. At the end of Britt Street, runoff continues south through a swale next to the wall, which outfalls to the Costco site.

The portion of Basin 405B between Britt Street and the western basin boundary is shown in Amendment #1 to flow south to the Costco property. However, new mapping with one foot contours indicates that this section flows to the northwest toward Central Avenue (see Attachment 1). Therefore, this portion of Basin 405B was removed from the model for the Costco drainage analysis.

The area for Basin 405B was reduced from 17 to 10.2 acres in the AHYMO models for interim and ultimate conditions, and the 100-year peak flow rates were calculated. The peak flow to the 36-inch storm drain and the Eubank storm drain was reduced. The revised AHYMO Summary Tables for interim and ultimate conditions are in Attachment 2. The following table summarizes peak flow rates at major analysis points in the system.

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HYDROLOGY SECTION

TABLE 1
100-YEAR PEAK FLOW RATES

Analysis Point	Interim Flow (cfs)	Ultimate Flow (cfs)
Detention Pond Inflow	138	102
Detention Pond Outflow	43	30
36-inch Storm Drain Flow to Eubank SD	55	54
Eubank SD Flow at Bell Avenue	98	100

Hydraulics

The reduced 100-year flow rates for interim and ultimate conditions will allow greater freeboard in the detention pond. The freeboard will be 1.75 feet for interim conditions and 3.34 feet for ultimate conditions.

The reduced flow rates will also improve the hydraulic function of the storm drain system. The revised flow rates were used to calculate the interim and ultimate hydraulic grade lines (HGL) in the 36-inch storm drain. The hydraulic grade line at Manhole 6 was above the top of rim in the previous submittal, Addendum No. 1. With the revised flow rates, it is at the rim in the interim condition and slightly below in the ultimate condition. The storm drain is not under pressure flow for the entire length like it was in the original plan. The HGL calculations are included in Attachment 3 along with the revised plan and profile Sheet 34A.

In Addendum No. 1, an 8-inch orifice plate was added to the top of the riser pipe to further restrict pond outflow in interim conditions. A trial AHYMO model was run with the orifice plate removed. However, the unregulated flow was too high in the 36-inch storm drain; therefore, the orifice plate should remain in place until the Elizabeth Street storm drain is constructed.

If you have any questions or comments regarding Addendum No. 2, please contact Craig Hoover at (505) 823-1000.

Sincerely,
Bohannan Huston, Inc.

Lynn M. Mazur

Lynn M. Mazur, P.E.
Water Resources Group

LYNN M. MAZUR
NEW MEXICO
11797
REGISTERED PROFESSIONAL ENGINEER

LMM\gr
Enclosure

cc: Craig W. Hoover, P.E., Bohannan Huston, Inc. (w/enclosure
Bruce Stidworthy, P.E., Bohannan Huston, Inc. (w/enclosure)

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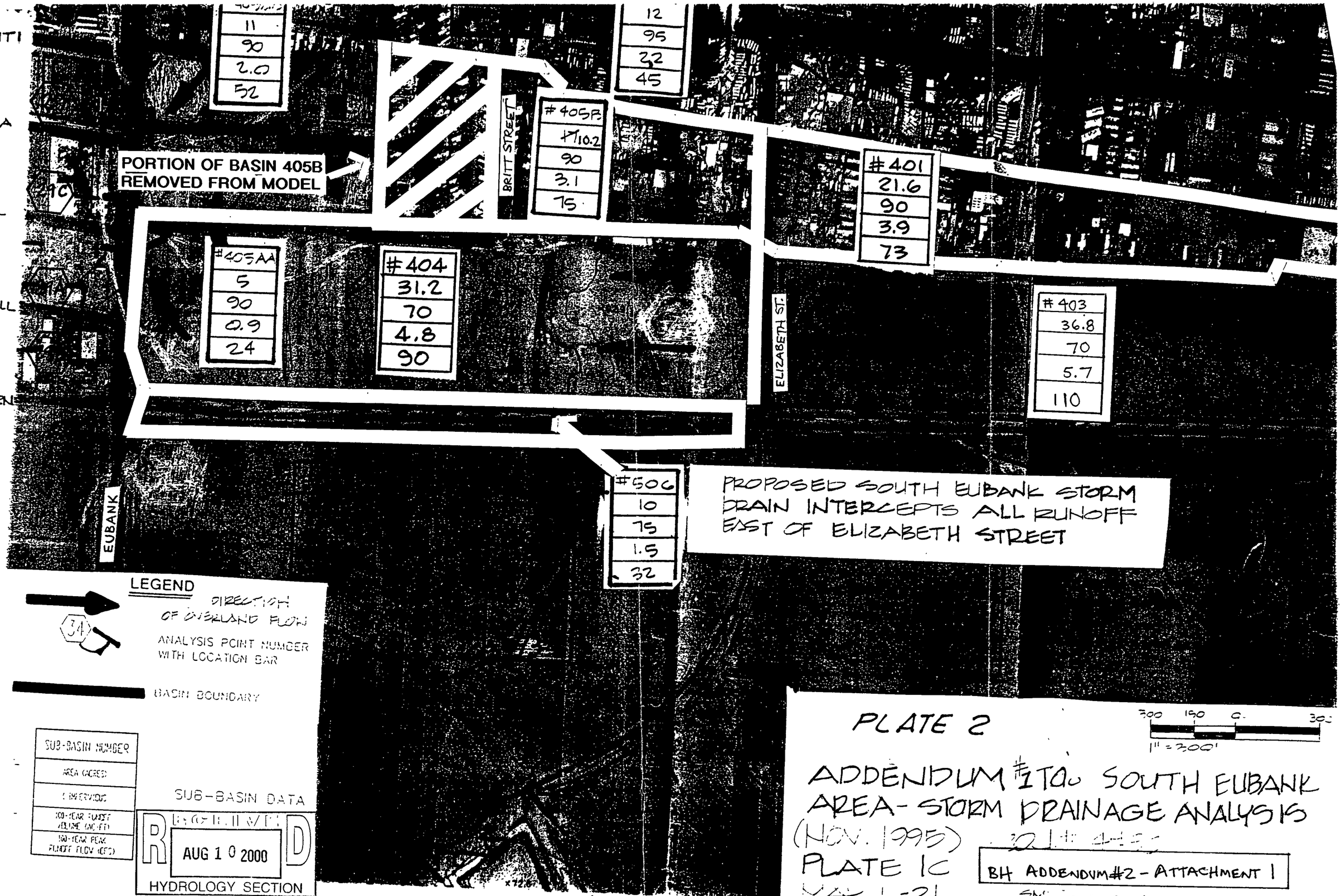

PLATE 2

ADDENDUM #1 TO SOUTH EUBANK AREA - STORM DRAINAGE ANALYSIS
(NOV. 1995)
PLATE 1C
L-21

BH ADDENDUM #2 - ATTACHMENT 1

```
AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =08/07/2000
INPUT FILE = int_100.hym                                                                  USER NO.= BOHN_HNM.STE

                              FROM  TO                    PEAK        RUNOFF                TIME TO    CFS      PAGE =   1
                  HYDROGRAPH   ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND        IDENTIFICATION  NO.  NO.     (SQ MI)      (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE     NOTATION

START                                                                                                      TIME=       .00
*S*    ANALYSIS OF DETENTION POND EAST OF COSTCO SITE, EUBANK AND SOUTHERN.
*S*    THIS FILE MODELS INTERIM CONDITIONS WITH POND FROM GRADING PLAN.
*S*    100 YEAR, 24 HOUR STORM
*S*
*S*
*S*    RAINFALL AND DRAINAGE BASINS FROM "SOUTH EUBANK AREA STORM DRAIN
*S*    ANALYSIS", SMITH ENGINEERING CO., NOV. 1995
*S*    BASINS TO POND IN INTERIM CONDITIONS:  PORTION OF 405B, 401, PORTION OF 4
*S*    USE LAND TREATMENT FACTORS FROM BHI CONCEPTUAL GRADING & DRNG PLAN.
RAINFALL  TYPE= 2                                                                                          RAIN24=   3.170
*S*    1-HOUR = 2.07
*S*    6-HOUR = 2.56
*S*   24-HOUR = 3.17
*S*
*S*** COMPUTE HYD FOR BASIN 401 EAST OF ELIZABETH
COMPUTE NM HYD        401.10   -     1        .03380        73.05       4.931      2.73533    1.600    3.377 PER IMP=  90.00
*S*** ROUTE THROUGH BASIN 405B TO DETENTION POND INLET
ROUTE                401.1OR    1   11        .03380        76.30       4.931      2.73534    1.650    3.527
*S*** COMPUTE HYD FOR PORTION OF BASIN 405B BETWEEN WALL & ELIZABETH
COMPUTE NM HYD        405.00   -     2        .01610        42.30       2.349      2.73533    1.550    4.105 PER IMP=  90.00
*S*** ADD BASIN 405B FLOW TO ROUTED FLOW
ADD HYD               405.AP 11& 2  12        .04990       107.04       7.280      2.73531    1.600    3.352
*S*** COMPUTE HYD FOR PORTION OF BASIN 404 EAST OF POND, TRACT 2 = 15 AC.
COMPUTE NM HYD          2.00   -     3        .02340        31.53       1.093       .87562    1.550    2.105 PER IMP=    .00
*S*** ADD TRACT 2 FLOW TO TOTAL FLOW AT POND
ADD HYD               TR2.AP  3&12  13        .07330       136.29       8.372      2.14163    1.600    2.905
*S*** COMPUTE HYD FOR DETENTION POND AREA
COMPUTE NM HYD          8.10   -     8        .00140         2.48        .074       .99001    1.500    2.771 PER IMP=   1.00
*S*** ADD POND AREA FOR TOTAL FLOW TO DETENTION POND
ADD HYD               TR2.AP 13& 8  13        .07470       138.16       8.446      2.11991    1.600    2 890
*S*  ROUTE TOTAL FLOW THROUGH POND WITH 18" RISER PIPE W/ORIFICE PLATE & 36" OUT
ROUTE RESERVOIR       TR2.RR   13   16        .07470        43.38       8.430      2.11589    2.100     .907 AC-FT=    3.868
*S*** COMPUTE HYD FOR BASIN 1-C
COMPUTE NM HYD          1.00   -     1        .00200         5.89        .292      2.73533    1.500    4.603 PER IMP=  90.00
*S*** COMPUTE HYD FOR BASIN 1-G
COMPUTE NM HYD          1.00   -     2        .00270         8.26        .421      2.92382    1.500    4.781 PER IMP= 100.00
*S*** ADD BASINS 1-C AND 1-G
ADD HYD                 ADD1  1& 2   1        .00470        14.15        .713      2.84350    1.500    4.705
*S*** ADD TO POND DISCHARGE FOR TOTAL AT MH1
ADD HYD                  AP1  1&16   3        .07940        46.46       9.142      2.15896    2.050     .914
*S*** ROUTE TO MH2 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP1.SR    3   13        .07940        46.48       9.142      2.15890    2.050     .915
*S*** COMPUTE HYD FOR BASIN 1-D
COMPUTE NM HYD          1.00   -     1        .00130         3.84        .190      2.73533    1.500    4.611 PER IMP=  90.00
*S*** ADD TO TOTAL PIPE FLOW AT MH2
ADD HYD                  AP2  1&13   3        .08070        47.30       9.332      2.16817    2.050      916
*S*** ROUTE TO MH3 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP2.SR    3   13        .08070        47.31       9.332      2.16816    2.050     .916
*S*** COMPUTE HYD FOR BASIN 1-B
```

