HYDROLOGY

F21/D37

MONTGOMERY

BUSINESS PARK

F21-D37

2 PLANS

RECEIVED B.H. NOV 10 1982

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

July 15, 1982

Mr. Robert Kastning
Jack M. Clifford & Company
2201 San Pedro Dr. NE
Two San Pedro Park, Suite 201
Albuquerque, NM 87110

RE: WATER AND SEWER AVAILABILITY TO THE 14 ACRES ON THE NORTHEAST CORNER OF MONTGOMERY BLVD. & MORRIS STREET (F-21)

Dear Mr. Kastning:

In response to your letter of request for water and sewer availability to the referenced site, the status is as follows:

Water and sewer services are generally available to the referenced site. The details of line extensions, the determination of the line sizes, and the point of service connections for both water and sewer will require more information which will have to be provided by you in order to complete the study. Required will be:

1) Fire flow requirements obtained from the Fire Department.

2) Floor elevations for each of the proposed buildings.

3) Access and street configuration from the proposed buildings to the major streets.

If you have any questions, feel free to call me.

Sincerely,

Paul Brasher for

Brian Pirooz, Engineer
Water Resources Department

Attach:

cc: P.D. Noland
M.E. Mendoza
P. Brasher
f/Project
f/readers (7-06)

JACK M. CLIFFORD & COMPANY
2201 SAN PEDRO DRIVE NE
TWO SAN PEDRO PARK, SUITE 201
ALBUQUERQUE, NEW MEXICO 87110
PHONE (505) 884-5573

November 5, 1982

HAND DELIVERED

Development Review Board Committee
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Dear Sir:

Jack M. Clifford & Co. wishes to thank the Development Review Board for informally addressing the issue of access through Clifford Industrial Park (D.R.B. 164) on October 26, 1982. We also wish to make the following statements in regard to this issue:

Ok 1. Jack M. Clifford & Co. agrees with the recommendation of the D.R.B. to cul-de-sac Washington Place, NE if the lands lying west of Clifford Industrial Park should be used for purposes other than industrial.

2. Jack M. Clifford & Co. will not be held responsible for acquiring the consent of A.M.A.F.C.A. for the use of their lands for the future access. This will have to be the responsibility of the beneficiary of the access road.

3. Jack M. Clifford & Co. will not be responsible for the costs of any improvements to the access road on A.M.A.F.C.A.'s lands, other than the drainage improvements already being designed in conjunction with our project.

4. Jack M. Clifford & Co. is willing to grant a 48' wide right-of-way to the City of Albuquerque between Lots 54 and 55 and provide for construction of a dip section-crossing at the intersection of the drainage easement and access road on Jack M. Clifford & Co.'s lands only. There is to be the understanding that, should these lands be used for purposes other than industrial uses or the city finds this right-of-way unnecessary, the 48' right-of-way will revert back, in total, to the existing lot owners.

5. If the use of the lands in question has not been decided prior to the construction of Phase Two of Clifford Industrial Park, which contains both Lots 54 and 55, the 48' right-of-way will then revert back to the land owners.

Sincerely,

Robert L. Kastning

RECEIVED
NOV 5 1982
TRAFFIC ENGINEERING DIVISION
City of Albuquerque

RLK:ls

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION

HYDROLOGY SECTION PROJ. NO._____ DATE: 11-17-82

PLANNING DIVISION NO._____

CONFERENCE RECAP

SUBJECT: Clifford Business Park (Montgomery & Morris)

ATTENDANCE: WHO	REPRESENTING
Brian Burnett	City
Dave Woods	B&H

FINDINGS:
1. Permission granted for placing diversion berm and desilting basin on Park Property. Written concurrence should be obtained from City Engr. and Parks and Rec.
2. Nuisence flows must remain on-site.
3. Permanent drainage facilities (and maintained by City) must be constructed to City Standards (use Drainage Ordinance for establishing responsibility)

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Brian D. Burnett
TITLE: Cit Hydrology
DATE: 11-17-82

SIGNED:
TITLE:
DATE:

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE REF. NO._____

11/18/82

TO: Chuck Easterling, Assistant City Engineer, Engineering Division

FROM: Al Boberg, Assistant Director, Golf/Park Management

SUBJECT: Hahn Park Drainage

This is to request the assistance of the City Engineer's Office in the review of proposed drainage improvements on or adjacent to Hahn Park. This is the result of the development of the Clifford Property to the south and west of the park. Since this park is leased to the Roadrunner Little League it will be necessary to coordinate any improvements with the League's site plan. Dave Woods from Bohannon - Houston Engineering (881-2000) is preparing the drainage report for the Clifford Property.

AB/JS/jb

cc: Hahn Park
Roadrunner Little League President

RECEIVED

NOV 23 1982

ENGINEERING

INFORMATION SHEET

PROJECT TITLE Montgomery Business Park TYPE OF SUBMITTAL Conceptual Grading and Drainage Plan

ZONE ATLAS PAGE NO. F-21 -D37 CITY ADDRESS East of Morris, North of Montgomery

LEGAL DESCRIPTION

ENGINEERING FIRM Bohannan–Huston, Inc. CONTACT Dave Woods

ADDRESS 4125 Carlisle Blvd., N.E. PHONE 881-2000

OWNER Jack M. Clifford and Company CONTACT Knight Seavey

ADDRESS 2201 San Pedro, N.E. PHONE 884-5573

ARCHITECT CONTACT

ADDRESS PHONE

SURVEYOR CONTACT

ADDRESS PHONE

CONTRACTOR CONTACT

ADDRESS PHONE

DATE SUBMITTED November 29, 1982

BY David M.G. Millikan

RECEIVED
NOV 30 1982
ENGINEERING

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

F21 - D37

December 16, 1982

Mr. Dave Woods
Bohannan-Huston, Inc.
4125 Carlisle Blvd. N.E.
Albuquerque, N.M. 87110

RE: MONTGOMERY BUSINESS PARK DRAINAGE REPORT

Dear Dave:

I have made an initial review of the referenced drainage report and forward the following comments:

1. Report Statement: "Basin E consists of six lots which will discharge to Montgomery Blvd."

Comment: Please clarify the drainage boundaries for each basin. I'm abit confused about which lots are associated with this basin (I count 5 lots). A table outlining the development criteria for each lot would be helpful.

2. Report Statement: "If an individual lot is developed, the developer will be required to protect his lot from the runoff from the upland lots."

Comment: Criteria should be established outlining what type of diversion(s) or conveyance will be acceptable.

