City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

Planning Department
Transportation Development Services Section

March 21, 2003

Ronald R. Bohannan, P.E.
8509 Jefferson NE
Albuquerque, NM 87113

Re: Certification Submittal for Final Building Certificate of Occupancy for
Rockfish Bar and Grill, [E-17/D67]
4441 The 25 Way NE
Engineer's Stamp Dated 03/20/03

Dear Mr. Bohannan:

The TCL / Letter of Certification submitted on March 20, 2003 is sufficient for acceptance by this office for final Certificate of Occupancy (C.O.). Notification has been made to the Building and Safety Section.

Sincerely,

Nilo E. Salgado-Fernandez, P.E.
Senior Traffic Engineer
Development and Building Services
Planning Department

c: Engineer
Hydrology file
CO Clerk

TIERRA WEST, LLC

8509 Jefferson NE
Albuquerque, NM 87113

(505) 858-3100
fax (505) 858-1118

twllc@tierrawestllc.com
1-800-245-3102

March 20, 2003

Ms. Terry Martin
Public Works Department
City of Albuquerque
PO Box 1293
Albuquerque, NM 87103

RE: Final Certification of Transportation for Certificate of Occupancy
ROCK FISH BAR AND GRILL
4441 The 25 WAY NE

Dear Ms. Martin:

Enclosed please find one copy of the As-Built Traffic Control Layout and Information Sheet for the ROCK FISH BAR AND GRILL Restaurant located in the @25 Development. Wilson Barnes Construction completed the on-site paving, curb and gutter, striping and sidewalks. All work is in substantial compliance with the approved plan. Landscaping for the site is complete. As-built information was field verified by our office. We are, therefore, requesting Final Certification of Transportation for Certificate of Occupancy.

If you have any questions or need additional information regarding this matter, please do not hesitate to call me.

Sincerely,

RONALD RAY BOHANNAN — NEW MEXICO — 7868 — REGISTERED PROFESSIONAL ENGINEER

3/20/03

Ronald R. Bohannan, PE

RECEIVED
MAR 21 2003
HYDROLOGY SECTION

Enclosure/s

cc: Tom Harmeyer

JN: 220066
RRB/rd/db

220066 -Final CO Transportation03202003 ltr

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

March 21, 2003

Ron Bohannan, PE
Tierra West LLC
8509 Jefferson NE
Albuquerque, NM 87113

Re: Rockfish Cafe @25 Engineering Certification
Engineer Stamp date 3-20-03 (E17/D67)

Dear Mr. Bohannan,

Based on information provided in your submittal dated 3-21-03, the above referenced Certification is adequate for Certificate of Occupancy release.

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

Sincerely,

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

C: Certificate of Occupancy Clerk, CoA
file

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

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 3, 2002

Ron Bohannan, PE
Tierra West LLC
8509 Jefferson NE
Albuquerque, NM 87113

Re: Rockfish Cafe @25 Drainage Report
Engineer Stamp date 9-16-02 (E17/D67)

Dear Mr. Bohannan,

Based on information provided in your submittal dated 9-18-02, the above referenced plan is approved for Building Permit. Please attach a copy of this approved plan to the construction sets prior to sign-off by Hydrology.

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, PE
Sr. Engineer, Planning Dept.
Development and Building Services

C: file

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

DRAINAGE REPORT

for

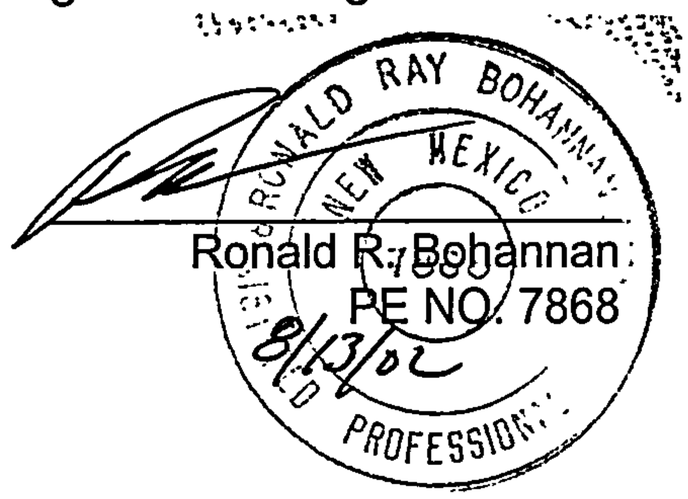
ROCK FISH CAFE
Tract D-2
4441 The 25 Way
Albuquerque, New Mexico

Prepared by:

Tierra West, LLC
8509 Jefferson NE
Albuquerque, New Mexico 87113

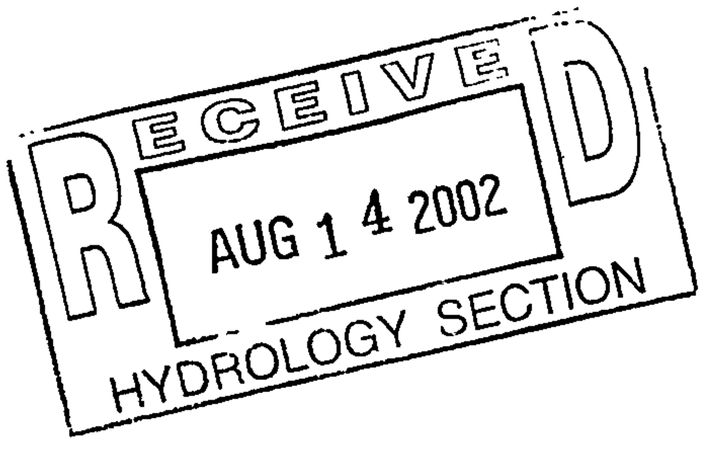
August, 2002

I certify that this report was prepared under my supervision, and I am a registered professional engineer in the State of New Mexico in good standing.



Ronald R. Bohannan
PE NO. 7868

Job No. 220066



PURPOSE

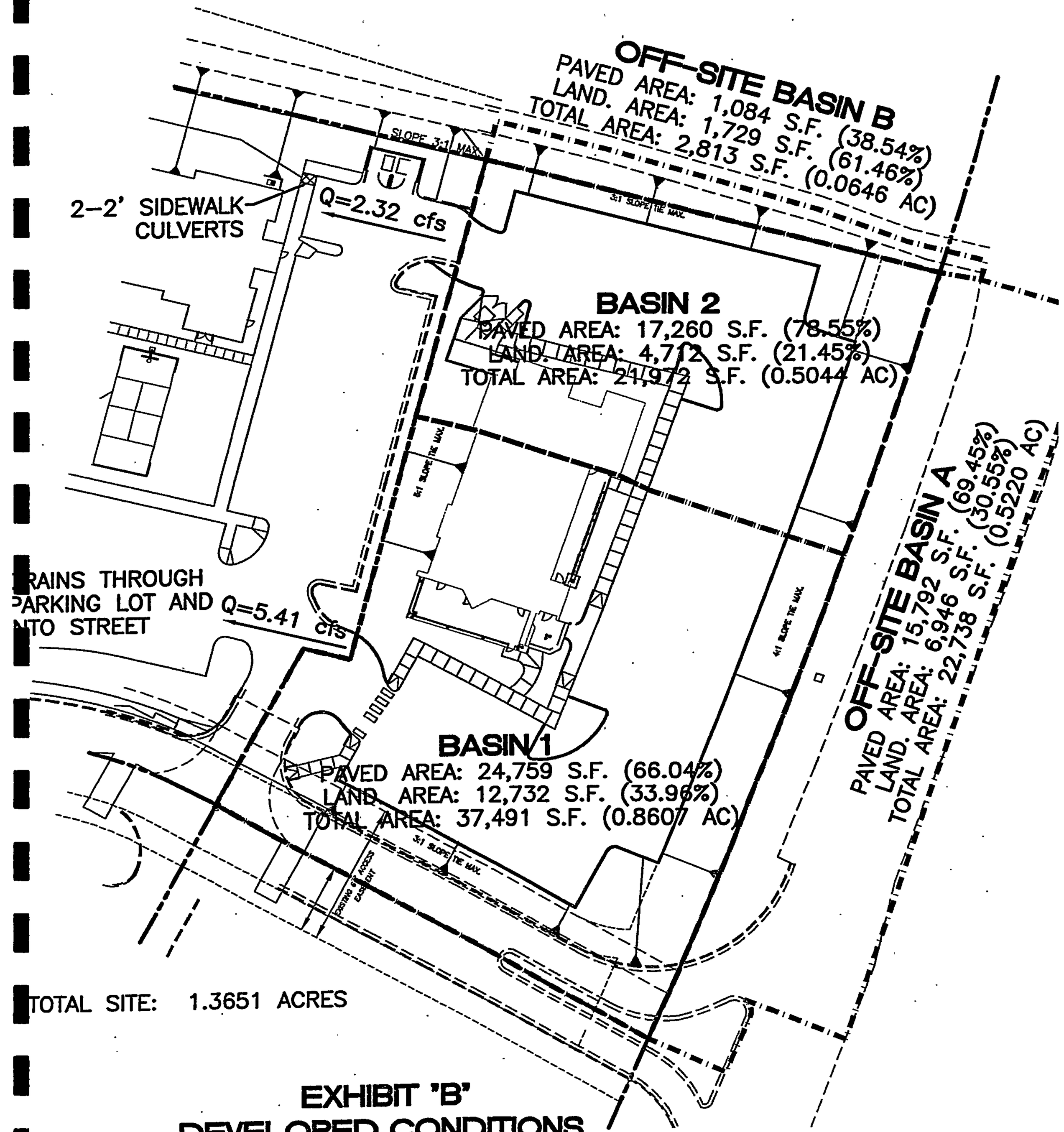
The purpose of this report is to provide the drainage management plan for the development of Tract D-2, of The 25 Development. This plan will be utilized for the development of the subject 1.3651-acre property, for the use as Rock Fish Café. This plan is in accordance with the DPM Chapter 22 and will demonstrate that the proposed improvements do not adversely effect the surrounding properties, the upstream or downstream facilities.