ATTACHMENT 2

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HYDROLOGY SECTION

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
COMPUTE NM HYD	1.00	-	8	.00270	7.62	.367	2.54685	1.500	4.411	PER IMP= 80.00
*S*** COMPUTE HYD FOR BASIN 1-F										
COMPUTE NM HYD	1.00	-	2	.00310	9.48	.483	2.92382	1.500	4.780	PER IMP= 100.00
*S*** ADD BASINS 1-B AND 1-F										
ADD HYD	1BF.ADD	8& 2	2	.00580	17.11	.850	2.74823	1.500	4.608	
*S*** ADD TO TOTAL PIPE FLOW AT MH3										
ADD HYD	AP3	13& 2	3	.08650	51.26	10.182	2.20705	2.000	.926	
*S*** ROUTE TO MH6 THROUGH PROPOSED STORM DRAIN										
ROUTE	AP3.SR	3	13	.08650	51.26	10.182	2.20701	2.000	.926	
*S*** COMPUTE HYD FOR BASIN 1-E										
COMPUTE NM HYD	1.00	-	1	.00530	15.58	.773	2.73533	1.500	4.593	PER IMP= 90.00
*S*** ADD TO TOTAL PIPE FLOW AT MH6										
ADD HYD	AP4	1&13	3	.09180	55.00	10.955	2.23751	2.000	.936	
*S*** ROUTE TO EUBANK STORM DRAIN										
ROUTE	AP4.SR	3	13	.09180	55.01	10.955	2.23750	2.000	.936	
*S*** COMPUTE HYD FOR BASIN 1-A										
COMPUTE NM HYD	1.00	-	1	.00800	22.55	1.087	2.54685	1.500	4.404	PER IMP= 80.00
*S*** ADD TO TOTAL EUBANK SD FLOW AT BELL AVE										
ADD HYD	AP4	1&13	3	.09980	75.35	12.041	2.26229	1.500	1.180	
*S*** COMPUTE HYD FOR BASIN 506 - SOUTHERN BLVD. BASIN										
COMPUTE NM HYD	6.10	-	6	.01250	26.13	1.589	2.38405	1.550	3.266	PER IMP= 75.00
*S*** ADD TO TOTAL EUBANK SD FLOW										
ADD HYD	AP4	3& 6	3	.11230	97.64	13.631	2.27584	1.500	1.359	

FINISH

ATTACHMENT 2

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AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =08/07/2000
INPUT FILE = ult_100.hym                                                                  USER NO.= BOHN_HNM.STE

                            FROM  TO                    PEAK        RUNOFF                TIME TO    CFS      PAGE =   1
                HYDROGRAPH   ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND       IDENTIFICATION  NO.  NO.     (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE     NOTATION