3. Report Statements: "No substantial grading will take place in Blocks E and F. A berm shall be constructed within Hahn Park along the north property line of Block F. This berm will concentrate the upland runoff (11.0 cfs) at one point. From this point, it will be discharged through Block F to Montgomery Blvd. within an asphalt-lined swale. Minor nuisance flows from Hahn Park will be retained within the park."

Comments:

a. When permission was granted for placing a diversion berm and desilting basin on property to the north of Block F (see Conference Recap 11-17-82), I did not realize that the City was leasing the land to the Little

League and that the league is responsible for maintaining and upkeep on the property. We, therefore, want to insure that the method used for the diversion is relatively maintenance free and does not restrict any plans for future development on the site. A possible solution may be to place an asphalt curb along the property line. This item should be investigated further.

b. Are the asphalt lined swales going to be maintained by the developer?

c. Any thoughts on how to retain nuisance flows within the park? Any plans for this site should be coordinated with Parks & Recreation and a representative from the Little League Association.

4. Report Statement (p.5): "Each lot shall protect itself from upland flows..."

Comment: See comment #2.

5. Report Statement: "An asphalt lined swale should be constructed along the west property line to convey the runoff (4.0 csf) from the upland basin to Montgomery Blvd."

Comment: Please clarify the watershed that yields this 4.0 cfs. Figure 9 just shows one large watershed impacting Block G.

6. Report Statement: "An additional asphalt swale, or diversion berm, should be constructed within the proposed utility and access easement at the east property line to convey the upland runoff (16.4 cfs) to Montgomery Blvd."

Comment: Depending on how the property develops, it maybe possible to convey the off-site flows through Block G without the use of a berm. See Comment #2.

7. Comments on Erosion Control Plan:

a. What was the rational used for selecting the 10-year storm for ponding purposes? Do you see this amount of runoff causing "nuisance ponds" that might be maintenance headaches?

b. What type of "temporary discharge point" will be provided?

c. Construction details should be provided for the berm. A berm constructed with just a grader blade will probably not hold up.

8. I concur with the hydrologic and hydraulic computations listed in the report.

Overall, the report is well documented and thorough. If you have any questions on the items listed above, please call.

Very truly yours,

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

cc: Al Boberg, Parks & Recreation

BOHANNAN-HUSTON INC.
4125 CARLISLE BLVD., N.E. ALBUQUERQUE, NEW MEXICO 87107 505 881-2000
6701 VISCOUNT BLVD., EL PASO, TEXAS 79925 915 778-4491
330 GARFIELD, SANTA FE, NEW MEXICO 87501 505 988-7871

January 4, 1983

Roadrunner Little League
c/o Mr. Dan Dalen
2521 La Charles, N.E.
Albuquerque, NM 87112

Gentlemen:

Enclosed is a drawing illustrating the proposed temporary treatment of the storm waters discharged from Hahn Park. The purpose of the proposed berm is to concentrate the runoff at one location so Jack M. Clifford and Company may provide a facility to safely convey these flows through Montgomery Business Park to Montgomery Boulevard. Upon development of all the lots adjoining Hahn Park, the berm will be removed by Jack M. Clifford and Company. The runoff from the park will be conveyed through the individual lots in drainage facilities constructed by each lot owner.

Jack M. Clifford and Company shall be responsible for the functional maintenance of the berm and desilting pond. The berm shall be designed to allow vehicle access to the building and southern entrances of the playing fields.

If you are in agreement with this arrangement, please sign in the space indicated below. If you have any questions, please contact Dave Woods or me.

Sincerely yours,

Michial M. Emery

Michial M. Emery, P.E.
Vice President

APPROVED

_____
Roadrunner Little League

_____
Jack M. Clifford and Company

Paul T. Burnett Co/Hydro 1/20/83
City Hydrology

_____
Albuquerque Parks & Recreation Dept.

cc: Mr. Bob Wharton
Mr. Chuck Easterling
Mr. Marty Valdez

Enclosure

DWW/dlh
Job No. 2 144 0

PRINCIPALS
JERRY R. BOHANNAN, P.E. & L.S.
LARRY W. HUSTON
DONALD T. CREMANS, P.E.
C.J. (SKIP) MEAD, P.E.
MICHIAL M. EMERY, P.E.

ASSOCIATES
ANDRES ARAGON VIAMONTE, P.E.
JACK EICHORN
ROBERT H. GREENLEE, P.E.
G. LEE TRUSSELL
ISAAC J. PINO, P.E.
RAMON LARA, P.E.
DARRELL L. WADE, P.E.
PATRICK L. STIEHR, P.E.
DAVID M.Y. MILLIKAN, P.E.

BOHANNAN-HUSTON INC.
4125 CARLISLE BLVD., N.E. ALBUQUERQUE, NEW MEXICO 87107 505 881-2000
6773 VISCOUNT BLVD., EL PASO, TEXAS 79925 915 778-4491
330 GARFIELD, SANTA FE, NEW MEXICO 87501 505 988-7671

January 5, 1983

RECEIVED
JAN 1 1 1983
CITY ENGINEER

Mr. Brian Burnett
City Engineering – Hydrology
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

Re: Montgomery Business Park Drainage Report Comments

Dear Brian:

I have reviewed your comments regarding Montgomery Business Park and have the following responses to them. The numbers refer to your comment numbers in your letter of December 16, 1982 (F21-D37).

1. You are correct that there are five (5) lots in Basin E, not six (6). As you are aware, this drainage report is conceptual and the actual sizes of each lot are not yet established. Therefore, we feel it is undesirable to try and list specific pond volumes when actual lot sizes are unknown. Sheets 5 and 6 of the report include a formula for determining required pond volumes based upon actual lot size and a table indicating the total pond volumes required for each block.

2. It is City policy that when a parcel develops, the developer shall provide either protection from or a conveyance for the upland runoff impacting the site. Since this is a conceptual report, each developer shall be required to submit a detailed drainage plan prior to development of his lot. At that time, details of the specific facilities for that lot may be reviewed. In this project, the upland runoff for individual lots is approximately 1 cfs and no major facility will be required for its diversion or conveyance. Included at the end of this letter is a detail for the construction of a temporary diversion berm which may be used if upland flows are to be diverted around the site.

3. a. We are currently in the process of obtaining approval from the Roadrunner Little League, Jack M. Clifford and Company, Water Resources, and the Parks & Recreation Department to put a berm within Hahn Park which will be maintained by Jack M. Clifford and Company, and removed upon development of the lots adjoining the park. The complete design for the berm will be included in the construction drawings for Montgomery Business Park Phase II. A tentative design is enclosed.