INTRODUCTION

The subject of this report, as shown on the Exhibit A vicinity map, is a 1.3651-acre parcel of land located on the northeast corner of the I-25 Frontage Road, and The Bear Canyon Arroyo adjacent to the Frontage Road. The site is located on Zone Atlas page E-17. The site currently exists as a rough graded pad site within The 25 Development. The legal description of the property is Tract D-2 of The 25 Development. As shown on FIRM map 35001C0139D, the site lies within flood zone X.

This site was analyzed within the Master Drainage Report and Grading Plan for The 25 Development (F17-D46D) previously submitted by Tierra West, LLC, with the stamp date of 5/5/99 and approved and shown in Appendix B. The City of Albuquerque Hydrology Section approved the Drainage Management Plan on 5/13/99. Based upon the approved Drainage Management Plan, this site is located entirely within Basin A of The 25 Development. The approved Master Drainage Plan indicates this parcel is allowed free discharge if the land treatments are equal to, or less than, 85% D and 15% B. Since our improvements are consistent with developed condition assumptions within The 25 Development Drainage Plan, the site should be allowed free discharge.

Minor offsite flows enter the site from the east from the adjacent I-25 Frontage Road and The Bear Canyon Arroyo. These flows will sheet flow onto the site and continue to pass through the site via surface flow within the sidewalk on the south side of the property as indicated on the Master Drainage Study.



TOTAL SITE: 1.3651 ACRES

EXHIBIT "B"
DEVELOPED CONDITIONS

ON

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op of a
0.2',
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levard,
he east-
and 7.4'
e north

106°35'37"

35°09'22"

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

BERNALILLO COUNTY, NEW MEXICO AND INCORPORATED AREAS

PANEL 139 OF 825
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
ALBUQUERQUE, CITY OF	350002	0139	D
BERNALILLO COUNTY, UNINCORPORATED AREAS	350001	0139	D

MAP NUMBER
35001C0139 D

EFFECTIVE DATE:
SEPTEMBER 20, 1996

FEDERAL EMERGENCY MANAGEMENT AGENCY

ZONE A
ZONE X
OSUNA ROAD
100-YEAR FLOOD CONFINED TO CONSTRUCTED CHANNEL
BERNALILLO COUNTY UNINCORPORATED AREAS 350001
25
ZONE A
LIMIT OF DETAILED STUDY
ZONE AO (DEPTH 1)
HARPER
LIMIT OF DETAILED STUDY
HARPER
FREEWAY
ZONE AH (EL 5186)
ZONE
AMERICAN
PAN
BOULEVARD
ACADEMY
RECENTLY CONSTRUCTED BOX CULVERT
ZONE AO (DEPTH 2)
LIMIT OF DETAILED STUDY
MATEO
BRENTWOOD LANE
OSUNA ROAD
SAN

EXHIBIT C

CITY OF ALI
250

EXISTING CONDITIONS

The site slopes from east to west, with general grades between 1-3%. The site was rough graded with the construction of The 25 Development. The approved grading plan for The 25 Development is included in Map Pocket A. This site was analyzed within the Drainage Study for the entire 25 Development. This site is located entirely within Basin A, as described within the master drainage study, and shown in Exhibit B. As discussed within The 25 Development's drainage report, Basin A flows from the east to the west.

Basin A drains from east to west, where this flow is intercepted by a series of drop inlets in "The Lane @ 25" and conveyed to The Bear Canyon Arroyo. The overflow for that system continues to Jefferson Street then south to the intersection of Singer and Jefferson. Drop inlets at that location pick up any remaining flow and discharges directly to the Vineyard Channel. This site discharges into the Marriott Residence Inn which was approved by the City of Albuquerque on October 22, 2001 under E17/D65 prepared by our office. This report tracts and is consistent with that plan.

As shown in Appendix A, the upstream and portion of Basin 4 discharges onto this site. This plan refines that to 2.0672 cfs. This runoff enters the site along its eastern boundary and sheet flows across the site. Once the flow leaves the site, it continues to sheet flow to the southwest through The 25 Development and is ultimately captured by the previously mentioned public storm drain system.

PROPOSED CONDITIONS

The proposed improvements consist of the construction of a 5,353 square foot restaurant and its associated parking lot. As shown in Exhibit B, the entire site lies within Basin A as described within The 25 Development's Master Drainage Study. As shown in the calculations section, the proposed land treatments are consistent with the developed condition assumptions

for this site within The 25 Development's Drainage Management Plan. The offsite flows that currently enter the site from the east will continue to be accepted and passed through the site. Minor runoff from the I-25 Frontage Road, it is anticipated 2.067cfs will sheet flow into the water along the east property line.

As shown on the Basin Map exhibit in Map Pocket A, the site consists of two (2) onsite basins and two (2) offsite basins. Basin 1 contains a portion of the northern roof and the northeast portion of the site while Basin 2 contains the remaining portion of the site and roof. As shown in Exhibit B, Basin 1 generates 5.41 cfs and Basin 2 generates 2.32 cfs during a predicted 100 year, 6-hour storm event. Basin 2 flows to a sidewalk culvert as shown. Should events larger than the 100 year, 6 hour occur, they will over top the culvert and continue west and out the entrance. No building will be flooded. The proposed Grading Plan is included in Map Pocket B of this report. As shown on the Grading Plan and Basin Map, the entire site will discharge the combined onsite and offsite flow of 7.71 cfs as a sheet flow at the southwest corner of the site. As described within the Master Drainage Study for The 25 Development, the flows leaving this site will be conveyed via surface flow to a set of existing inlets which discharge to the Vineyard Arroyo.

SUMMARY AND RECOMMENDATIONS

This site is an existing pad within The 25 Development, which is an existing commercial center. The City of Albuquerque Hydrology Section approved the drainage management plan for the entire center. The 25 Development's Master Drainage Plan assumed fully developed conditions for our site. The proposed improvements are consistent with the land treatment types used for the developed condition for this site within The 25 Development's drainage plan. The development of this site is consistent with the DPM, Chapter 22, Hydrology section. Since this site encompasses less than five (5) acres, a NPDES permit is not required prior to any

construction activity. There are no improvements required within City right-of-way, therefore, an infrastructure list is not required. It is recommended this development be approved for rough grading and Site Plan for Building Permit.

The Site is @ Zone 2

RUNOFF CALCULATIONS

LAND TREATMENT

Proposed	*Existing*
B = 15%	A = 100%
D = 85%	

DEPTH (INCHES) @ 100-YEAR STORM

P_{60} = 2.01
P_{360} = 2.35
P_{1440} = 2.75

DEPTH (INCHES) @ 10-YEAR STORM

P_{60} = 1.87 x 0.667 = 1.34
P_{360} = 2.20 x 0.67 = 1.57

Zone 2

Land Treatement

From Table A-8 Soil Treatment	A	B	C	D
Weighted E 100 yr.	0.53	0.78	1.13	2.12
Wieghted E 10 yr.	0.13	0.28	0.52	1.34

Peak Discharge

From Table A-9

	A	B	C	D
100 Yr	1.56	2.28	3.14	4.7
10 Yr	0.38	0.95	1.71	3.14

Volume Undeveloped

	Total	Acre "A"	Acre "B"	Acre "C"	Acre "D"	Weigh E 100	E 10	V 100 Yr	V 10 Yr
Basin A	0.5219	0.0000	0.1594	0.0000	0.3625	1.7107	1.0163	0.0744	0.0442
Basin B	0.0646	0.0000	0.0397	0.0000	0.0249	1.2965	0.6886	0.0070	0.0037
Basin 1	0.8607	0.8607	0.0000	0.0000	0.0000	0.5300	0.1300	0.0380	0.0093
Basin 2	0.5044	0.5044	0.0000	0.0000	0.0000	0.5300	0.1300	0.0223	0.0055