START                                                                                                   TIME=       .00
*S*    ANALYSIS OF DETENTION POND EAST OF COSTCO SITE, EUBANK AND SOUTHERN.
*S*    THIS FILE MODELS ULTIMATE CONDITIONS POND ON GRADING PLAN WITH 2% BULKING
*S*    100 YEAR, 24 HOUR STORM
*S*
*S*
*S*    RAINFALL AND DRAINAGE BASINS FROM "SOUTH EUBANK AREA STORM DRAIN
*S*    ANALYSIS", SMITH ENGINEERING CO., NOV. 1995
*S*    BASINS TO POND FOR ULTIMATE CONDITIONS:  405B AND PORTION OF 404
*S*    USE LAND TREATENT FACTORS FROM BHI CONCEPTUAL GRADING & DRNG PLAN.
RAINFALL  TYPE= 2                                                                                       RAIN24=   3.170
*S*    1-HOUR = 2.07
*S*    6-HOUR = 2.56
*S*   24-HOUR = 3.17
*S*
*S*    USE 2% BULKING FACTOR
SEDIMENT BULK                                                                                           PK BF =    1.02
*S*** COMPUTE HYD FOR PORTION OF BASIN 405B BETWEEN WALL & ELIZABETH ST.
COMPUTE NM HYD        405.00   -     2        .01610        43.14       2.396      2.79004    1.550    4.187 PER IMP=  90.00
*S*** COMPUTE HYD FOR PORTION OF BASIN 404 EAST OF POND, TRACT 2 = 15 AC.
COMPUTE NM HYD          2.00   -     3        .02340        56.98       3.002      2.40553    1.550    3.805 PER IMP=  70.00
*S*** ADD TRACT 2 FLOW AND BASIN 405B
ADD HYD               TR2.AP  3& 2  13        .03950       100.12       5.398      2.56224    1.550    3.960
*S*** COMPUTE HYD FOR DETENTION POND AREA
COMPUTE NM HYD          8.10   -     8        .00140         2.53        .075      1.00981    1.500    2.827 PER IMP=   1.00
*S*** ADD POND AREA FOR TOTAL FLOW TO DETENTION POND
ADD HYD               TR2.AP 13& 8  13        .04090       102.46       5.473      2.50884    1.550    3.914
*S*  ROUTE TOTAL FLOW THROUGH POND WITH 18" RISER PIPE & 36" OUTFALL
ROUTE RESERVOIR       TR2.RR   13   16        .04090        30.34       5.463      2.50425    1.950    1.159 AC-FT=    2.602
*S*** COMPUTE HYD FOR BASIN 1-C
COMPUTE NM HYD          1.00   -     1        .00200         6.01        .298      2.79004    1.500    4.695 PER IMP=  90.00
*S*** COMPUTE HYD FOR BASIN 1-G
COMPUTE NM HYD          1.00   -     2        .00270         8.43        .429      2.98229    1.500    4.877 PER IMP= 100.00
*S*** ADD BASINS 1-C AND 1-G
ADD HYD                 ADD1  1& 2   1        .00470        14.44        .727      2.90037    1.500    4.799
*S*** ADD TO POND DISCHARGE FOR TOTAL AT MH1
ADD HYD                  AP1  1&16   3        .04560        34.22       6.190      2.54508    1.950    1.173
*S*** ROUTE TO MH2 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP1.SR    3   13        .04560        34.25       6.190      2.54503    1.950    1.174
*S*** COMPUTE HYD FOR BASIN 1-D
COMPUTE NM HYD          1.00   -     1        .00130         3.91        .193      2.79004    1.500    4.703 PER IMP=  90.00
*S*** ADD TO TOTAL PIPE FLOW AT MH2
ADD HYD                  AP2  1&13   3        .04690        35.28       6.383      2.55182    1.950    1.176
*S*** ROUTE TO MH3 THROUGH PROPOSED STORM DRAIN
ROUTE                 AP2.SR    3   13        .04690        35.29       6.383      2.55177    1.950    1.176
*S*** COMPUTE HYD FOR BASIN 1-B
COMPUTE NM HYD          1.00   -     8        .00270         7.77        .374      2.59778    1.500    4.499 PER IMP=  80.00
*S*** COMPUTE HYD FOR BASIN 1-F
COMPUTE NM HYD          1.00   -     2        .00310         9.67        .493      2.98229    1.500    4.876 PER IMP= 100.00
*S*** ADD BASINS 1-B AND 1-F
```

ATTACHMENT 2

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	1BF.ADD	8& 2	2	.00580	17.45	.867	2.80320	1.500	4.701	
*S*** ADD TO TOTAL PIPE FLOW AT MH3										
ADD HYD	AP3	13& 2	3	.05270	40.27	7.250	2.57944	1.900	1.194	
*S*** ROUTE TO MH6 THROUGH PROPOSED STORM DRAIN										
ROUTE	AP3.SR	3	13	.05270	40.32	7.250	2.57940	1.900	1.195	
*S*** COMPUTE HYD FOR BASIN 1-E										
COMPUTE NM HYD	1.00	-	1	.00530	15.89	.789	2.79004	1.500	4.685	PER IMP= 90.00
*S*** ADD TO TOTAL PIPE FLOW AT MH6										
ADD HYD	AP4	1&13	3	.05800	54.17	8.038	2.59864	1.500	1.459	
*S*** ROUTE TO EUBANK STORM DRAIN										
ROUTE	AP4.SR	3	13	.05800	54.02	8.038	2.59862	1.500	1.455	
*S*** COMPUTE HYD FOR BASIN 1-A										
COMPUTE NM HYD	1.00	-	1	.00800	23.00	1.108	2.59778	1.500	4.492	PER IMP= 80.00
*S*** ADD TO TOTAL EUBANK SD FLOW AT BELL AVE										
ADD HYD	AP4	1&13	3	.06600	77.01	9.147	2.59852	1.500	1.823	
*S*** COMPUTE HYD FOR BASIN 506 - SOUTHERN BLVD. BASIN										
COMPUTE NM HYD	6.10	-	6	.01250	26.65	1.621	2.43173	1.550	3.331	PER IMP= 75.00
*S*** ADD TO TOTAL EUBANK SD FLOW										
ADD HYD	AP4	3& 6	3	.07850	99.75	10.768	2.57195	1.500	1.986	
FINISH										

ATTACHMENT 2

COSTCO WHOLESALE OFFSITE STORM DRAIN - ULTIMATE CONDITIONS

==========

Storm & Sanitary SelectCAD Design Log

Drainage File: P:\00198\Hydro\design\Control\00198.sdb

Display Log: P:\00198\HYDRO\DESIGN\DRAWING\CONTROL\ult_hgl.log

Date: Monday, August 07, 2000 09:23:21

==========

HGL/EGL Computations:

Table A:

Struct ID	D (in)	Q (cfs)	L (ft)	V (ft/s)	d (ft)	dc (ft)	$V^2/2g$ (ft)	Sf (ft/ft)	Dnstrm Soffit (ft)	EGLdn (ft)	HGLdn (ft)	Tot Loss (ft)	EGLup (ft)	HGLup (ft)	Rim Elev. (ft)
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	5466.50	-
P8	36	54.00	48.32	7.64	-	-	0.91	0.0066	5461.50	5467.41	5466.50	0.32	5467.73	5466.82	-
MH6	-	-	-	-	-	-	-	-	-	5467.73	5466.82	0.84	5468.57	5467.66	5472.61
P6	36	54.00	150.15	7.64	-	-	0.91	0.0066	5463.00	5468.57	5467.66	1.00	5469.57	5468.66	-
MH5	-	-	-	-	-	-	-	-	-	5469.57	5468.66	0.12	5469.69	5468.78	5471.09
P5	36	41.00	52.57	5.80	-	-	0.52	0.0038	5467.10	5469.69	5468.78	0.20	5469.89	5469.36	-
MH4	-	-	-	-	-	-	-	-	-	5469.89	5469.36	0.07	5469.95	5469.43	5472.21
P4	36	40.30	290.43	5.70	-	-	0.51	0.0037	5467.80	5469.95	5469.43	1.07	5471.03	5470.52	-
MH3	-	-	-	-	-	-	-	-	-	5471.03	5470.52	0.04	5471.07	5470.57	5476.71