PRINCIPALS
JERRY R. BOHANNAN, P. E. & L.S.
LARRY W. HUSTON
DONALD T. CREMANS, P. E.
C.J. (SKIP) MEAD, P. E.
MICHAEL M. EMERY, P. E.

ASSOCIATES
ANDRES ARAGON VIAMONTE, P. E.
JACK EICHORN
ROBERT H. GREENLEE, P. E.
G. LEE TRUSSELL
ISAAC J. PINO, P. E.
RAMON LARA, P. E.
DARRELL L. WADE, P. E.
PATRICK L. STIEHR, P. E.
DAVID M.Y. MILLIKAN, P. E.

b. The asphalt-lined swales within Montgomery Business Park will be privately maintained.

c. The tentative drawings for the Hahn Park berm also include a desilting pond which will retain nuisance flows.

4. See response number 2.

5. Enclosed is a modified figure 10 from the report delineating the basins impacting Block G. The runoff which will be conveyed west is actually 2.8 cfs. The runoff from Basin A is 17.6 cfs instead of the 16.4 shown in the report. It is intended to extend the Hahn Park berm to protect the north boundary of Block G so the 2.8 cfs will be combined with the 11.0 cfs from Basin B to yield a total discharge from Hahn Park of 13.8 cfs.

6. You are correct, runoff from upland Basin A may be conveyed through or diverted around Block G. Since this is a conceptual report, we will not outline a specific method on how the upland runoff from Basin A should be handled by Block G.

7. a. The purpose of the retention ponds on the graded lots is to eliminate silted runoff to the existing and proposed roads. Most of the graded lots are within Phase I and should be developed in the next few years. The retention ponds will only be used until development occurs. If the capacity of a pond is exceeded, it will be the responsibility of the developer to refurbish the pond.

b. The temporary discharge point for the retention ponds will be a compacted earth weir. The berms forming these ponds shall conform to the berm specifications included with this letter. Details of each berm and compacted earth weirs will be provided with the grading plans for each phase.

If you have any questions, please call Dave Woods or me.

Sincerely yours,

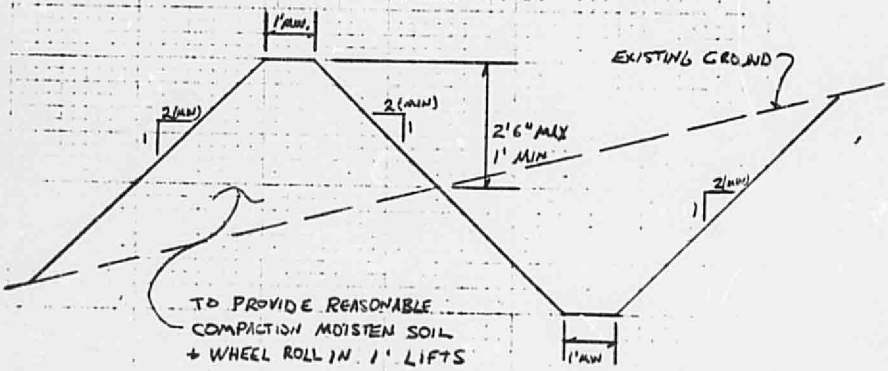
Michial M. Emery

Michial M. Emery, P.E.
Vice President

cc: Mr. Bob Wharton

Enclosures

DWW/dlh
Job No. 2 144 0



MAXIMUM SIDE SLOPE 2:1

TYPICAL SECTION OF TEMORARY
DIVERSION BERM

NO SCALE

NOTE: THIS WIND ROW SHALL ONLY BE USED TO DIVERT MINOR RUNOFF ON CROSS SLOPES LESS THAN 5%. IN NO CASE SHALL THE WATER SURFACE EXCEED 1/2 THE NOMINAL HEIGHT.