Volume Developed

	Total	Acre "A"	Acre "B"	Acre "C"	Acre "D"	Weigh E 100	E 10	V 100 Yr	V 10 Yr
Basin A	0.5219	0.0000	0.1594	0.0000	0.3625	1.7107	1.0163	0.0744	0.0442
Basin B	0.0646	0.0000	0.0397	0.0000	0.0249	1.2965	0.6886	0.0070	0.0037
Basin 1	0.8607	0.0000	0.2923	0.0000	0.5684	1.6649	0.9800	0.1194	0.0703
Basin 2	0.5044	0.0000	0.3962	0.0000	0.1082	1.0674	0.5074	0.0449	0.0213

Peak Discharge

	Total	Acre "A"	Acre "B"	Acre "C"	Acre "D"	Q 100 Yr	Q 10 Yr
Basin A	0.5219	0.0000	0.1594	0.0000	0.3625	2.0672	1.2897
Basin B	0.0646	0.0000	0.0397	0.0000	0.0249	0.2075	0.1159
Basin 1	0.8607	0.0000	0.2923	0.0000	0.5684	3.3379	2.0625
Basin 2	0.5044	0.0000	0.3962	0.0000	0.1082	1.4119	0.7161
Basin 1T	1.3826	0.0000	0.4517	0.0000	0.9309	5.4051	3.3521
Basin 2T	0.5690	0.0000	0.1479	0.0000	0.4211	2.3164	1.4628

***

****

BROADCREST WEIR

SIDEWALK CULVERT

Q = CLH 3/2 FORMULA FROM KING & BRATER

Q = 5.41 cfs
L = Computed
C = 2.65 Constant
H = .5 curb height

$$L = \frac{Q}{CH\ 3/2} = \frac{5.41}{(2.65)(.5)\ \hat{}\ 1.5}$$

L = 5.77 ft Use 3 culverts

DRAINAGE REPORT
FOR

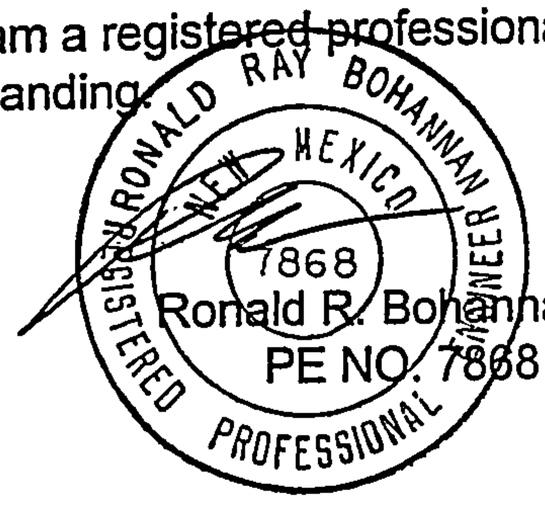
Digital @25

Prepared by:

Tierra West, LLC
4421 McLeod Rd., NE, Suite D
Albuquerque, New Mexico 87109

May, 1999

I certify that this report was prepared under my supervision, and I am a registered professional engineer in the state of New Mexico in good standing.



Ronald R. Bohannan
PE NO. 7868

Job No 980054

Location

The proposed site, entitled @25, is the former Digital site located on Jefferson Street just west of Interstate 25. The site is developed with buildings, parking and landscaping and consists of ±49.4245 acres. The current owner, Provident Realty Advisors, proposes to build a multiple use development that will include a general office building, a variety of restaurants, banking facilities and specialty retail uses. They plan to utilize a portion of the existing facilities for the office use. We have highlighted the project's location on the enclosed zone atlas page.

Legal Description

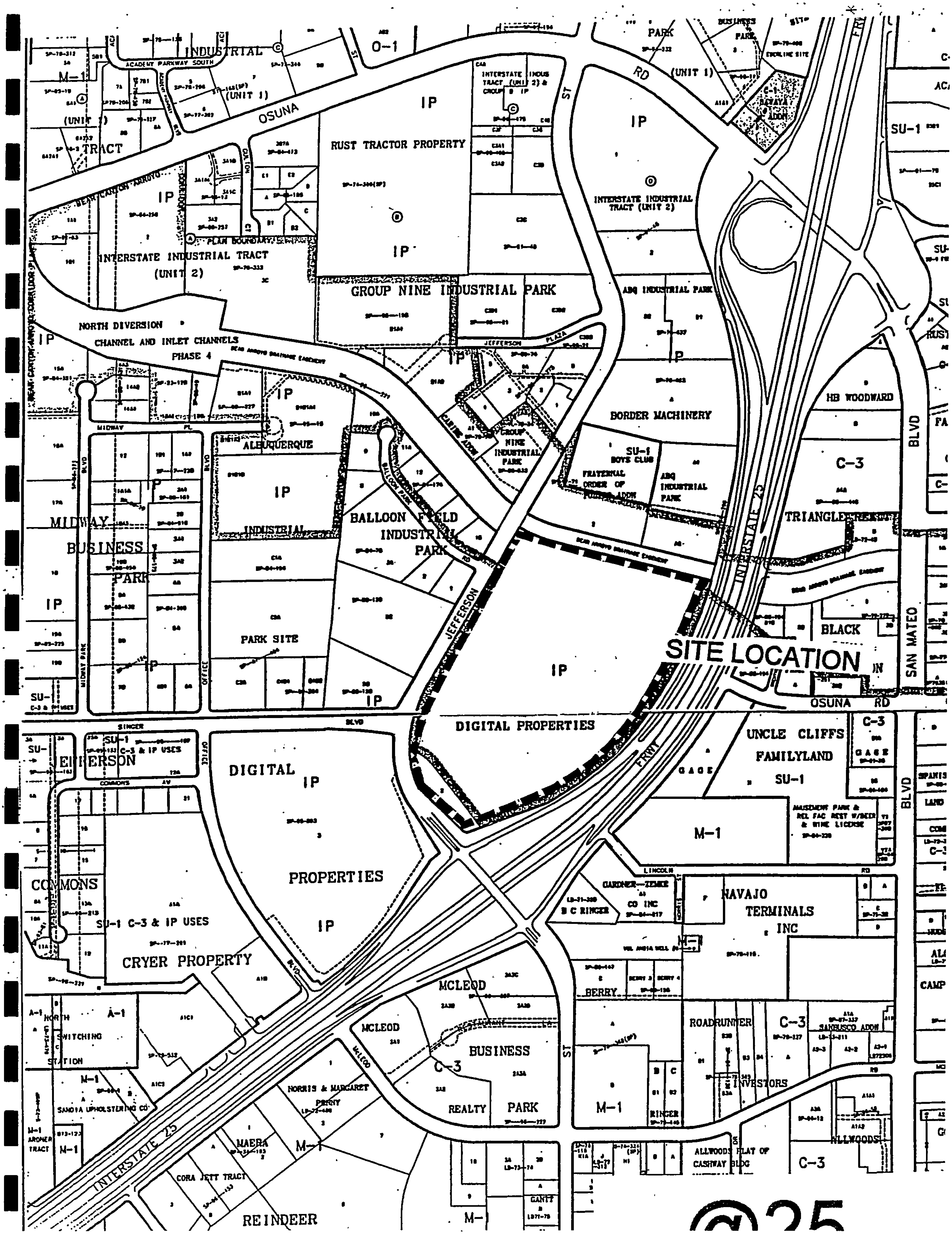
The legal description for the referenced property is as follows: ~~Parcels 1 and 2 as~~ shown on the "Plat of Survey for Parcels 1 and 2, Digital Properties, Albuquerque, Bernalillo County, New Mexico" filed for record in the office of the County Clerk Bernalillo County, New Mexico on August 15, 1991, in Volume 91C, Folio 169.

Zoning and Surrounding Development

The current zoning for the site is IP. The site is bordered on the north by the Bear Canyon Arroyo and the I-25 frontage road on the east. To the south is the I-25/Jefferson off-ramp and to the west (across Jefferson) are several commercial businesses and office parks and additional properties zoned IP.

Purpose

The purpose of this drainage report is to provide the drainage analysis and the management plan for the proposed ±49.4245 acre @25 development. We are requesting rough grading approval, Site Development Plan for Subdivision Approval, Preliminary Plat approval, and Building Permit Approval.