(Alternate HGL Used)														5471.18	
P3	36	35.30	243.86	9.13	1.61	1.93	1.29	-	5471.71	5472.47	5471.18	-	5473.72	5472.42	-
MH2	-	-	-	-	-	-	-	-	-	5473.72	5472.42	-	5473.72	5472.42	5482.11
P2	36	34.30	301.33	9.07	1.58	1.90	1.28	-	5473.81	5473.67	5472.39	-	5476.27	5474.99	-
MH1	-	-	-	-	-	-	-	-	-	5476.27	5474.99	-	5476.27	5474.99	5484.34
P1	36	30.30	135.38	8.99	1.44	1.78	1.26	-	5476.45	5476.15	5474.89	-	5477.38	5476.12	-

Table B:

	Losses							Loss Coefficients							
Str ID	Hf	Hb	Hstr	Hc	He	Hj	Total	Dstr	Ko	CD	Cd	Cq	Cp	Cb	K
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P8	0.32	-	-	-	-	-	0.32	-	-	-	-	-	-	-	-
MH6	-	-	0.84	-	-	-	0.84	6.82	1.137	1.000	0.818	1.000	1.000	1.000	0.930
P6	1.00	-	-	-	-	-	1.00	-	-	-	-	-	-	-	-
MH5	-	-	0.12	-	-	-	0.12	4.56	0.200	1.000	0.643	1.000	1.000	1.000	0.129
P5	0.20	-	-	-	-	-	0.20	-	-	-	-	-	-	-	-
MH4	-	-	0.07	-	-	-	0.07	4.56	0.200	1.000	0.643	1.000	1.000	1.000	0.129
P4	1.07	-	-	-	-	-	1.07	-	-	-	-	-	-	-	-
MH3	-	-	0.04	-	-	-	0.04	1.81	0.238	1.000	0.370	1.000	1.000	1.000	0.088
P3	-	-	-	-	-	-	SuperCrt	-	-	-	-	-	-	-	-
MH2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P2	-	-	-	-	-	-	SuperCrt	-	-	-	-	-	-	-	-
MH1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P1	-	-	-	-	-	-	SuperCrt	-	-	-	-	-	-	-	-

ATTACHMENT 3

COSTCO WHOLESALE OFFSITE STORM DRAIN - INTERIM CONDITIONS

==========

Storm & Sanitary SelectCAD Design Log

Drainage File: P:\00198\Hydro\design\Control\00198.sdb

Display Log: P:\00198\HYDRO\DESIGN\DRAWING\CONTROL\int_hgl.log

Date: Monday, August 07, 2000 09:28:06

==========

HGL/EGL Computations:

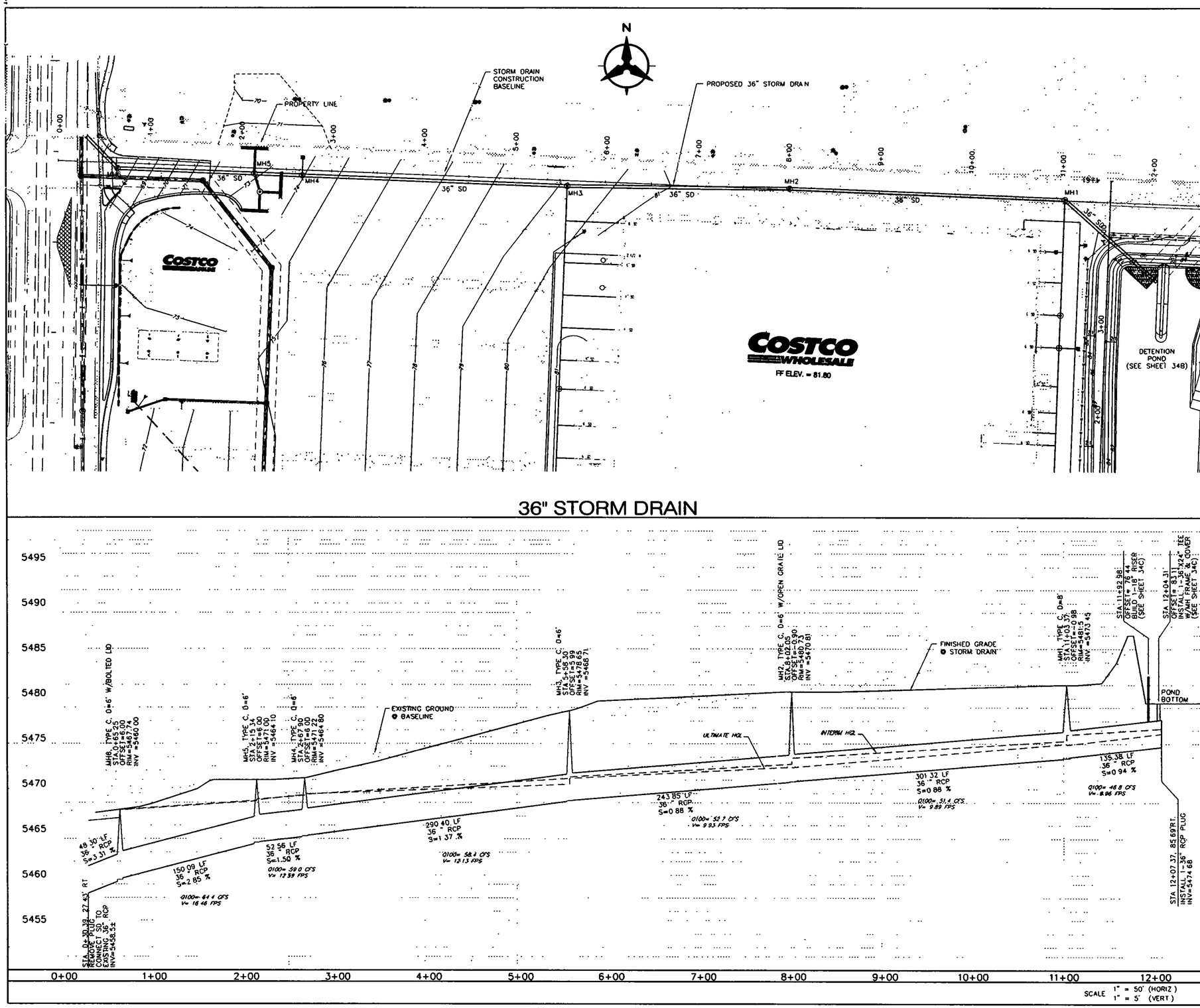
Table A:

Struct ID	D (in)	Q (cfs)	L (ft)	V (ft/s)	d (ft)	dc (ft)	$V^2/2g$ (ft)	Sf (ft/ft)	Dnstrm Soffit (ft)	EGLdn (ft)	HGLdn (ft)	Tot Loss (ft)	EGLup (ft)	HGLup (ft)	Rim Elev. (ft)
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	5466.50	-
P8	36	55.00	48.32	7.78	-	-	0.94	0.0069	5461.50	5467.44	5466.50	0.33	5467.77	5466.83	-
MH6	-	-	-	-	-	-	-	-	-	5467.77	5466.83	0.88	5468.65	5467.71	5472.61
P6	36	55.00	150.15	7.78	-	-	0.94	0.0069	5463.00	5468.65	5467.71	1.04	5469.69	5468.74	-
MH5	-	-	-	-	-	-	-	-	-	5469.69	5468.74	0.12	5469.81	5468.87	5471.09
P5	36	52.00	52.57	7.36	-	-	0.84	0.0062	5467.10	5469.81	5468.87	0.32	5470.13	5469.29	-
MH4	-	-	-	-	-	-	-	-	-	5470.13	5469.29	0.11	5470.24	5469.40	5472.21
P4	36	51.30	290.43	7.26	-	-	0.82	0.0060	5467.80	5470.24	5469.40	1.74	5471.98	5471.16	-
MH3	-	-	-	-	-	-	-	-	-	5471.98	5471.16	0.09	5472.07	5471.25	5476.71
(Alternate HGL Used)														5471.33	
P3	36	47.30	243.86	6.69	-	-	0.70	0.0051	5471.71	5472.15	5471.33	1.31	5473.46	5472.76	-
MH2	-	-	-	-	-	-	-	-	-	5473.46	5472.76	0.05	5473.51	5472.82	5482.11
(Alternate HGL Used)														5473.42	
P2	36	46.50	301.33	6.58	-	-	0.67	0.0049	5473.81	5474.11	5473.42	1.89	5476.01	5475.33	-
MH1	-	-	-	-	-	-	-	-	-	5476.01	5475.33	0.29	5476.30	5475.62	5484.34
(Alternate HGL Used)														5476.02	
P1	36	43.40	135.38	6.14	-	-	0.59	0.0043	5476.45	5476.69	5476.02	0.58	5477.27	5476.69	-

Table B:

	Losses							Loss Coefficients							
Str ID	Hf	Hb	Hstr	Hc	He	Hj	Total	Dstr	Ko	CD	Cd	Cq	Cp	Cb	K
Outfall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P8	0.33	-	-	-	-	-	0.33	-	-	-	-	-	-	-	-
MH6	-	-	0.88	-	-	-	0.88	6.83	1.137	1.000	0.819	1.000	1.000	1.000	0.931
P6	1.04	-	-	-	-	-	1.04	-	-	-	-	-	-	-	-
MH5	-	-	0.12	-	-	-	0.12	4.64	0.200	1.000	0.650	1.000	1.000	1.000	0.130
P5	0.32	-	-	-	-	-	0.32	-	-	-	-	-	-	-	-
MH4	-	-	0.11	-	-	-	0.11	4.49	0.200	1.000	0.637	1.000	1.000	1.000	0.127
P4	1.74	-	-	-	-	-	1.74	-	-	-	-	-	-	-	-
MH3	-	-	0.09	-	-	-	0.09	2.45	0.238	1.000	0.443	1.000	1.000	1.000	0.105
P3	1.24	-	-	-	-	-	1.24	-	-	-	-	-	-	-	-
MH2	-	-	0.05	-	-	-	0.05	1.95	0.204	1.000	0.386	1.000	1.000	1.000	0.079
P2	1.48	-	-	-	-	-	1.48	-	-	-	-	-	-	-	-
MH1	-	-	0.29	-	-	-	0.29	1.92	1.134	1.000	0.383	1.000	1.000	1.000	0.434
P1	0.58	-	-	-	-	-	0.58	-	-	-	-	-	-	-	-

ATTACHMENT 3



GENERAL NOTES

1. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE COMPLETE INSTALLATION OF ALL WORK RELATED TO MECHANICAL UTILITIES AS SHOWN ON THIS PLAN INCLUDING: TRENCHING, BACKFILL, SUPPORTS, CLEANOUT PADS, SERVICE STOPS AND BOXES, SERVICE LINES, TESTING, CLEANING, AND STERILIZING. ANY WORK NOT ACCEPTED BY THE ARCHITECT OR ENGINEER DUE TO IMPROPER WORKMANSHIP OR LACK OF PROPER COORDINATION SHALL BE REMOVED AND CORRECTLY INSTALLED AT THE CONTRACTOR'S EXPENSE, AS DIRECTED.

2. ALL WORK DETAILED ON THESE PLANS TO BE PERFORMED UNDER CONTRACT SHALL, EXCEPT AS OTHERWISE STATED OR PROVIDED OF HEREON, BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF ALBUQUERQUE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.

3. UTILITY LINES SHALL BE INSTALLED PRIOR TO PAVEMENT, CURB AND GUTTER, AND/OR SIDEWALK, AS APPLICABLE.

4. ROUGH GRADING OF SITE (±0.5') SHALL BE COMPLETED PRIOR TO INSTALLATION OF UTILITY LINES.

AS-BUILT INFORMATION

	DATE
CONTRACTOR STAKED BY	
VERIFICATION OF ELEVATIONS BY	
FIELD INSPECTION BY	
CORRECTED BY	

MICRO-FILM INFORMATION

	DATE
RECORDED BY	
NO	

BENCH MARKS

To reach the station from the intersection of Central Ave and Eubank Blvd., go south on Eubank Blvd 0.3 miles to Southern Ave., then east on Southern Ave 0.4 miles to the Little League Baseball field and the station. The station mark is a standard ACS brass tablet, stamped "S-L21", set in top of a concrete post which is about 0.2 ft. below ground surface at the southwest corner of a chainlink fence. Ground-to-Grade 0.999644584. X=1558424.9480, Y=1480485.3968, ELEV.=5499.07 (Ground Coord.)

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

LYNN M. MAXON NEW MEXICO 11797 REGISTERED PROFESSIONAL ENGINEER

No	Date	REMARKS	By
		REVISIONS	
		DESIGN	

Designed By L.M.M. DATE 04.03.00
Drawn By S.F.C. DATE 04.03.00
Checked By L.M.M. DATE 04.03.00

Bohannan ▲ Huston
Courtyard One 7500 JEFFERSON NE Albuquerque NEW MEXICO 87109
ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

COSTCO WHOLESALE
36" STORM DRAIN
PLAN & PROFILE