TYPICAL BLADED WIND ROW

NO SCALE

PROJECT NAME		SHEET 1	OF 1
PROJECT NO.		BY W	DATE 1/5/82
SUBJECT TYPICAL BERM CROSS SECTIONS		CH'D	DATE

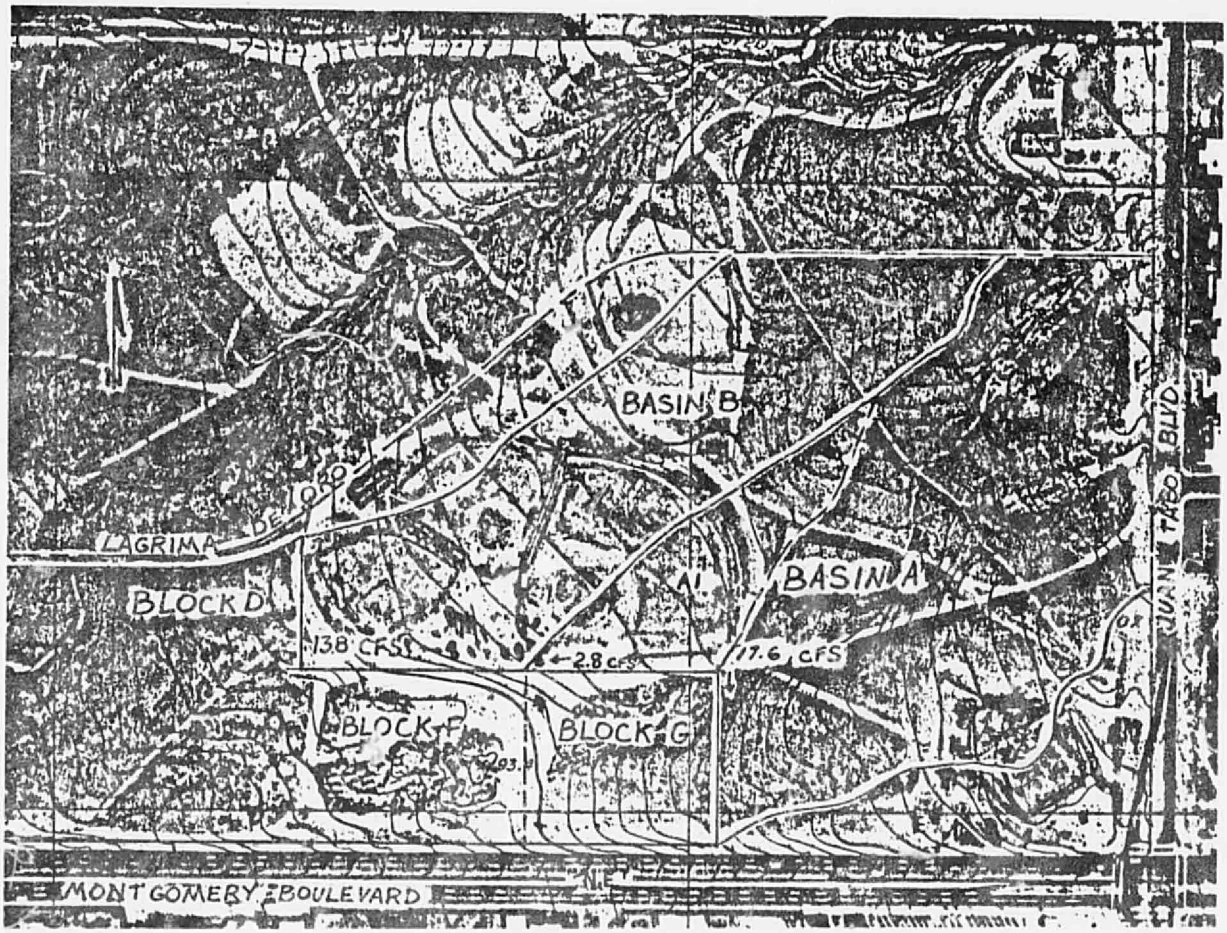
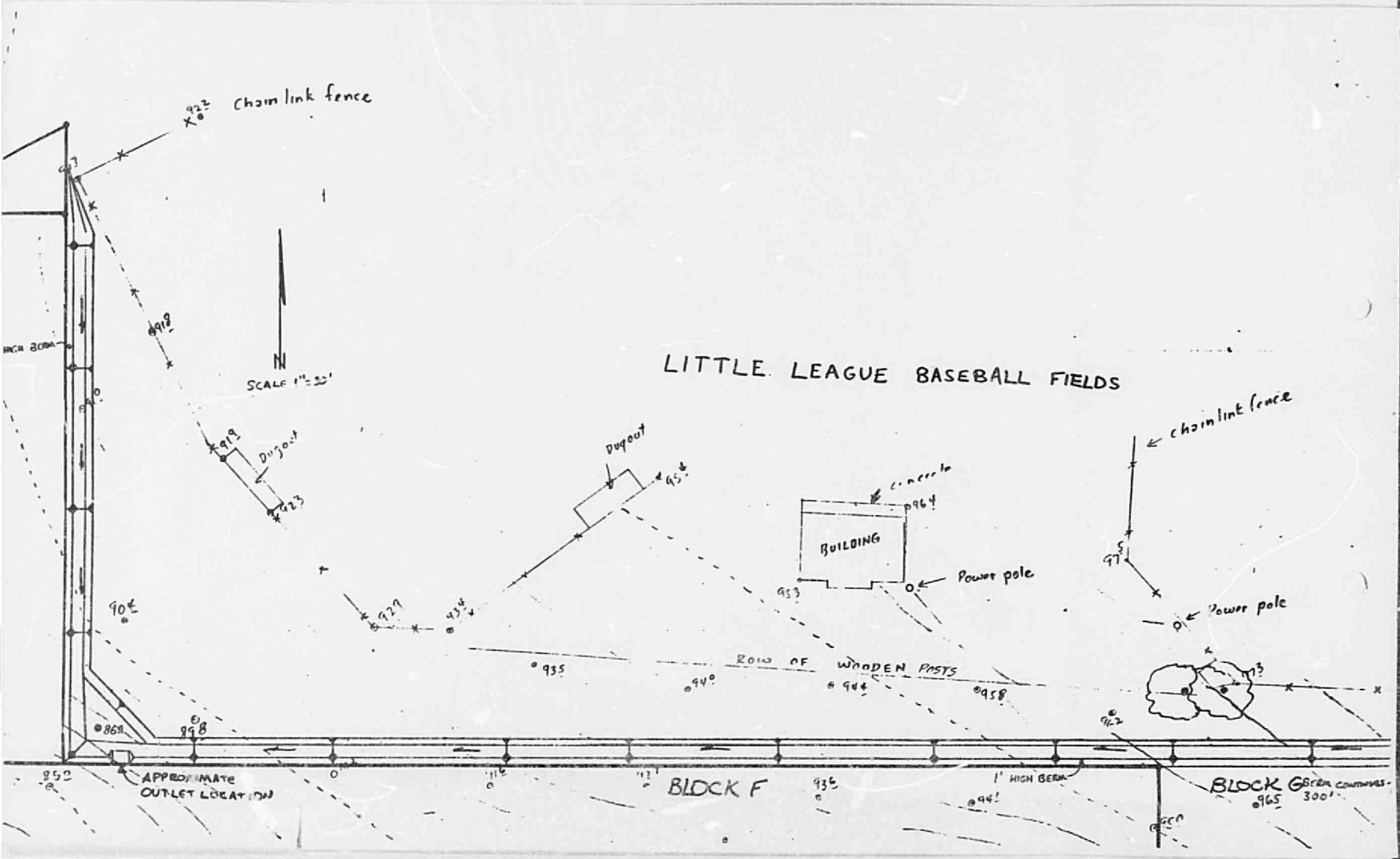

BASIN B
LAGRIMA DE ORO
BLOCK D
138 CFS
2.8 CFS
A'
BASIN A
17.6 CFS
BLOCK F
BLOCK G
MONTGOMERY BOULEVARD
JUAN TABO BLVD.

FIGURE 10


LITTLE LEAGUE BASEBALL FIELDS
Chain link fence
N
SCALE 1"=30'
Dugout
Dugout
Concrete
BUILDING
Power pole
Chain link fence
Power pole
ROW OF WOODEN POSTS
APPROXIMATE OUTLET LOCATION
BLOCK F
1' HIGH BERM
BLOCK G

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

January 20, 1983

Mr. Michiel Emery
Bohannan-Huston, Inc.
4125 Carlisle N.E.
Albuquerque, N.M. 87107

RE: RESPONSE TO YOUR LETTER OF JANUARY 5, 1983-MONTGOMERY BUSINESS PARK DRAINAGE REPORT COMMENTS

Dear Mike:

I have reviewed your response to my letter of December 16, 1983 and forward the following comments:

a. I agree with your comment #2 that a "developer shall provide protection from a conveyance for the upland runoff impacting the site." Either option maybe appropriate depending on the development sequence.

b. I concur with the design of the diversion on Hahn Park. Please forward the copy signed by the Little League when secured.

c. All other comments have been adequately addressed.