SITE LOCATION
INDUSTRIAL
ACADEMY PARKWAY SOUTH
(UNIT 1)
OSUNA
O-1
M-1
TRACT
IP
RUST TRACTOR PROPERTY
INTERSTATE INDUS TRACT (UNIT 2) & GROUP 9 IP
PARK
BUSINESS PARK
RD
ST
C-1 BATAYA ADDN
SU-1
INTERSTATE INDUSTRIAL TRACT (UNIT 2)
BEAR CANYON ARROYO
PLAN BOUNDARY
GROUP NINE INDUSTRIAL PARK
ABQ INDUSTRIAL PARK
NORTH DIVERSION
CHANNEL AND INLET CHANNELS
PHASE 4
JEFFERSON PLAZA
HB WOODWARD
BORDER MACHINERY
BLVD
MIDWAY PL
ALBUQUERQUE
CARLISLE ADDN
GROUP NINE INDUSTRIAL PARK
SU-1 BOYS CLUB
FRATERNAL ORDER OF POLICE ADDN
ABQ INDUSTRIAL PARK
C-3
INTERSTATE 25
TRIANGLE
MIDWAY BUSINESS PARK
INDUSTRIAL
BALLOON FIELD INDUSTRIAL PARK
BALLOON PARK RD
BEAR ARROYO DRAINAGE EASEMENT
JEFFERSON
BLACK
SAN MATEO
PARK SITE
MIDWAY PARK
OFFICE
OSUNA RD
SINGER BLVD
DIGITAL PROPERTIES
SU-1 C-3 & IP USES
JEFFERSON
COMMONS AV
UNCLE CLIFFS FAMILYLAND
GAGE
FRWY
AMUSEMENT PARK & REL FAC REST W/BEER & WINE LICENSE
DIGITAL IP
PROPERTIES
COMMONS
CRYER PROPERTY
LINCOLN RD
GARDNER-ZEMKE CO INC
B C RINGER
NAVAJO TERMINALS INC
MCLEOD
BERRY
A-1 NORTH SWITCHING STATION
M-1
SANDIA UPHOLSTERING CO
ROADRUNNER
SANBUSCO ADDN
BUSINESS
INVESTORS
REALTY PARK
NORRIS & MARGARET PENNY
ARONER TRACT
MAERA
CORA JETT TRACT
ALLWOODS PLAT OF CASHWAY BLDG
ALLWOODS
GANTT
REINDEER
CAMP
@25

Existing Drainage Conditions.

The site is the former Digital site and consists of ±49.4245 acres. Presently, the site discharges 193.08 cfs of storm water. (See Runoff Calculations for Existing Conditions in Appendix A.) There is not an approved drainage plan for the Digital Site on file with the City of Albuquerque's Hydrology Department. The site, with a portion of Jefferson Street NE, was included in the Design Analysis Report for the Vineyard Channel West of I-25, prepared for AMAFCA by Greiner, Inc., October 1992. The Greiner report states that the total Digital Site and a portion of Jefferson Street NE discharges 225 cfs into the public storm sewer system along Jefferson Street NE. This storm sewer discharges into the Vineyard Channel. (See Figure 1 in Map Pocket.)

Our review of the project revealed that an onsite storm water system exists on the northern portion of the site and that the system was rehabilitated, by Digital, in 1992. This onsite storm water system is shown in the Utility Rehabilitation drawings, prepared by Camp Dresser & McKee Inc., April 1992. These drawings show an onsite storm drain system which discharges 33.8 cfs directly into the Bear Canyon Arroyo. (The analysis was based using Manning's equation.) The storm water runoff (76.11 cfs) not captured within the onsite storm water system free discharges to Jefferson Street. The southern and western portion of the site discharges 91.0 cfs into the Jefferson Street public storm sewer system. In addition, this site accepts 11.26 cfs of offsite flow that enters the site from the I-25 west frontage road, along the eastern property line.

The existing site is divided into three onsite drainage basins 1, 2, and 3 and two offsite drainage basins 4 and 5. Basin 1 discharges 102 cfs and consists of the existing building, the existing storm sewer system, the north parking lot, and a portion of the west parking area. This basin discharges to the Bear Canyon Arroyo and to Jefferson Street. Basin 2, the southern portion of the site and the area east of the main building, discharges 82.33 cfs into the public

storm sewer in Jefferson Street. Basin 3 discharges 8.65 cfs and is the area west of the main building from the south entrance to the midpoint of the building. This basin free discharges to Jefferson Street. (See the enclosed Existing Conditions Drainage Basin Map.)

Basin 1, under existing conditions, develops 102.10 cfs of storm water runoff. This basin consists of the existing building, the existing storm sewer system, the north parking lot, a portion of the west parking area and the AMAFCA easement parallel to the Bear Canyon Arroyo. The existing buildings and the northern parking lot are connected to an onsite storm water system which discharges directly into the Bear Canyon Arroyo. The onsite storm water system consists of a series of pipes from the internal roof drain system that are connected to a main storm sewer pipe running east to west in the north parking lot. There are several curb and grate inlets within the parking lot. The main entrance has three inlets connected to the main storm sewer. The main storm sewer line, at this point, is a 30" reinforced concrete pipe which discharges 33.8 cfs directly into the Bear Canyon Arroyo. The storm water runoff not collected in the onsite storm water system sheet flows across the parking lot and free discharges into Jefferson Street through the main entrance at rate of 68.3 cfs. The storm water carried downstream in Jefferson Street is channeled to several inlets that are connected to the public storm drain system and that discharges into the Vineyard Channel. Flows upstream of our site are discharged into the Bear Canyon Arroyo.

Basin 2 discharges 82.33 cfs and is the southern and eastern portion of the site. Offsite flows enter this basin from the I-25 frontage road. Presently, the southern portion of the site is a parking area, a detention pond and land treatment "C". The eastern portion of the site is the existing ballfields and land treatment "C". This basin flows from the northeast to the southwest and the storm water runoff is channeled to a pond located near the southern property line. From the detention pond there is a 24' corrugated metal pipe which is connected to the public storm water system in Jefferson Street. The Jefferson Street public storm water system

discharges into the Vineyard Channel downstream. This basin discharges 82.33 cfs into the Jefferson Street public storm system.

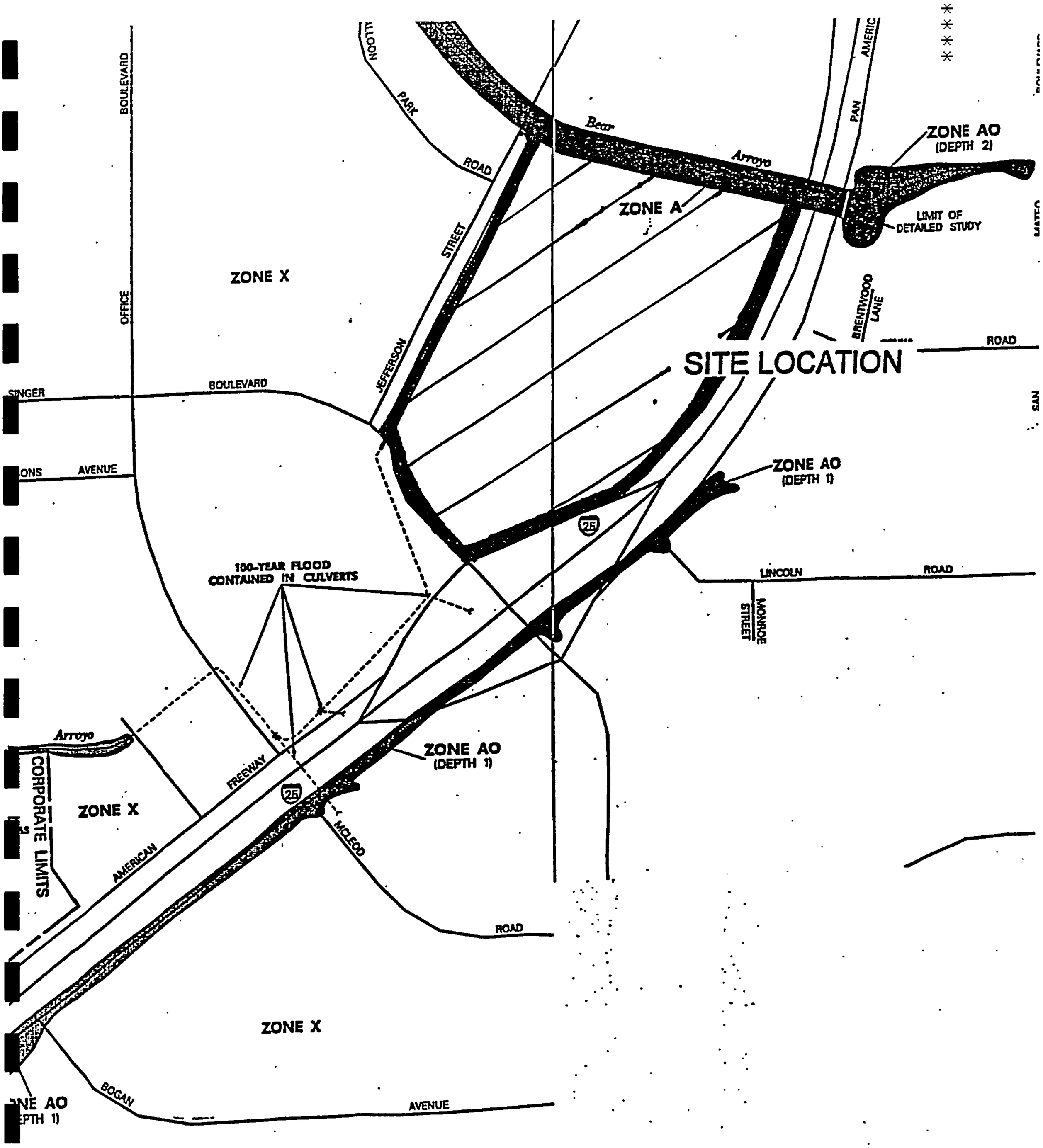
Basin 3 discharges 8.65 cfs directly into Jefferson Street and consists of the southern portion of the western parking lot and a portion of the landscaped area at the southern entrance to Digital. The parking lot runoff is channeled to an existing concrete rundown to the landscaped area. The runoff collected in the landscaped area appears to sheet flow across the site and over the existing curb into the existing inlet in Jefferson Street. The storm water collected in Jefferson Street is connected to the Vineyard Channel downstream.