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No	Zone Map No	Sheet	Of
638281	L-21-Z	34A	74

A_BHI_B01 00198 HYDRO DESIGN PLANS 00198UPNP01.DWG

BHI JOB NO 00198A7.05

Date 05.02.00

Copyright Bohannan Huston 2000

ATTACHMENT 3

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 15, 2001

Bill Blanton
Federal Emergency Management Agency
500 C Street, SW
Washington, DC 20472

Re: Request for a Conditional Letter of Map Revision for Costco Wholesale

City of Albuquerque, New Mexico, Community No. 350001, FIRM Panel 350001C0359D,

Dear Mr. Blanton,

The purpose of this submittal is to convey the documents in order to request a Conditional Letter of Map Revision for Costco Wholesale.

Enclosed with this letter are the Application and Certification forms for requesting revisions to the National Flood Insurance Program map, analysis of the project and a check in the amount of $3100.00.

As the acting Community official, I have reviewed the response provided with this submittal. Our Community would greatly appreciate your prompt response and approval for this Letter of Map Revision.

If you have any questions, you can contact me at (505) 924-3986.

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
City/County Floodplain Administrator (Acting)

C: Craig Hoover, P.E., Bohannan-Huston, Inc.
Alan Johnson, FEMA Headquarters
Jack Quarles, FEMA Region VI
L21-D37

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 20, 2002

Scott Steffen, PE
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: Costco Wholesale – Tract B-1 Excess Grading Plan
Engineer's Stamp dated 2-14-02 (L21/D37)

Dear Mr. Steffen,

Based upon the information provided in your submittal dated 2-14-02, the above referenced plan is approved for Grading Permit.

Please be advised that prior to Building Permit approval for this site, the topographical survey would have to include what was done by this Permit.

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

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Sr. Engineer, PWD
Development and Building Services

C: file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE INFORMATION SHEET
(REV. 11/01/2001)

PROJECT TITLE: Tract B-1 Costco Development ZONE MAP/DRG. FILE # L-21-Z/D-37
DRB #: EPC#: WORK ORDER#:

LEGAL DESCRIPTION: Tract B-1 Costco Development
CITY ADDRESS:

ENGINEERING FIRM: Bohannan Huston, Inc. CONTACT: Scott Steffen
ADDRESS: 7500 Jefferson NE – Courtyard I PHONE: (505) 823-1000
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

OWNER: Sandia Tech Center LLC CONTACT: Michael Silbert
ADDRESS: 6707 Academy Road NE, Suite B PHONE: 857-9555
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

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

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

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

CHECK TYPE OF SUBMITTAL:
____ DRAINAGE REPORT
____ DRAINAGE PLAN
____ CONCEPTUAL GRADING & DRAINAGE PLAN
X GRADING PLAN
____ EROSION CONTROL PLAN
____ ENGINEER'S CERTIFICATION (HYDROLOGY)
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ ENGINEERS CERTIFICATION (TCL)
____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:
____ SIA / FINANCIAL GUARANTEE RELEASE
____ 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 (PERM.)
____ CERTIFICATE OF OCCUPANCY (TEMP.)
X GRADING PERMIT APPROVAL
____ PAVING PERMIT APPROVAL
____ WORK ORDER APPROVAL
____ OTHER (SPECIFY)

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

DATE SUBMITTED: 2/14/02 BY: Scott Steffen

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

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

CLIENT/COURIER TRANSMITTAL

BOHANNAN HUSTON
Courtyard One
7500 JEFFERSON NE
Albuquerque
NEW MEXICO 87109
voice 505.823.1000
fax 505.821.0892

To: Bradley Bingham
City of Albuquerque
One Stop Shop
600 2nd Street 2nd Floor
505-924-3986

Requested By: Scott Steffen

Date: **February 14, 2002**

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

Job No.: 01353

Job Name: Costco Development

DELIVERY VIA

☒ Courier ☐ Federal Express
☐ Mail ☐ UPS
☐ Other _____

PICK UP

Item: _____
_____
_____

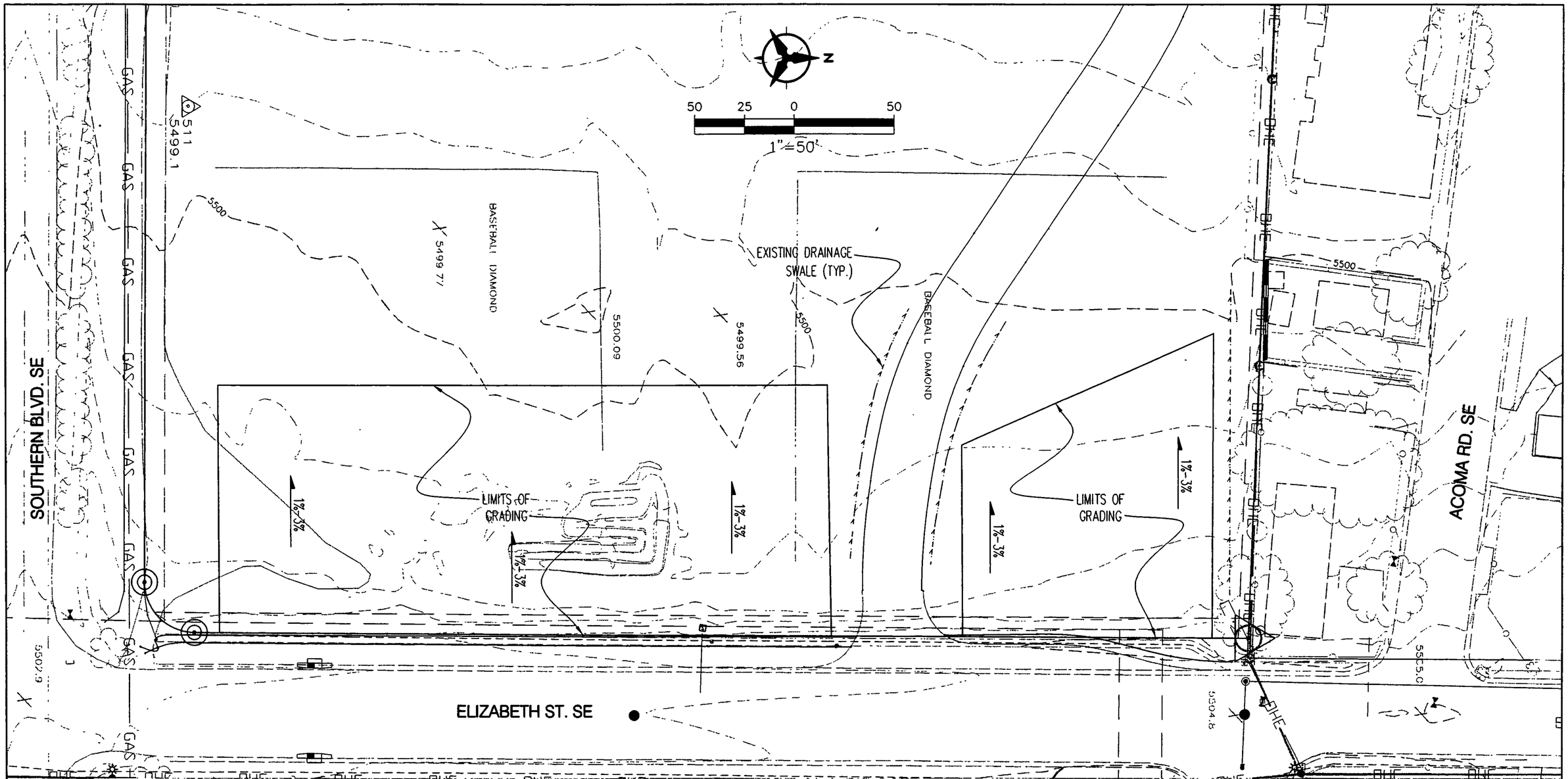
ITEM NO.	QUANTITY	DESCRIPTION
1	1	Grading Plan
2	1	Drainage Info Sheet

COMMENTS / INSTRUCTIONS

The enclosed grading plan shows the limits of grading for Condore Construction to spread excess non-compacted fill from the South Eubank Storm Drain Outfall Project, Phase III (COA Project #6366.92) on the subject property. If you have any questions, please call.

RECEIVED
FEB 14 2002
PWD/DESIGN REVIEW

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



NOTES:

1. MAXIMUM FILL OF 1.5' WITHIN LIMITS OF GRADING.
2. TIE TO EXISTING GRADE ALONG ALL EDGES OF LIMITS OF GRADING.
3. MAINTAIN EXISTING DRAINAGE ALONG BOTH SIDES OF ACCESS ROAD AND ALONG NORTH PROPERTY LINE.

TRACT B-1
COSTCO DEVELOPMENT
FEBRUARY 2002

SCOTT J. STEFFEN
NEW MEXICO
14664
REGISTERED PROFESSIONAL ENGINEER
2/14/02

Bohannan Huston
Courtyard One 7500 JEFFERSON NE Albuquerque NEW MEXICO 87109
ENGINEERS PLANNERS PHOTOGRAMMETRISTS SURVEYORS SOFTWARE DEVELOPERS

P:\01353\CDP\DESIGN\01353 INTERIM GRADE.DWG--LAYOUT1

City of Albuquerque

April 3, 2000

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

Re: Costco Wholesale - Eubank Grading and Drainage Plan

Engineer's Stamp dated 3-16-00 (L21/D37)

Dear Mr. Stidworthy,

Based upon the information provided in your submittal dated 3-16-00, the above referenced site cannot be approved for Building Permit or Grading Permit until the following comments are addressed:

- Please provide street grades and enough strategic spot elevations along Eubank and Southern to better define the road profile. Please add all grate elevations and pipe inverts for both the private and public storm drain.

- Please add additional spot elevations to all interior curb points and grate elevations to define all parking lot slopes.