This letter will serve as conceptual approval of the drainage report. To reiterate, all parcels within the development shall submit a grading/drainage plan (per the DPM checklist) to check compliance with the report. Any major site modifications not in accordance with the Master Plan will require an update to the plan.

If you have any questions concerning these matters, please call.

Very truly yours,

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

Ref. City Proj. 2707 AO

RECEIVED
MAY 01 1986
HYDROLOGY SECTION

799

86 36667

THIS GRANT OF EASEMENT AMENDS, REPLACES AND IS HEREBY SUBSTITUTED FOR THE GRANT OF EASEMENT FOR PUBLIC SEWER UTILITIES RECORDED IN THE BERNALILLO COUNTY REAL ESTATE RECORDS IN BOOK MISC. 313-A, PAGES 656-659.

AMENDED
GRANT OF EASEMENT
FOR
PUBLIC SEWER UTILITIES

THIS INDENTURE made and executed this ____ day of _____, 1986, by and between ALBUQUERQUE FEDERAL SAVINGS AND LOAN ASSOCIATION, a federal savings and loan association, hereinafter called the Grantor, and THE CITY OF ALBUQUERQUE, NEW MEXICO, a municipal corporation, hereinafter called Grantee.

WITNESSETH, that for good and valuable consideration the receipt of which is hereby acknowledged, the Grantor has this day bargained and sold and by these presents does sell and convey and deliver unto the City of Albuquerque a permanent easement, including the permanent right to enter upon the real estate hereinafter described at any time that it may see fit and construct, maintain and repair water lines and sanitary sewer lines under the lands hereinafter described and the further right to remove trees, bushes, undergrowth and obstructions interfering with the location, construction and maintenance of said utilities.

The land affected by the grant of this easement and right-of-way is located in the County of Bernalillo and State of New Mexico and is more particularly described as follows:

An easement being and comprising the southerly twenty (20) feet of the following described Tract, excepting therefrom the westerly twenty-five (25) feet;

A certain Tract of Land being the South One-Half (S 1/2), Southeast One-Quarter (SE 1/4), Southwest One-Quarter (SW 1/4), Southeast One-Quarter (SE 1/4), Southeast One-Quarter (SE 1/4), of Section 33, Township 11 North, Range 4 East, N.M.P.M., Albuquerque, New Mexico, excepting therefrom the southerly 53.00 feet thereof for the right-of-way of Montgomery Blvd., N.E., said tract of land being more particularly described as follows:

BEGINNING for a tie at the section corner common to Sections 33 and 34, T11N, R4E, N.M.P.M., and Sections 3 and 4 T10N, R4E, N.M.P.M., and running Thence N 89 deg. 56'E, 660.18 feet along the South line of said Section 33; Thence, N 00 deg. 02'W, 53.00 feet to the point on beginning being the Southeast corner of the tract herein described and being a point on the North right-of-way line of said Montgomery Blvd., N.E., Thence S 89 deg. 56'W, 330.09 feet along said North right-of-way line of Montgomery Blvd., N.E., to the Southwest corner; Thence, N 00 deg. 02'W, 112.00 feet to the Northwest corner; Thence, N 89 deg. 56'E, 330.09 feet to the Northeast corner; Thence, S 00 deg. 02'E, 112.00 feet to the point of beginning and containing 0.8487 acres, more or less.

TO HAVE AND TO HOLD the said right and easement for the uses and purposes aforesaid, unto Grantee its successors and assigns for so long as said easement shall not be abandoned for use as a right-of-way for aforesaid utilities.

Grantor reserves unto itself the right to use the surface of the easement premises for any lawful purpose which does not interfere with Grantee's use of the easement property, which shall specifically include landscaping, paved parking lots and driveways, which the Grantee may remove if reasonably required for maintenance of the utilities so long as Grantee restores the easement premises to its prior condition as nearly as practicable, with the exception that

Grantee shall not be obligated to restore the landscaping except for sod or other similar ground cover.

As a part of the consideration for this grant, the Grantee does hereby release Grantor from any and all claims for damages for whatsoever cause incidental to the exercise of the rights herein granted provided, further, that the Grantee agrees to save Grantor harmless from any and all liability that may arise as a result of the construction and use of the easement for the purposes set forth.

IN WITNESS WHEREOF, the parties have set their hands and seals this 26th day of February, 1986.

ALBUQUERQUE FEDERAL SAVINGS
AND LOAN ASSOCIATION, A Federal
Savings and Loan Association

By Rodney W. Shoemaker
Rodney Shoemaker,
Senior Vice President

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

The foregoing instrument was duly acknowledged before me this 26th day of February, 1986, by RODNEY SHOEMAKER, Senior Vice President of ALBUQUERQUE FEDERAL SAVINGS AND LOAN ASSOCIATION, a federal savings and loan association, on behalf of said association.

Paula C. Baggs
Notary Public

My commission expires:

6-1-88

GRAN14AF

GRAN14AF.LDC

Acknowledged:

for City Engineer
Dated: 3/31/86 4/18/86

Reviewed as to form only:

Assistant City Attorney
Dated: 4/19/86

City Attorney
Dated: 4/21/86

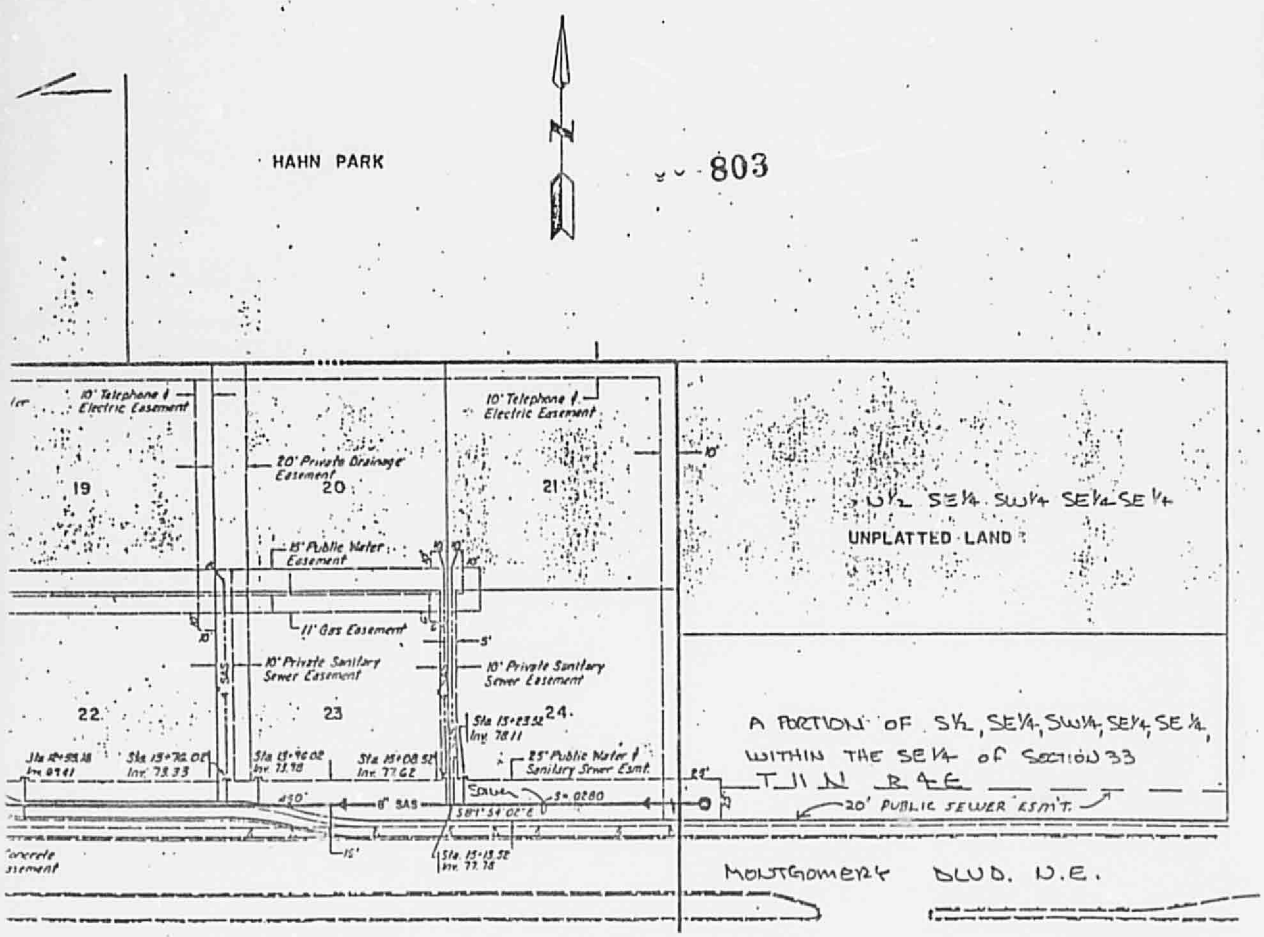
STATE OF NEW MEXICO
COUNTY OF BERNALILLO
FILED FOR RECORD

1986 APR 28 AM 10: 26

Mear 345A 799-803

DOLORES C. WALLER
CO. CLERK & RECORDER

4



3. Sewer
the Se
4. Electra
ort of
Supple
and 10
Swing
5. Streets
of utili
6. Future
proper
7. All ser
Sewer
noted.
8. A wate
each a
9. Water
the Se
10. The Ge
and su
Albuq
11. All en
Drawi
12. Defle
Speci
13. Sewer

LEGE

Sheet 7

DRAINAGE REPORT
FOR
MONTGOMERY MANOR

ZONE ATLAS SHEET F-21

PREPARED FOR:

FLATOW, MOORE, BRYAN & ASSOCIATES, INC.
5608 ZUNI, S.E.
ALBUQUERQUE, NEW MEXICO 87108

PREPARED BY:

BOHANNAN–HUSTON, INC.
4125 CARLISLE BOULEVARD, N.E.
ALBUQUERQUE, NEW MEXICO 87107

DAVID M. Y. MILLIKAN
NEW MEXICO
7547
REGISTERED PROFESSIONAL ENGINEER

David M Y Millikan

DAVID M.Y. MILLIKAN, P.E.
N.M.P.E. No. 7547

DRAINAGE REPORT
FOR
MONTGOMERY MANOR

TABLE OF CONTENTS

	Page
Purpose and Scope	1
Site Location and Description	1
Methods of Analysis	1
Existing Drainage Conditions	3
Drainage Conditions After Development	3
Off-Site Runoff	3
On-Site Runoff	3
Recommendations	4
Flood Hazard Areas	6
Easements and Rights-of-Way	6
Maintenance	6
Conclusions	6
Bibliography	7

TABLES

I – Runoff Coefficient Values
II – Runoff Curve Number (CN) Values

FIGURES

I – Rainfall Intensity Curve
II – Determination of Rational Method Coefficient (c)
III – Composite CN Values for Developed Sites
IV – NOAA Atlas 10-Year, 6-Hour Rainfall Distribution
V – NOAA Atlas 100-Year, 6-Hour Rainfall Distribution
VI – Spillway Construction Details

TABLE OF CONTENTS (cont.)

VII - A – Orfice Plate Construction Details – Basin A
VII - B – Orfice Plate Construction Details – Basin B
VIII – Inflow Hydrographs for Detention Ponds
IX – Orfice Plate Discharge Curves
X – Discharge Hydrographs

APPENDIX

Computer Model

PLATES

I – Vicinity Map
II – Soil Types Map
III – AMDS Flood Hazard Map
IV – Existing Drainage Pattern
V – Developed Drainage Pattern

DRAINAGE REPORT
FOR
MONTGOMERY MANOR PROJECT

PURPOSE AND SCOPE

The purpose of this report is to present a detailed plan for drainage facilities which will safely handle storm water runoff from the Montgomery Manor Project and surrounding areas which discharge onto the site. Actual grades, profiles and plans shall be verified in the final design drawings to be submitted to the City of Albuquerque for review.

SITE LOCATION AND DESCRIPTION

The site is located at the northwest corner of Montgomery Boulevard and Morris Street, as shown on City of Albuquerque Zone Atlas Sheet F-21-2 (see Plate I).[1] Presently, the site is vacant land with dirt and trash piled in several locations on the site. The existing ground slopes at 2 to 3% towards the southwest corner of the site, with a minor drainage course dividing the property into two roughly equal parts (see Plate IV). The soils on the site are classified as Embudo gravelly fine sandy loam (EtC) and Tijeras gravelly fine sandy loam (TgB). These two soil types have a SCS Hydrologic Classification of "B"[2] (see Plate II).