Offsite flows enter this site from the southbound west frontage road of I-25, Basin 4. This offsite flow rate entering the site is 11.26 cfs. (See attached Existing Conditions Basin Map.) The offsite flows follow a swale along the eastern property line. The flows carried in the swale are discharged into an existing 24" corrugated metal pipe connected to the public storm sewer system in Jefferson Street.

We have designated the flows in Jefferson Street as basin 5. The flows in Jefferson include everything that falls in Jefferson Street from north of I-25 to the Bear Canyon Arroyo. Storm water does not enter Jefferson from the west right of way. Basin 5, Jefferson Street, contributes 8.60 cfs of storm water runoff to the public storm drain system. At this location Jefferson Street is two lanes in each direction separated by a median. The drive lanes are 24-feet from face of curb to face of curb. When the storm water enters Jefferson Street it flows into both the southbound and northbound driving lanes. For the design of the street capacity we used 24-feet from face of curb to face of curb and a flow height of 0.365 to keep one driving lane free of water. (See Appendix A for Jefferson Street Capacity Calculations.) The capacity of Jefferson Street at this location is 25.0 cfs for one half of the street.

Flood Plain and Soil Conditions

The project is not in a Flood Hazard Zone, as shown on Panel 138 and 139 of 825 of the



Flood Insurance Rate Maps

National Flood Insurance Program Flood Insurance Rate Maps, published by FEMA for the County of Bernalillo, New Mexico, and incorporated areas, dated September 20, 1996.

The site soil is Embudo gravelly fine sandy loam (EmB), as indicated on the Soil Map (Sheet 21) from the Soil Conservation Service Survey of Bernalillo County. Embudo gravelly fine sandy loam has a medium runoff, the hazard of water erosion is moderate and control of moisture is required for proper compaction.

Proposed Conditions and On-Site Drainage Management Plan

The proposed site will include the refurbished existing building and retails pad sites. The proposed site is divided into four basins A, B, C and D and discharges the following under developed conditions:

BASIN	AREA (AC)	Q100
A	25.46	109.82
B	1.70	7.24
C	1.29	5.7
D	20.97	91.3

Basin A includes the existing building, six future pad sites and a portion of service road. This basin discharges 109.82 cfs to the Bear Canyon Arroyo and Jefferson Street. Basin B is the proposed parking area between the existing building and the west property line. This basin discharges 7.24 cfs to the Jefferson Street public storm water system. Basin C is along the west property line, south of the existing building and adjacent to Jefferson Street NE. This basin includes one future pad site, landscaping and parking. This basin discharges 5.7 cfs directly into Jefferson Street. Basin D includes the southern portion of the site from the existing building to the Jefferson Street off ramp. The site includes six future pad sites, parking and a

portion of the service road. This basin discharges 91.3 cfs into the public storm water system in Jefferson Street NE. (See attached Proposed Conditions Basin Map and Grading and Drainage Plan in map pocket.)

Offsite flows enter the site from the west frontage road of I-25. The proposed site will accept the offsite flows and direct the flows to the storm inlets on site and or the public storm system in Jefferson Street.

Basin A consists of 25.46 acres and includes the existing buildings, five future pad sites, and the associated parking and landscaping. The existing on site storm water system is functional and will be utilized with the exception of the existing inlets. The existing roof drains connected to the existing onsite storm water system will remain. The existing inlets at the main entrance will be replaced with two type "C" inlets. The inlets along the north property line will be removed when the future retail pad sites are developed. For the future pad sites the storm water is to be channeled from the roofs into the landscaped area. The runoff in the parking areas sheet flows across the parking lots and into the ring road. The runoff carried in the ring road will be intercepted by two new type "C" inlets at the main entrance to the Retail Site. These inlets are connected to the existing storm sewer system which discharges 32.91 cfs into the Bear Canyon Arroyo through a 30" reinforced concrete pipe. Rip rap is located at the outfall to dissipate the discharged energy and to control erosion. The existing 30" concrete reinforced pipe has a capacity of 33.8 cfs. The developed storm water that is channeled to the ring road and not captured in the inlets at the main entrance (which are connected to the existing onsite storm water system) will free discharge to Jefferson Street. Basin A has a developed runoff of 109.82 cfs, with 32.91 cfs discharging into the Bear Canyon Arroyo, and 76.91 cfs will free discharge into Jefferson Street. With the new development the capacity of Jefferson Street will remain the same. For the design of the street capacity we used 24-feet from face of curb to face of curb and a flow height of 0.365 (See Appendix A for Jefferson Street Capacity

Calculations.) The capacity of Jefferson Street at this location is 25.0 cfs. The storm water, carried downstream in Jefferson Street, is channeled to several inlets which are connected to the public storm drain system which discharges into the Vineyard Channel. The flows in basin A follows the historic pattern. (See attached Proposed Conditions Basin Map and Grading and Drainage Plan in Map Pocket.)

Basin B is the west parking lot for the existing building. This basin is 1.70 acres, slopes north to south and discharges 7.24 cfs. The storm water runoff is diverted to a concrete rundown which is connected to two-24" sidewalk culverts. The sidewalk culverts discharge the storm water into Jefferson Street. This follows the historic pattern for the storm water runoff for this portion of the site. (See Appendix A for sidewalk culvert calculations.) The capacity of Jefferson Street, flowing full, is 25 cfs. (See Street Capacity Calculations in the Appendix A.)

Basin C is located at the southern entrance to the site. It consists of one retail pad site and the associated parking and landscaping. The roof will be sloped to channel the storm water into roof drains that discharge into the landscaped areas. The parking is sloped to channel the storm water to a 2-foot curb opening connected to two-24" wide sidewalk culverts. This basin contains 1.29 acres and discharges 5.7 cfs into Jefferson Street which flows south along the gutter to a new type "D" inlet. Due to the widening of the south entrance into the site, the type "D" inlet is replacing the existing curb type inlet. This follows the historic drainage pattern. (See attached Proposed Conditions Basin Map and Grading and Drainage Plan in the map pocket.)

Basin D is the eastern and southern portion of the site. This basin accepts offsite flows of 11.26 cfs from the I-25 west frontage road. The basin consists of the seven retail pad sites, a portion of the ring road and the associated parking and landscaping. The storm water from the roofs is channeled to roof drains and discharged to the landscaped area. Storm water in the parking areas sheet flows to either concrete rundowns, sidewalk culverts or the ring road.

The runoff is then directed to the desilting pond located near the southern boundary. The desilting pond releases the runoff to the existing public storm water system in Jefferson Street, as previously stated under the existing conditions. The storm water carried in the ring road is also channeled to the desilting pond. The storm water collected in the desilting pond will be discharged into the existing 24" reinforced concrete located at the southern property line. This existing pipe is connected to the Jefferson Street public storm drain system that discharges into the Vineyard Channel. This basin discharges 91.3 cfs and 11.26 cfs of offsite flows into the public storm drain system. (See attached Proposed Conditions Basin Map and Grading and Drainage Plan in Map Pocket.)

Basin 5, Jefferson Street contributes 8.60 cfs to the public storm sewer system downstream.

Emergency Conditions

For emergency conditions the storm water will be carried in the service road and the parking lots to the public storm drain system in Jefferson Street or to the Bear Canyon Arroyo.

Summary

The developed site will discharge 32.91 cfs directly into the Bear Canyon Arroyo and 181.08 cfs into the public storm drain system in Jefferson. **Flowmaster** was used to analyze the existing storm water system with improvements. Using this software the allowable discharge into Bear Canyon Arroyo is 32.91 cfs to keep the hydraulic grade line in the ground. The public storm drain system is connected to the Vineyard Channel downstream. The site accepts 11.26 cfs of offsite flows that will discharge into the public storm sewer on Jefferson Street. The total amount of flows entering the public storm water system in Jefferson is 181.08 from @25, 11.26 cfs from I-25 offsite and 8.60 cfs in Jefferson for a total of 200.94 cfs. The

Vineyard Channel report has an allowable discharge of 225 cfs entering the public system from this site and a portion of Jefferson Street. This development is contributing 24 cfs less than the allowable reported in the Vineyard Channel Report developed by Greiner Inc.

RUNOFF SUMMARY TABLE -DEVELOPED CONDITIONS

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
A	1109042	25.46	.03978
B	74052	1.70	.00226
C	56192	1.29	.00216
D	913456	20.97	.03278

BASIN	DEVELOPED Q100 (CFS)	DEVELOPED V100 (CF)
A	109.82	158606
B	7.24	11575
C	5.7	9100
D	91.3	13290

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TIERRA WEST LLC
4421 McLeod Road NE, Suite D, Albuquerque, NM 87109 Phone (505) 883-7592 - Fax (505) 883-7034

RUNOFF CALCULATIONS

Date: Jan. 15, 1999 Project: Digital @25 Zone Atlas: E-17 & F-17

This procedure is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", peak discharge rate for small watersheds less than forty acres in size.