- Please provide pond invert, top of berm elevation and all pipe inverts. Please add note stating how you are going to keep a 2:1 slope from eroding.

- There are a couple of roof drains near the SW corner of the pad that do not connect to the storm drain.

- Please denote on the plan what will be built with work order and what will be built with the Building Permit.

- How are you proposing to drain the loading dock?

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

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Hydrology Review Engineer

C: file

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Costco Wholesale ZONE ATLAS/DRNG. FILE # L-21 / D-37

DRB #: _____ EPC #: 99-136 WORK ORDER #: _____

LEGAL DESCRIPTION: Tract A & 1C Manzano Mesa

CITY ADDRESS: NE Corner of Southern and Eubank

ENGINEERING FIRM: Bohannan Huston, Inc. CONTACT: Bruce Stidworthy

ADDRESS: 7500 Jefferson NE, Albuquerque, NM 87109 PHONE: (505) 823-1000

OWNER: Costco Wholesale CONTACT: Peter Kahn

ADDRESS: _____ PHONE: _____

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN
- X FINAL 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 SUBD. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- X BUILDING PERMIT APPROVAL
- ____ CERTIFICATE OF OCCUPANCY APPROVAL
- X GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- ____ DRAINAGE REQUIREMENTS
- ____ SUBDIVISION CERTIFICATION
- ____ OTHER _____ (SPECIFY)

DATE SUBMITTED: 03/16/00

BY: Bohannan Huston, Inc.

RECEIVED
MAR 16 2000
HYDROLOGY SECTION

Revised 02/98

City of Albuquerque

February 17, 2000

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

Re: Costco Wholesale - Eubank Grading and Drainage Plan
Engineer's Stamp dated 2-15-00 (L21/D37)

Dear Mr. Stidworthy,

Based upon the information provided in your resubmittal dated 2-17-00, the above referenced site is approved for Site Development Plan for Subdivision, Site Development Plan for Building Permit and Final Plat.

Please be advised that prior to Building Permit approval, a more comprehensive grading and drainage plan will be required.

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

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Hydrology Review Engineer

C: Fred Aguirre, DRB
file

ORIGINAL

DRB Case No 1000262
DRC Project No.
Prelim. Plat Approved: 3/22/00
Prelim. Plat Expires: 3/22/01
Site Plan Approved: 3/22/00

Date Submitted: 3/14/00

Figure 12

INFRASTRUCTURE LIST

EXHIBIT "A"
TO SUBDIVISION IMPROVEMENTS AGREEMENT
DEVELOPMENT REVIEW BOARD (D.R.B.) REQUIRED INFRASTRUCTURE LIST

COSTCO WHOLESALE WAREHOUSE – PLAT & SITE PLAN

Following is a summary of Public/Private Infrastructure required to be constructed or financially guaranteed for the above development. This listing is not necessarily a complete listing. During the SIA process and/or in the review of the construction drawings, if the DRB Chair determines that appurtenant items and/or unforeseen items have not been included in the infrastructure listing, the DRC Chair may include those items in the listing and related financial guarantee. Likewise, if the DRC Chair determines that appurtenant or non essential items can be deleted from the listing, those items may be deleted as well as the related portions of the financial guarantees. All such revisions require approval by the DRC Chair, the User Department and agent/owner. If such approvals are obtained, these revisions to the listing will be incorporated administratively. In addition, any unforeseen items which arise during construction which are necessary to complete the project and which normally are the Subdivider's responsibility will be required as a condition of project acceptance and close out by the City.

Size	Type Improvement	Location	From	To
ROADWAY IMPROVEMENTS				
~~29'~~ 31' WIDE	ARTERIAL PAVING W/~~8'~~ BIKE LANE AND PCC C&G NORTH SIDE ONLY w/ temp. pvmt. transition	SOUTHERN	EUBANK	ELIZABETH
~~14' WIDE~~ 10' MIN.	BIKE PATH FINAL DESIGN T.B.D AT DRC	SOUTHERN	EUBANK	ELIZABETH
~~29'~~ 31' WIDE	ARTERIAL PAVING W/~~8'~~ BIKE LANE AND PCC C&G AND SIDEWALK EAST SIDE ONLY 6'	EUBANK	SOUTHERN	COSTCO N. PROPERTY LINE
~~8'~~ 6' WIDE	TEMPORARY BIKE PATH ON SOUTH SIDE OF TEMP. ART. ASPHALT	S. OF SOUTHERN	EUBANK	ELIZABETH
	~~TRIANGULAR ISLANDS~~	~~AT THE RIGHT-IN/RIGHT DRIVEWAYS ON SOUTHERN AND EUBANK~~		
	NE QUADRANT OF INTERSECTION INCLUDING ARTERIAL PVMT & C&G	EUBANK/SOUTHERN		
24' WIDE	ARTERIAL PAVING	EUBANK	500' S. OF SOUTHERN	SOUTHERN
17' WIDE	ARTERIAL PAVING W/12' NORTHBOUND RIGHT-TURN LANE	EUBANK	500' S. OF SOUTHERN	SOUTHERN
WIDTH VARIES (MIN 24')	CONNECT THE NEW SOUTHERN ALIGNMENT TO EXISTING SOUTHERN WEST OF EUBANK	SOUTHERN	EUBANK	APPROX 500' W. OF EUBANK

ORIGINAL

Size	Type Improvement	Location	From	To
ROADWAY IMPROVEMENTS CONT'D				
APPROX. 12' WIDE	LENGTHEN LEFT TURN LANES (EXACT LENGTH T.B.D. AT DRC)	EUBANK	NORTH AND SOUTH APPROACHES TO CENTRAL	
12' WIDE	3rd SOUTHBOUND LANE	EUBANK	CENTRAL	SOUTHERN
12' WIDE	ARTERIAL PVMT RT. TURN DECEL LANE	SOUTHBOUND ELIZABETH AT COSTCO ENTRANCE		
12' WIDE 100' LENGTH	ARTERIAL PVMT. RT. TURN DECEL LANE	WESTBOUND SOUTHERN AT COSTCO ENTRANCE		
12' WIDE 100' LENGTH	ARTERIAL PVMT. RT. TURN DECEL LANE	NORTHBOUND EUBANK AT THE 2 COSTCO ENTRANCES		
	FULL SIGNALIZATION OF EUBANK AND SOUTHERN (EXIST. EQUIPMENT TO BE RE-USED TO THE EXTEND POSSIBLE)			
UTILITIES				
10"	WATERLINE	SOUTHERN	EUBANK	ELIZABETH
10"	SANITARY SEWER	SOUTHERN	EUBANK	ELIZABETH
18"	SANITARY SEWER	~~Southern~~ Eubank	Southern	EXIST. TERMINUS
DRAINAGE				
36" – 42"	STORM DRAIN	EUBANK	NORTH PROPERTY LINE	SOUTHERN
-36"	STORM DRAIN	ESMT N. OF COSTO BLDG.	POND ON TRACT B	EUBANK
	RETENTION POND ON TRACT B w/ Agreement & Covenant			
	~~CLOMR/LOMR SUBMITTAL TO FEMA FOR EXISTING FLOODPLAIN MODIFICATION~~ LOMR must be recieved from FEMA prior to release of financial guarantee			

Prepared by: Rene Stidworthy
Firm: Bohannan Huston

Development Review Board Member Approval