METHODS OF ANALYSIS

The peak flow rates for runoff were obtained by applying the Modified Rational Method.[3] Rainfall intensities were determined through the use of the Intensity/Duration Frequency Curve of Appendix "A" to the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) Resolution No. 1980-15 (see Figure I).[4] Times of concentration for the runoff were computed using the Kirpitch Equation expressed as:

$$T_c = \frac{.00078\,(L)^{0.77}}{(S)^{0.385}}$$

Where: L = Length of the basin in feet

S = Watershed gradient in feet/foot

T_c = Time of concentration in hours

Since the runoff areas were small, the minimum time of concentration (ten minutes) was used for all the drainage basins [3].

Values for the runoff coefficient (c) were determined by using the values shown in Table 1[5]. These values were weighted by multiplying them by their relative percentages of the total area of the basin to obtain a composite runoff coefficient for each basin (see Figure II)[3].

Runoff volumes were obtained using the U.S.D.A. Soil Conservation Service Method [6] (see Figure III)[6]. These volumes were used to determine ponding requirements for the retention ponds shown on the Developed Drainage Map (Plate V). The runoff curve numbers for the basins on the developed site (see Table II) is based upon Composite Curve Numbers (CN), as shown in Figure III[3], where the pervious CN is equal to 61 (see Table II).

Volumes of the 10 and 100 year, six-hour rainfall events were taken from the NOAA Atlas No. 2[7] (see Figures IV and V). For the 10 year storm, the design rainfall is 1.6 inches, and for the 100 year storm, the design rainfall is 2.5 inches.

Flow depths and velocities were computed using Manning's equation for normal depth. A roughness coefficient (n) of 0.015 was used for street flow, 0.013 was used for flow in the reinforced concrete pipe.

Flows through the orfice plates were computed using the orfice flow equation with a value of 0.6 for the orfice coefficient "C":

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

where Q = Flow rate in cubic feet per second

A = Area of the orfice in square feet

h = Head in feet above the orfice centerline

EXISTING DRAINAGE CONDITIONS

Presently, the site drains to its southwest corner and eventually reaches Montgomery Boulevard (see Plate IV). All drainage north and east of the site will be intercepted by Lagrima de Oro and Morris Streets, therefore, the off-site area was not considered. The peak runoff value was computed for the site only. The peak runoff for the site was computed as follows:

C = 0.34

I = 5.9 inches/hour 5.28

A = 5.85 acres

Q = CIA = 0.34 x 5.9 x 5.85 = 11.7 CFS for a 100 year storm 10.5

To determine the allowable rate of controlled discharge, the 5 year flow-rate was determined by multiplying the 100 year peak value by a factor of .541[3]. The 5 year flow rate was calculated to be 6.33 cubic feet per second (see Plate IV).

DRAINAGE CONDITIONS AFTER DEVELOPMENT

The criteria for drainage conditions after development was based upon the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) Resolution No. 1980-15[4] and the City of Albuquerque's drainage criteria[3].

Off-Site Runoff — The runoff which presently enters the site from the upstream drainage areas will be intercepted by Lagrima de Oro and Morris Streets and conveyed to Montgomery Boulevard. Water blocks, in the form of crest vertical curves, shall be constructed at all the entrances to the site. These water blocks shall confine the off-site runoff to the perimeter of the subdivision.

On-Site Runoff — Basin "A" — The runoff from Basin "A" is collected in a detention pond as shown on Plate V. The hydrograph for Basin "A" is shown in Figure VIII-A. Total runoff volume for this basin was 3410 cubic feet, by using the SCS Curve Number Method[6].

CN = 86

P = 2.5 inches in six hours

Area = .755 acres

$$S = \frac{1000}{CN} - 10 = 163$$

$$V = \frac{(P - 0.25)^2}{(P + 0.85)} \times \frac{A \times 43560}{12}$$

= 3410 cubic feet

The detention pond will discharge under the sidewalk through orfice plate of the size and shape shown in Figure VII. The discharge curve for the orfice is shown in Figure IX-A.

Basin "B" – The remaining drainage from the site and the discharge from Basin "A" is conveyed to a detention pond facility shown on Plate V. The hydrograph for Basin "B" was derived through the following series of computations:

Area @ 4.071 acres (68% impervious)

Time of Concentration = 10 minutes

Intensity (100 year event) @ 5.9 inches/hour

Runoff Coefficient (C) = 0.64

CN = 86

P = 2.5 inches in 6 hours

S = 1.63

Peak Flow Rate (Q_p) = C x I x A = 0.68 x 5.9 x 4.071 = 16.3 CFS

$$\text{Runoff Volume (V)} = \frac{(P - 0.25)^2}{(P + 0.85)} \times \frac{A \times 43560}{12} = 18{,}380 \text{ cubic feet}$$

$$\text{Duration Time (T)} = \frac{2 \times 18{,}380}{16.3} \; \frac{1}{60} = 37.5 \text{ minutes}$$

The resulting hydrograph for Basin "B" is presented as Figure VIII-B. A composite hydrograph of the discharge from Basin "A" and Basin "B" was loaded into an SCS Hydrogic Modeling Program (HYMO)[8] to be routed through the detention pond. The computer modeling produced the discharge curve shown in Figure X. The output generated by the model is presented in the Appendix of this report.

Recommendations — Based on the results of the investigation summarized in this report, the following measures are recommended:

A. Construct a detention pond facility with 3:1 side slopes in Basin "A" in the area shown on Plate V. The pond shall drain to its southwest corner at a minimum slope of 1% and have a volume of 2600 cubic feet with a depth at the southwest corner of 0.7 feet.

B. An orfice plate of the dimensions shown in Figure VII-A shall be installed at the southwest corner of the detention pond. In Basin "A" the discharge conduit shall have a minimum grade of 2% and shall discharge to the gutter, as shown in Plate V.

C. The runoff in Basin "B" and discharge from the detention pond in Basin "A" shall be collected in the southwest corner of the site. The site shall be graded to insure that this drainage pattern is realized.

D. A detention pond facility with concrete block retaining wall sides shall be constructed as shown on Plate V. A concrete spillway shall be constructed as shown on Figure VI-A. The pond shall have a maximum depth of 4.0 feet and a minimum volume of 10,450 cubic feet. The pond shall be surrounded by a 4-foot high block wall or other acceptable protective barrier.

E. The detention pond shall discharge through an 11-inch diameter orfice plate as detailed in Figure VII-B. This orfice plate shall discharge into an 18-inch R.C.P. storm drain. The storm drain will discharge to Montgomery Boulevard through a sidewalk culvert as shown in Figure XI. An overflow opening in the detention pond wall shall be provided as shown in Plate V. A graded swale shall be provided from the wall opening to Montgomery Boulevard through the 20-foot wide drainage easement (see Plate V). When the land the easement is on is developed, the swale may be provided within a parking area.