Precipitation Zone from Figure A-1: 2
Land treatment descriptions are in Table A-4.

1. RUNOFF RATE COMPUTATION

Use Equation A-10: $Q_P = Q_{PA} A_A + Q_{PB} A_B + Q_{PC} A_C + Q_{PD} A_D$
Values of Q_{pi} are from Table A-9, and are in CFS/acre. Area values are in acres.

BASIN	Q_{PA}	A_A	Q_{PB}	A_B	Q_{PC}	A_C	Q_{PD}	A_D	Q_P
EXISTING RATE OF RUNOFF (CFS)									
Basin 1	1.56	0.00	2.28	4.40	3.14	2.20	4.70	18.12	102.10
Basin 2	1.56	0.00	2.28	2.26	3.14	9.94	4.70	9.78	82.33
Basin 3	1.56	0.00	2.28	1.69	3.14	0.00	4.70	1.02	8.65
Total									193.08
OFF-SITE BASINS RATE OF RUNOFF (CFS)									
Basin 4	1.56	0.00	2.28	0.00	3.14	1.79	4.70	1.20	11.26
Basin 5	1.56	0.00	2.28	0.00	3.14	0.00	4.70	1.83	8.60

BASIN	Q_{PA}	A_A	Q_{PB}	A_B	Q_{PC}	A_C	Q_{PD}	A_D	Q
DEVELOPED RATE OF RUNOFF (CFS)									
Basin A	1.56	0.00	2.28	2.65	3.14	2.20	4.70	20.61	109.82
Basin B	1.56	0.00	2.28	0.31	3.14	0.00	4.70	1.39	7.24
Basin C	1.56	0.00	2.28	0.17	3.14	0.00	4.70	1.12	5.65
Basin D	1.56	0.00	2.28	2.99	3.14	0.00	4.70	17.97	91.28
Total									213.98
OFF-SITE DEVELOPED RATE OF RUNOFF (CFS)									
Basin 4	1.56	0.00	2.28	0.00	3.14	1.79	4.70	1.20	11.26
Basin 5	1.56	0.00	2.28	0.00	3.14	0.00	4.70	1.83	8.60

2. RUNOFF VOLUME COMPUTATION

Use Equation A-5 to compute weighted excess precipitation:

Weighted E = "E" = $(E_A A_A + E_B A_B + E_C A_C + E_D A_D)/(A_A + A_B + A_C + A_D)$

$(A_A + A_B + A_C + A_D) = \sum A_I$

Use Equation A-6 to compute the volume:

V_{360} = "E" x $(A_A + A_B + A_C + A_D)$ x 3630 feet^3/acre·inch

Values of E_I are from Table A-8, and are in inches. Area values are in acres.

BASIN	E_A	A_A	E_B	A_B	E_C	A_C	E_D	A_D	$\sum A_I$	"E"	V_{360}
EXISTING VOLUME OF RUNOFF (CUBIC FEET)											
Basin 1	0.53	0.00	0.78	4.40	1.13	2.20	2.12	18.12	24.73	1.79	160927
Basin 2	0.53	0.00	0.78	2.26	1.13	9.94	2.12	9.78	21.98	1.51	122435
Basin 3	0.53	0.00	0.78	1.69	1.13	0.00	2.12	1.02	2.71	1.51	12635
Total											295,996
OFF-SITE VOLUME OF RUNOFF (CUBIC FEET)											
Basin 4	0.53	0.00	0.78	0.00	1.13	1.79	2.12	1.20	2.99	1.53	16577
Basin 5	0.53	0.00	0.78	0.00	1.13	0.00	2.12	1.86	1.86	2.12	14314

BASIN	E_A	A_A	E_B	A_B	E_C	A_C	E_D	A_D	$\sum A_I$	"E"	V_{360}
DEVELOPED VOLUME OF RUNOFF (CUBIC FEET)											
Basin A	0.53	0.00	0.78	2.65	1.13	2.20	2.12	20.61	25.46	1.72	158606
Basin B	0.53	0.00	0.78	0.31	1.13	0.00	2.12	1.39	1.70	1.88	11575
Basin C	0.53	0.00	0.78	0.17	1.13	0.00	2.12	1.12	1.29	1.94	9100
Basin D	0.53	0.00	0.78	2.99	1.13	0.00	2.12	17.97	20.96	1.82	138290
Total											317,571
OFF-SITE DEVELOPED VOLUME OF RUNOFF (CUBIC FEET)											
Basin 4	0.53	0.00	0.78	0.00	1.13	1.79	2.12	1.20	2.99	1.46	16577
Basin 5	0.53	0.00	0.78	0.00	1.13	0.00	2.12	1.83	1.86	2.12	14314

Storm Inlets @ Entrance

- Overall area =

BASIN A. 102.58 CFS
+ 7.23 CFS

Inlet - Top of Grate = 57.53 = 57.72 = .20
INV = 53.00
= 53.27

Type "C" inlet

$Q = CA\sqrt{2gH}$

A = 4.36
H = .20
C = .60
g = 32.2

4.36

Q = 9.38 capacity

Pipe - h = 3' ft of pipe

24" ϕ

$Q = CA\sqrt{2gh} =$

$= .6 * \frac{\pi d^2}{4} \sqrt{2g3}$

Q = 26.20

SIDEWALK CULVERT

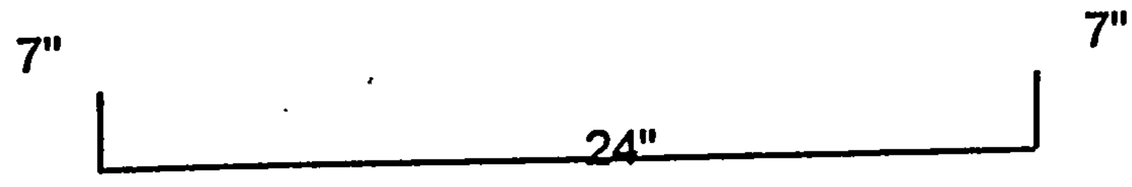
Orifice Equation:

$$Q = CA\sqrt{2gH}$$

Solve for Q
C = 0.6
A = 0.5833*2 = 1.167 ft^2
g = 32.2
H = Height of water measured from center of orifice

$$Q = 0.6(1.167)\sqrt{2*32.2*\frac{0.5833}{2}}$$

Q=3.04 cfs
Use a 24" sidewalk culvert
3.04 cfs > 1.59 cfs



BASIN B 2-24" SIDEWALK CULVERTS
BASIN C 2-24" SIDEWALK CULVERTS
BASIN D 5-24" SIDEWALK CULVERTS
2-24" SIDEWALK CULVERTS

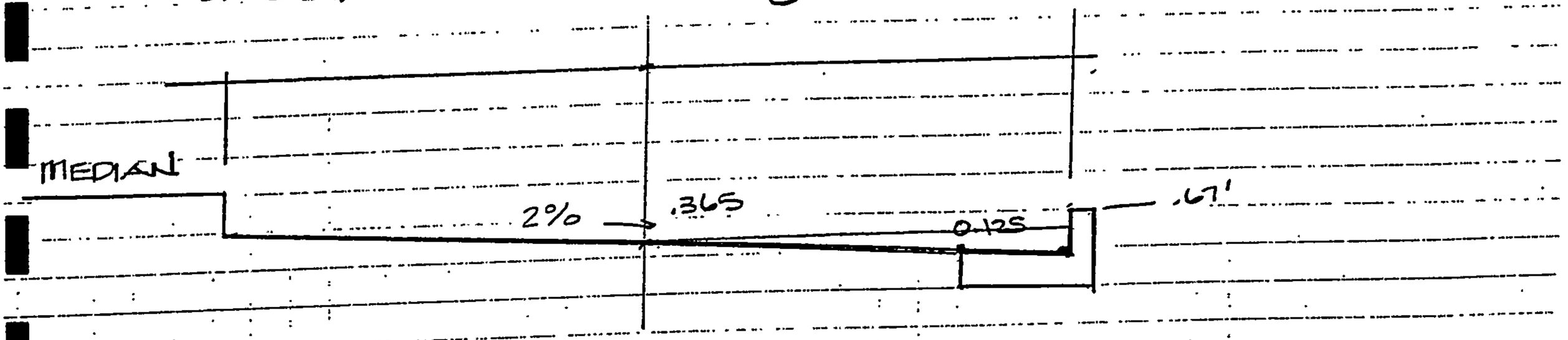
Street Capacity

Jefferson STREET.