3-22-00 Transportation Development Date	3/22/00 Utility Development Date	3-22-00 Parks and Recreation Date	
3-22-00 City Engineer Date	~~AMAFCA~~ Date	DRB Chair	3/22/00 Date

DRC REVISIONS

REVISIONS	DATE	DRC CHAIR	USER DEPT	AGENT/OWNER
1				
2				

October 20, 2000

BOHANNAN-HUSTON, INC

Courtyard One

7500 JEFFERSON NE

Albuquerque

NM 87109-4335

voice 505 823.1000

fax 505 821 0892

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

Re: Drainage Certification for Costco (City Drainage File L21-D37)

Dear Brad:

Based on site inspections and survey data, it appears that the grading and drainage at the Costco site has been substantially completed in conformance with the grading and drainage plan engineer's stamp dated 4/18/00. Based on my inspection and the items below, the site is ready for release of temporary certificate of occupancy by city Hydrology.

Below is a list of items which need to be completed or corrected prior to release of permanent certificate of occupancy:

1. The seeding, gravel mulch, and rip-rap in the drainage pond need to be completed.
2. Onsite and offsite storm drains must be cleaned to remove sediment.
3. Storm drain manholes must be adjusted to match finished paving.
4. The berm south of the pond must be constructed. See Section A, Sheet C1.
5. The sidewalk culverts in the parking area must be installed. See keyed not 8, Sheet C1.

The items above are minor and do not inhibit critical drainage function of the site. Should you have any questions, please contact me.

Sincerely,
Bohannan Huston, Inc.

Bruce Stidworthy, P.E.
Community, Development
and Planning Group

BJS/am
Enclosures
cc: Dan Kemnitz, Robinson Construction
Norm Raupe, Robinson Construction
Kyle Schomaker, Mulvanny Architects

P \00198\cdp\corres\c702-drng_cert\DrainCertBrad doc

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Costco Wholesale ZONE ATLAS/DRNG. FILE # L21-D37

DRB #: _____ EPC #: 99-136 WORK ORDER #: 6382

LEGAL DESCRIPTION: Tract A & 1-C Manzano Mesa

CITY ADDRESS: NE Corner of Southern & Eubank

ENGINEERING FIRM: BOHANNAN-HUSTON INC. CONTACT: Bruce Stidworthy

ADDRESS: 7500 JEFFERSON NE, ALB. NM 87109 PHONE: (505) 823-1000

OWNER: Costco CONTACT: _____

ADDRESS: _____ PHONE: _____

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN
- ____ FINAL GRADING & DRAINAGE PLAN
- ____ GRADING PLAN
- ____ EROSION CONTROL PLAN
- X ____ ENGINEER'S CERTIFICATION
- ____ OTHER

PRE-DESIGN MEETING:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

30 day temp.

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SKETCH PLAT APPROVAL
- ____ PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUBэD. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- X ____ CERTIFICATE OF OCCUPANCY APPROVAL
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- ____ DRAINAGE REQUIREMENTS
- ____ SUBDIVISION CERTIFICATION
- ____ OTHER _____ (SPECIFY)

DATE SUBMITTED: October 20, 2000

BY: Bruce Stidworthy, Bohannan Huston, Inc.

RECEIVED
OCT 20 2000
HYDROLOGY SECTION

Revised 02/98

Bohannan ▲ Huston

FACSIMILE TRANSMITTAL COVER SHEET

BOHANNAN HUSTON
Courtyard One
7500 JEFFERSON NE
Albuquerque
NEW MEXICO 87109
voice 505.823.1000
fax 505.821.0892

Date: October 20, 2000

To: Kyle Schomaker — Dan Kemnitz
Company: Mulvanny Architects — Robinson Construction
Fax: (425) 822-4129 — (503) 645-5357

cc: Norm Raupe, Robinson Construction, fax 299-2447
Loren Meinz, COA Hydrology, fax 924-3864
Bill Vreeke, BHI
Matt Santistevan, BHI

Costco File.

From: Bruce Stidworthy

Project No: 00 198 **Project Name:** Costco - Southern Blvd & Eubank

Number of Pages (including cover) 02

Re:

Comments:

Kyle -

Apparently the City did not install an 18" tee into the 54" SD at Station 9+75 on Eubank. The tee was supposed to be installed to accommodate an inlet being constructed with the Costco project.

Two possible solutions are illustrated on the attached sketch. Per my conversation with Loren Meinz with City Hydrology, Option #1 is preferable; however, if Option #1 conflicts with the existing gas line, Option #2 is acceptable.

I would expect a small cost increase to be associated with this change.

- Bruce

Original to Follow: ☐ **Yes**

If you do not receive all pages, please contact Anna at 823-1000

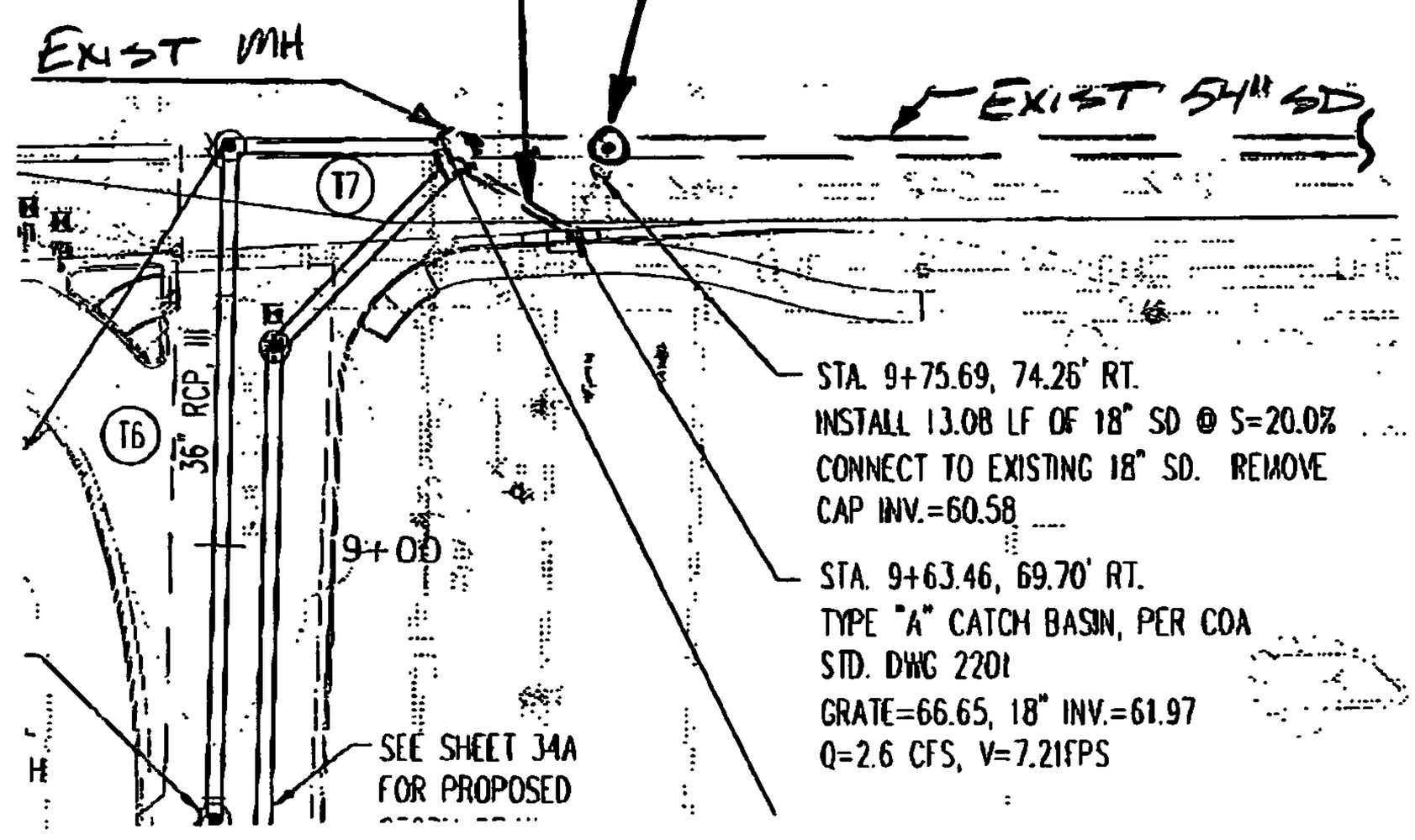
Greg Menke

OPTION #1

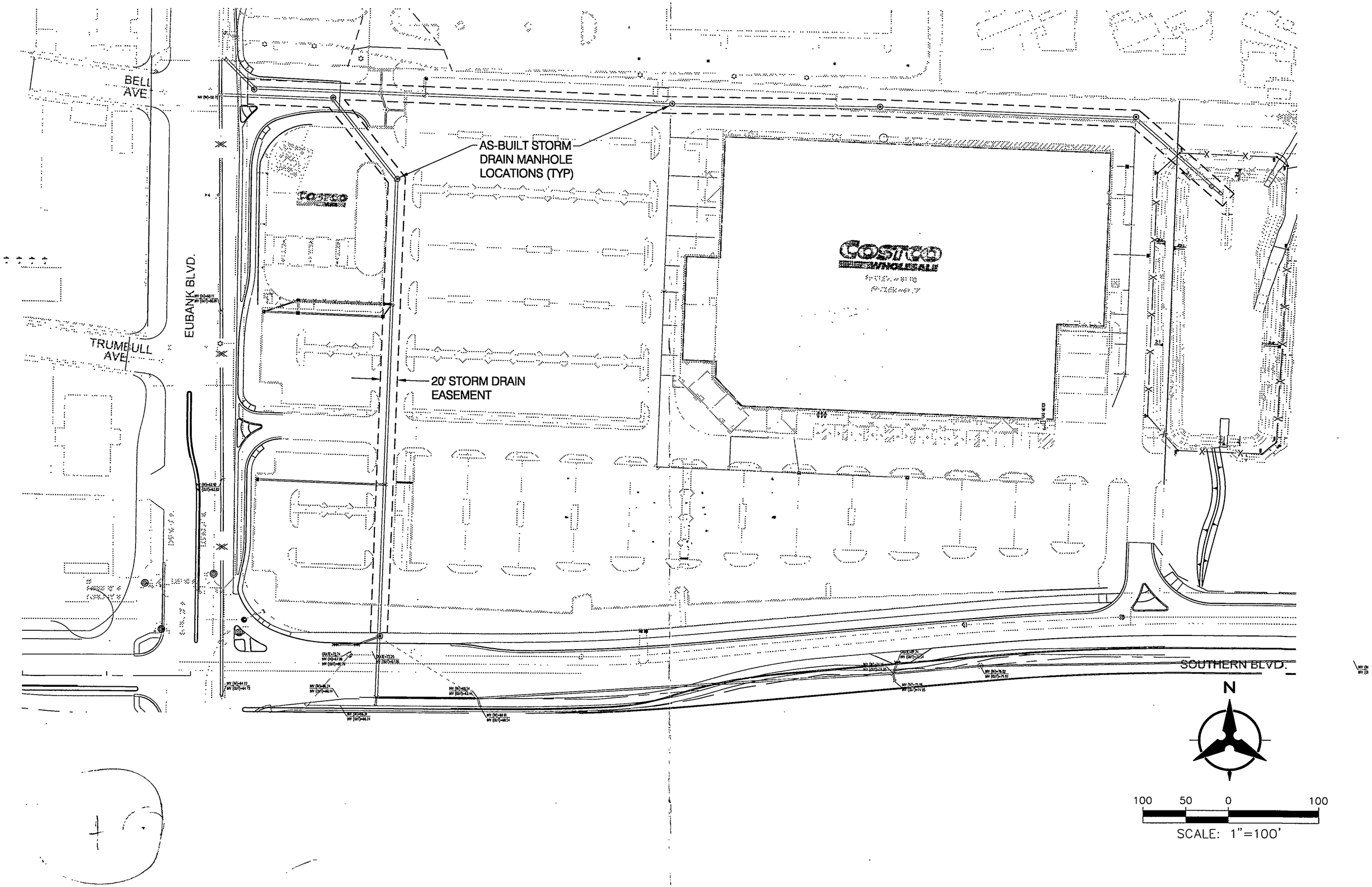
INSTALL 18" SD LINE FROM INLET TO EXIST MH

OPTION 2

INSTALL NEW 6' DIA TYPE C MH OVER EXIST 54" SD & TIE NEW 18" SD FROM INLET.



REF. SHEET 32 OF 74 10/20/00


BELL AVE
TRUMBULL AVE
EUBANK BLVD.
SOUTHERN BLVD.
AS-BUILT STORM DRAIN MANHOLE LOCATIONS (TYP)
20' STORM DRAIN EASEMENT
COSTCO WHOLESALE
N
100 50 0 100
SCALE: 1"=100'

CITY OF ALBUQUERQUE

April 3, 2006

Ms. Pamela Thies, PE
BOHANNAN-HUSTON, INC.
7500 Jefferson St. NE – Courtyard I
Albuquerque, NM 87109

RE: LONGFORD VILLAGE EAST SUBDIVISION (L-21/D37)
Engineers Certification for Release of Financial Guaranty
Engineers Stamp dated 01/14/2004
Engineers Certification dated 03/28/2006

Dear Pam:

Based upon the information provided in your Engineer's Certification Submittal dated 03/29/2006, the above referenced plan is adequate to satisfy the Grading and Drainage Certification for Release of Financial Guaranty.

If you have any questions, you can contact me at 924-3982

Sincerely,

Arlene V. Portillo

Arlene V. Portillo
Plan Checker, Planning Dept.- Hydrology
Development and Building Services
BLB

C: Marilyn Maldonado, COA# 732881
File

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(REV. 1/28/2003rd)

PROJECT TITLE: Longford Village East Subdivision ZONE MAP/DRG. FILE # L21/D37
DRB #: 1000262 EPC#: WORK ORDER#: 7328.81

LEGAL DESCRIPTION: Tract B-1 of the Costco Development
CITY ADDRESS: Elizabeth St. and Southern Blvd.

ENGINEERING FIRM: Bohannan Huston, Inc. CONTACT: Pam Thies
ADDRESS: 7500 Jefferson NE – Courtyard I PHONE: (505) 823-1000
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