Minor Arterial

Maximum Street Depth for 10 yr. storm

- one lane free driving



Driving Lane Free

open channel

$$Q = \frac{1.49}{.017} \cdot A \cdot R^{2/3} \cdot S^{1/2}$$

$$A = \frac{.365 \times 12}{2} = 2.19$$

$P = 12.365$

$S = .0072$

$R = 0.177$

$Q = 25.32$

Street Capacity Calculations

Loop Roads - 1/2 Street Section
32' F-F Street Section with 6" curb
Slope= 0.0091

For water depths less than 0.125 feet

Y= Water depth
Area = 6*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0006	0.170312	0.003523	0.000116	0.000232	0.193061	0.001931	0.340225	0.001939
0.02	0.0024	0.340624	0.007046	0.000736	0.001471	0.306465	0.006129	0.38189	0.00472
0.04	0.0096	0.681249	0.014092	0.00467	0.00934	0.486483	0.019459	0.428657	0.011432
0.06	0.0216	1.021873	0.021138	0.013769	0.027539	0.637473	0.038248	0.458625	0.019137
0.08	0.0384	1.362498	0.028184	0.029654	0.059308	0.772243	0.061779	0.481151	0.027552
0.1	0.06	1.703122	0.035229	0.053767	0.107533	0.896109	0.089611	0.499382	0.036531
0.12	0.0864	2.043746	0.042275	0.08743	0.174861	1.011925	0.121431	0.51479	0.045982
0.125	0.09375	2.128902	0.044037	0.097485	0.19497	1.039843	0.12998	0.518304	0.048411

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.104375	2.383952	0.043782	0.108115	0.21623	1.035833	0.134658	0.506279	0.048528
0.16	0.194375	3.914252	0.049658	0.218974	0.437947	1.126553	0.180248	0.496322	0.057885
0.2	0.384375	5.954652	0.06455	0.515757	1.031513	1.341806	0.268361	0.528746	0.079905
0.24	0.654375	7.995052	0.081847	1.028618	2.057236	1.571909	0.377258	0.56545	0.106348
0.28	1.004375	10.03545	0.100083	1.80534	3.610681	1.797476	0.503293	0.598627	0.1353
0.32	1.434375	12.07585	0.11878	2.890125	5.780249	2.014902	0.644769	0.627698	0.166025
0.36	1.944375	14.11625	0.13774	4.324252	8.648505	2.223981	0.800633	0.653208	0.198148
0.365	2.01375	14.3713	0.140123	4.530044	9.060088	2.249556	0.821088	0.656179	0.202249

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365
A3= A2 + Y2*14
P3= P2 + Y2

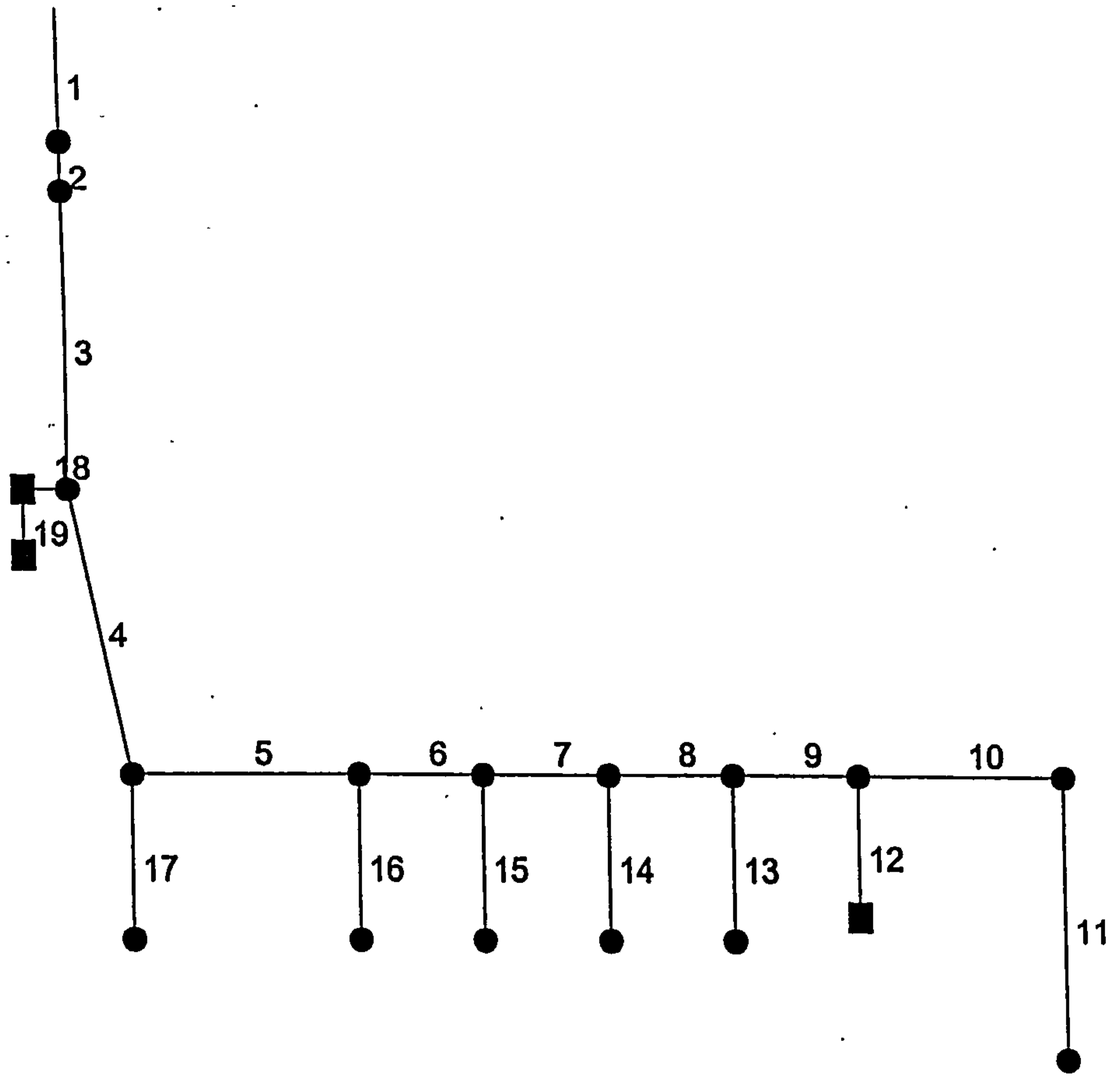
Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.37	2.08375	14.3763	0.144943	4.79441	9.588819	2.300856	0.851317	0.666593	0.209825
0.41	2.64375	14.4163	0.183386	7.115771	14.23154	2.691545	1.103533	0.740767	0.270931
0.45	3.20375	14.4563	0.221616	9.783257	19.56651	3.053689	1.37416	0.802215	0.332909
0.49	3.76375	14.4963	0.259635	12.77283	25.54565	3.393644	1.662886	0.854359	0.395762
0.54	4.46375	14.5463	0.306865	16.93383	33.86767	3.793634	2.048562	0.909768	0.475387
0.59	5.16375	14.5963	0.353771	21.53793	43.07587	4.170987	2.460882	0.95694	0.556211
0.63	5.72375	14.6363	0.391065	25.52334	51.04667	4.459198	2.809295	0.990053	0.621649
0.667	6.24175	14.6733	0.425381	29.43852	58.87704	4.716389	3.145831	1.017698	0.682754

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667
A4= A3 + 14 * Y3 + 25 * Y3^2
P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.730975	16.32363	0.412345	31.09396	62.18792	4.619533	3.233673	0.973018	0.674856
0.72	7.053975	17.32383	0.407183	32.31353	64.62707	4.580897	3.298246	0.951385	0.673461
0.74	7.396975	18.32403	0.403676	33.68993	67.37986	4.554555	3.370371	0.933044	0.674198
0.76	7.759975	19.32423	0.401567	35.22002	70.44004	4.538677	3.449395	0.917476	0.676789
0.78	8.142975	20.32443	0.40065	36.90202	73.80404	4.531761	3.534774	0.904257	0.681006
0.8	8.545975	21.32463	0.400756	38.73518	77.47036	4.532564	3.626051	0.89304	0.686659
0.847	9.57175	23.6751	0.404296	43.63968	87.27937	4.559217	3.861657	0.873013	0.704729

Plan View



Proj. file: 9854-2.STM	IDF file: ZONE254.IDF	No. Lines: 19	05-04-1999

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Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1	1	32.91	30 c	80.0	50.00	51.28	1.600	52.50	53.20	1.03	End
2	2	32.91	30 c	30.0	51.28	51.54	0.867	54.23*	54.42*	0.70	1
3	3	32.91	30 c	180.0	51.54	52.73	0.661	55.12*	56.28*	0.70	2
4	4	14.91	27 c	180.0	52.73	53.92	0.661	56.98*	57.39*	0.22	3
5	5	13.20	27 c	180.0	53.92	54.80	0.489	57.61*	57.94*	0.17	4
6	6	11.49	24 c	100.0	54.80	55.64	0.840	58.11*	58.37*	0.21	5
7	7	9.78	21 c	100.0	55.64	57.31	1.670	58.58	58.91	0.28	6
8	8	8.07	18 c	100.0	57.31	59.22	1.910	59.19	60.30	0.54	7
9	9	6.36	18 c	100.0	59.22	61.00	1.780	60.84	61.96	0.44	8
10	10	4.65	15 c	162.0	61.00	63.50	1.543	62.40	64.36	0.41	9
11	11	1.71	10 c	170.0	63.50	65.20	1.000	64.77	65.83	0.23	10
12		1.71	10 c	85.0	61.00	64.00	3.529	62.40	64.58	0.28	9
13		1.71	8 c	100.0	59.22	61.22	2.000	60.84*	62.85*	0.37	8
14		1.71	8 c	100.0	57.31	59.31	2.000	59.19*	61.20*	0.37	7
15		1.71	8 c	100.0	55.64	57.64	2.000	58.58*	60.58*	0.37	6
16		1.71	8 c	100.0	54.80	56.80	2.000	58.11*	60.12*	0.37	5
17		1.71	8 c	100.0	53.92	55.92	2.000	57.61*	59.62*	0.37	4
18		18.00	24 c	35.0	52.73	53.00	0.771	56.98*	57.20*	0.51	3
19		9.00	24 c	40.0	53.00	53.27	0.675	57.71*	57.77*	0.13	18

PROJECT FILE: 9854-2.STM | I-D-F FILE: ZONE254.IDF | TOTAL NO. LINES: 19 | RUN DATE: 05-04-1999

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

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Storm Sewer Inventory Report

Line #	Line ID	DnStr line #	Defl angle (deg)	Line length (ft)	Line size (in)	Line type	Line slope (%)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Known Q (cfs)	Invert El dn (ft)	Invert El up (ft)	N value	Junction type	J-Loss coeff (JLC)	Natural grnd (ft)	Dns line #
1	1	0	90	80	30	Circular	1.60	0.00	.00	0	0.0	50.00	51.28	.013	MH	1.0	60.00	Off
2	2	1	0	30	30	Circular	0.87	0.00	.00	0	0.0	51.28	51.54	.013	MH	1.0	60.00	1
3	3	2	0	180	30	Circular	0.66	0.00	.00	0	0.0	51.54	52.73	.013	MH	1.0	59.00	2
4	4	3	-15	180	27	Circular	0.66	0.00	.00	0	0.0	52.73	53.92	.013	MH	1.0	60.00	3
5	5	4	-75	180	27	Circular	0.49	0.00	.00	0	0.0	53.92	54.80	.013	MH	1.0	60.50	4
6	6	5	0	100	24	Circular	0.84	0.00	.00	0	0.0	54.80	55.64	.013	MH	1.0	61.50	5
7	7	6	0	100	21	Circular	1.67	0.00	.00	0	0.0	55.64	57.31	.013	MH	1.0	62.50	6
8	8	7	0	100	18	Circular	1.91	0.00	.00	0	0.0	57.31	59.22	.013	MH	1.0	63.50	7
9	9	8	0	100	18	Circular	1.78	0.00	.00	0	0.0	59.22	61.00	.013	MH	1.0	64.50	8
10	10	9	0	162	15	Circular	1.54	0.00	.00	0	2.9	61.00	63.50	.013	MH	1.0	65.50	9
11	11	10	90	170	10	Circular	1.00	0.00	.00	0	1.7	63.50	65.20	.013	MH	1.0	66.30	10
12		9	90	85	10	Circular	3.53	0.00	.00	0	1.7	61.00	64.00	.013	Grate	1.0	67.00	9
13		8	90	100	8	Circular	2.00	0.00	.00	0	1.7	59.22	61.22	.013	MH	1.0	63.50	8
14		7	90	100	8	Circular	2.00	0.00	.00	0	1.7	57.31	59.31	.013	MH	1.0	62.50	7
15		6	90	100	8	Circular	2.00	0.00	.00	0	1.7	55.64	57.64	.013	MH	1.0	61.00	6
16		5	90	100	8	Circular	2.00	0.00	.00	0	1.7	54.80	56.80	.013	MH	1.0	60.50	5
17		4	15	100	8	Circular	2.00	0.00	.00	0	1.7	53.92	55.92	.013	MH	1.0	60.00	4
18		3	90	35	24	Circular	0.77	0.00	.00	0	9.0	52.73	53.00	.013	Curb	1.0	57.00	3
19		18	-90	40	24	Circular	0.68	0.00	.00	0	9.0	53.00	53.27	.013	Curb	1.0	57.50	18

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PROJECT FILE: 9854-2.STM | I-D-F FILE: ZONE254.IDF | TOTAL NUMBER OF LINES: 19 | RUN DATE: 05-04-1999

DESIGN CODES: Min. Pipe Size = 12 in; Max. Pipe Size = 60 in; Min. Slope = .2 %; Min. Cover = 4 ft; Inlet N-Values = .013 ; Average Inlet Throat Height = 8 in

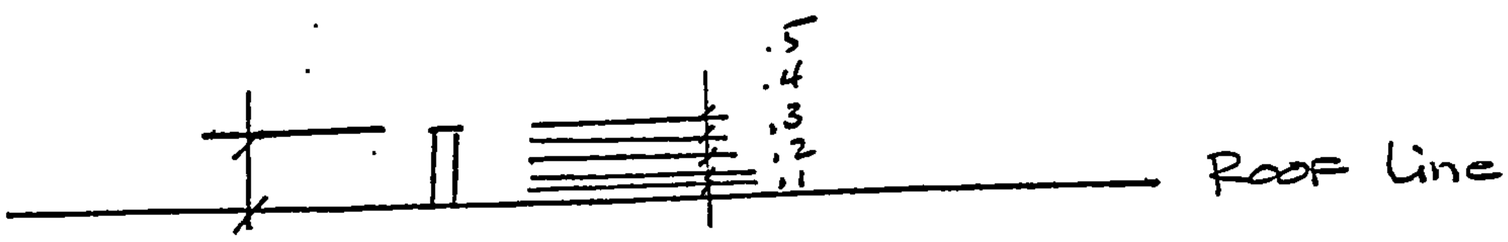
9800654 DIGITAL @ 25. 1.19.99

ROOF PIPING CAPACITY

ORIFICE EQUATION

$$Q = CA\sqrt{2gH}$$

H = water depth measured to Center of Plate.



C = .6

$A = \frac{\pi d^2}{4} = \pi \cdot \frac{0.17^2}{4}$ $d = 2'' = 0.022\ FT^2$

H = 0.1 => 0.5

$Q_1 = .6 * 0.022\sqrt{2*32.2*.1} = 0.03$ CFS ①

$Q_2 = .6 * 0.022\sqrt{2g*.2} = 0.047$ CFS

$Q_3 = .6 * .022\sqrt{2g*.3} = 0.058$ CFS

$Q_4 = .6 * .022\sqrt{2g*.4} = 0.066$ CFS

$Q_5 = .6 * .022\sqrt{2g*.5} = 0.074$ CFS

$d = 4''$, $C = .6$

$Q = .6 * .0873\sqrt{2g \cdot .1} = 0.133$ CFS

$Q_2 = .6 * .0873\sqrt{2g \cdot .2} = 0.188$ CFS

$Q_3 = .6 * 0.0873 * \sqrt{2g*.3} = 0.230$ CFS

$Q_4 = .6 * 0.0873 * \sqrt{2g*.4} = 0.266$ CFS

$Q_5 = .6 * 0.0873 * \sqrt{2g \cdot .5} = 0.297$ CFS

MANNING'S EQUATION Q=1.49/n *A*R2/3*S1/2
n = 0.013

PIPE NO.,	A	P	R	S	Q	V
1 - 8"	0.352387	2.09124	0.16851	0.02	1.732246	4.915755
2 - 10"	0.544703	2.61876	0.20800	0.02	3.083333	5.660578
3 - 8"	0.352387	2.09124	0.16851	0.02	1.732246	4.915755
4 - 8"	0.352387	2.09124	0.16851	0.02	1.732246	4.915755
5 - 8"	0.352387	2.09124	0.16851	0.02	1.732246	4.915755
6 - 8""	0.352387	2.09124	0.16851	0.02	1.732246	4.915755
7 - 8"	0.352387	2.09124	0.16851	0.02	1.732246	4.915755
8 - 15"	1.226563	3.925	0.31250	0.015	7.898193	6.439291
9 - 18"	1.76625	4.71	0.37500	0.02	14.83922	8.401539
10 - 18"	1.76625	4.71	0.37500	0.021	15.20567	8.609016
11 - 21"	2.404063	5.495	0.43750	0.0157	19.84238	8.253688
12 - 24"	3.14	6.28	0.50000	0.0085	20.85412	6.64144
13 - 24"	3.14	6.28	0.50000	0.0088	21.21895	6.757626
14 - 27"	3.974063	7.065	0.56250	0.0066	25.16701	6.332818
15 -12"	0.785	3.14	0.25000	0.0147	4.309144	5.489356
16 - 12"	0.785	3.14	0.25000	0.0196	4.975771	6.338562
17 - 15"	1.226563	3.925	0.31250	0.0183	8.723839	7.11243
18 - 30"	4.90625	7.85	0.62500	0.0068	33.84439	6.898219
19 - 30"	4.90625	7.85	0.62500	0.0068	33.84439	6.898219
20 - 30"	4.90625	7.85	0.62500	0.0068	33.84439	6.898219
21 - 10"	0.544703	2.61876	0.20800	0.02	3.083333	5.660578
22 - 10"	0.544703	2.61876	0.20800	0.02	3.083333	5.660578