OWNER: Longford Homes CONTACT: Rick Beltramo
ADDRESS: 7007 Jefferson St NE - Ste A PHONE: (505) 761-9911
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

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

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

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

CHECK TYPE OF SUBMITTAL:

____ DRAINAGE REPORT
____ DRAINAGE PLAN 1st SUBMITTAL, ***REQUIRES TCL or equal***
____ DRAINAGE PLAN RESUBMITTAL
____ CONCEPTUAL GRADING & DRAINAGE PLAN
____ GRADING PLAN
____ EROSION CONTROL PLAN
__X__ ENGINEER'S CERTIFICATION (HYDROLOGY)
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ ENGINEERS CERTIFICATION (TCL)
____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

__X__ SIA / FINANCIAL GUARANTEE RELEASE
____ 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 (PERM.)
____ CERTIFICATE OF OCCUPANCY (TEMP.)
____ GRADING PERMIT APPROVAL
____ PAVING PERMIT APPROVAL
____ WORK ORDER APPROVAL
____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:

____ YES
____ NO
____ COPY PROVIDED

RECEIVED
MAR 29 2006
HYDROLOGY SECTION

DATE SUBMITTED: 03-29-06 BY: Pamela Thies

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

1. Conceptual Grading and Drainage Plan: Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.

2. Drainage Plans: Required for building permits, grading permits, paving permits and site plans less than five (5) acres.

3. Drainage Report: Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

Courtyard I
7500 Jefferson St. NE
Albuquerque, NM
87109-4335

www.bhinc.com

voice: 505.823.1000
facsimile: 505.798.7988
toll free: 800.877.5332

March 28, 2006

Brad Bingham, P.E.
Hydrology Development Division
City of Albuquerque Planning Department
P. O. Box 1293
Albuquerque, NM 87103

Re: Longford Village East Subdivision – Grading and Drainage Certification
DRB Case No. 1000262; COA Drainage File # L21/D37

Dear Brad:

The purpose of this letter is to request your concurrence of the enclosed grading and drainage certification for the above referenced subdivision for Longford Homes. This submittal requests approval of the certification for Longford Village East Subdivision. The plans attached are the certified grading plan (Engineers Stamp dated 01-14-04, with the original date of 12-03-03) approved by DRB on January 21, 2004, and the as-built survey certified by Thomas W. Patrick of Community Sciences Corporation.

In order to close out this package, approval of the enclosed certification is necessary. If you have any questions, please give me a call at 823-1000.

Sincerely,

Pamela Thies

Pamela Thies, P.E.
Project Engineer
Community Development and Planning

PT/cc
Enclosures

cc: Rick Beltramo, Longford Homes (w/enclosures)
Howard Stone, Bohannan Huston, Inc.

CITY OF ALBUQUERQUE
DEVELOPMENT & BUILDING SERVICES CENTER
PLANNING DEPARTMENT/HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NUMBER: L21/D37 DATE: 03/08/2007
CROSS REFERENCE NUMBERS: EPC_____ DRB_____ DRC_____
SUBJECT: TRACT I-1, MANZANO MESA
STREET ADDRESS: SOUTHEAST CORNER OF EUBANK BLVD. SE & SOUTHERN BLVD SE
SUBDIVISION NAME: TRACT I-1, MANZANO MESA

TYPE OF APPROVAL
__ PRELIMINARY& FINAL PLAT
__ BUILDING PERMIT
__ GRADING PERMIT
__ SITE DEVELOPMENT PLAN FOR SUBDIVISION
X OTHER FLOODPLAIN DETERMINATION; DEVELOPMENT CRITERIA

ATTENDEE:	ORGANIZATION:	PHONE:
JEFF MORTENSEN	JMA	345-4250
BRAD BINGHAM	HYDROLOGY	924-3986

FINDINGS:

1) STORM DRAIN WORK UPSTREAM OF THE SITE HAS REMOVED THE PHYSICAL FLOODPLAIN FROM THE SITE
2) FEMA FLOODPLAIN WAS REMOVED BY LOMR (7-21-06), PANEL 358F 01-06-657R/03-06-832
3) EXISTING FLOODPLAIN EASEMENT SHOWN ON THE PLAT OF RECORD CAN BE VACATED BASED UPON ITEMS 1 AND 2 ABOVE
4) THERE IS AN ALLOWABLE DISCHARGE RATE FROM THE SITE. IT IS POSSIBLY 55 CFS, BUT MUST BE VERIFIED BY FURTHER RESEARCH AND DOCUMENTATION
5) THE DISCHARGE OF DEVELOPED RUNOFF FROM THE SITE MUST BE ACCOMPLISHED BY DIRECT CONNECTION TO THE PUBLIC STORM DRAIN STUBOUT IN/ALONG EUBANK
6) THE DEVELOPMENT OF THIS SITE WILL NOT REQUIRE THE DESIGN AND/OR CONSTRUCTION OF PUBLIC STORM DRAIN IMPROVEMENTS UNLESS ASSOCIATED WITH PUBLIC STREET IMPROVEMENTS

THE UNDERSIGNED AGREE THAT THE ABOVE FINDINGS ARE SUMMARIZED ACCURATELY AND ARE ONLY SUBJECT TO CHANGE IF FURTHER INVESTIGATION REVEALS THAT THE FINDINGS ARE NOT REASONABLE OR THAT THEY ARE BASED UPON INACCURATE INFORMATION.

SIGNED: _____ SIGNED: Bradley L. Bingham
TITLE: CONSULTANT TITLE: CITY HYDROLOGIST
DATE: 03-19-2007 DATE: _____

NOTE: PLEASE PROVIDE A COPY OF THIS RECAP WITH EACH DRAINAGE SUBMITTAL
JMA PROJECT NO. 2006.182.7

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 24, 2003

L-21/D37

Joseph A. Martinenza
PBS&J
12101 Indian Creek Court
Beltsville, Maryland 20705

RE: Request for a Letter of Map Revision for CostCo Wholesale
FIRM Case No. 01-06-657R

City of Albuquerque, New Mexico, Community No. 350002, FIRM Panel 35001C0359 D Effective Date September 20,1996

Dear Mr. Martinenza,

The purpose of this submittal is to convey the documents in order to request a Letter of Map Revision based on the construction of storm drain and a detention pond to revise the 100-year floodplain.

Enclosed with this letter is the as-builts for the Eubank storm drain, CostCo storm, drain, and CostCo detention pond. Also included is a geotechnical report, public easement, construction plans for the CostCo detention pond, and a check in the amount of $3,800.00.

As the City Floodplain Administrator, I have reviewed the response provided with this submittal. Our Community would greatly appreciate your prompt response and approval for this Letter of Map Revision.

If you have any questions, you can contact me at (505) 924-3982.

Sincerely,

Carlos A. Montoya
City Floodplain Administrator

C: Bill Blanton, Federal Emergency Management Agency Headquarters
Jack Quarles, FEMA Region VI
Craig W. Hoover, Bohannan Huston
Susan Calongne, Bernalillo County Floodplain Administrator