F. Construct water blocks at the vehicle entrances to the site to prevent off-site drainage from entering the site.

FLOOD HAZARD AREAS

The Albuquerque Master Drainage Study indicates that the proposed project is not located in a flood hazard area (see Plate III). Plate I I is a portion of the "Albuquerque Master Drainage Study – Volume III," Sheet No. F-21.

EASEMENTS AND RIGHTS-OF-WAY

Easements and rights-of-way are shown on Plate IV and were obtained from a survey and certification by D.T. Morrison Surveyor, Inc. dated December 1981.

MAINTENANCE

Detention Ponds – The detention ponds shall be maintained by the owner or developer. The City of Albuquerque shall assume no maintenance responsibility for these facilities.

18" RCP & Sidewalk Outlet – These facilities shall be maintained by the City of Albuquerque in accordance with the standard city maintenance requirements.

CONCLUSIONS

Based upon the recommendations outlined in this report, the developed site will safely handle all on-site flows generated during a 100-year storm and discharge then to downstream facilities at the undeveloped 5-year flow rate. Off-site drainage from upland areas will not impact the site, but will be conveyed around the site by Lagrima de Oro Road and Morris Street. Thus, it is felt that the drainage facilities outlined in this report will allow development of the site in accordance with current AMAFCA and City of Albuquerque requirements.

BIBLIOGRAPHY

1. City of Albuquerque Zone Atlas
2. Soil Survey of Bernalillo County – USDA Soil Conservation Service
3. City of Albuquerque Development Process Manual (DPM) Volume 2, Chapter 2 (Draft)
4. AMAFCA Resolution No. 1980-15
5. "Open Channel Hydraulics" V.T. Chow
6. USDA Soil Conservation Service Engineering Handbook No. 4 "Hydrology"
7. NOAA Atlas No. 2, Volume 2, dated 1973
8. SCS HYdrologic MOdeling Program
9. City of Albuquerque City-Wide Utilities and Cash Paving No. 30

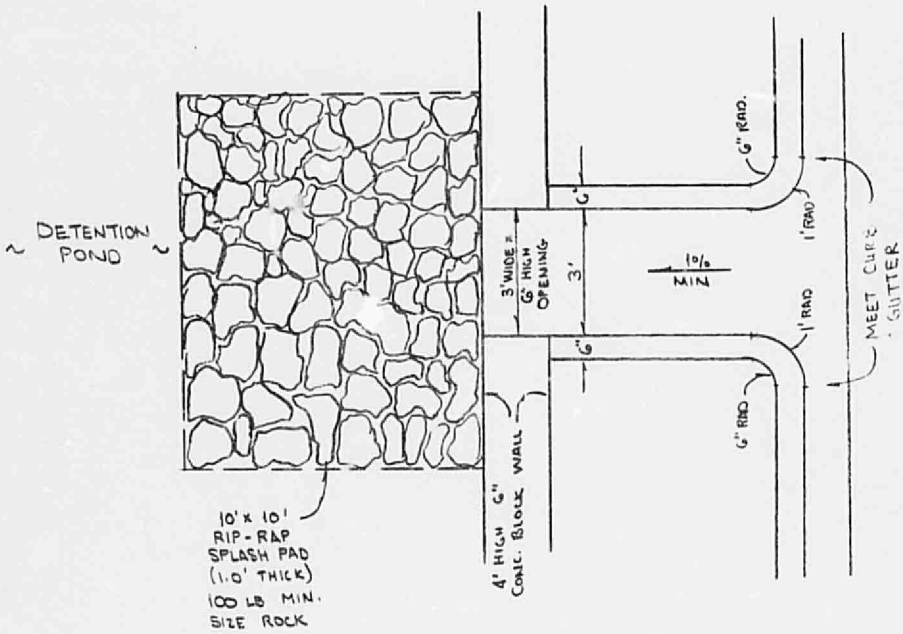


FIGURE VI ~ SPILLWAY CONSTRUCTION

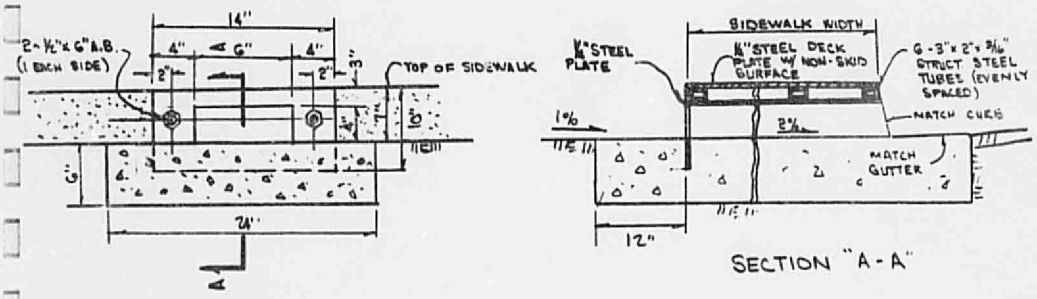


FIGURE VII-A ~ ORFICE PLATE (BASIN "A")

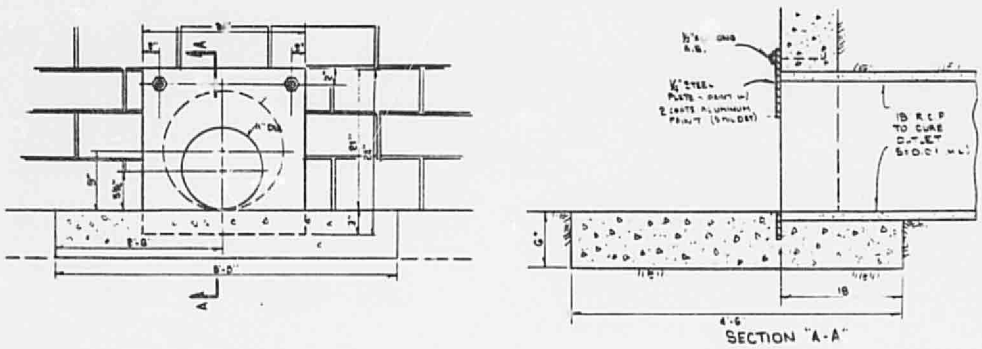


FIGURE VII-B ~ ORFICE PLATE (BASIN "B")

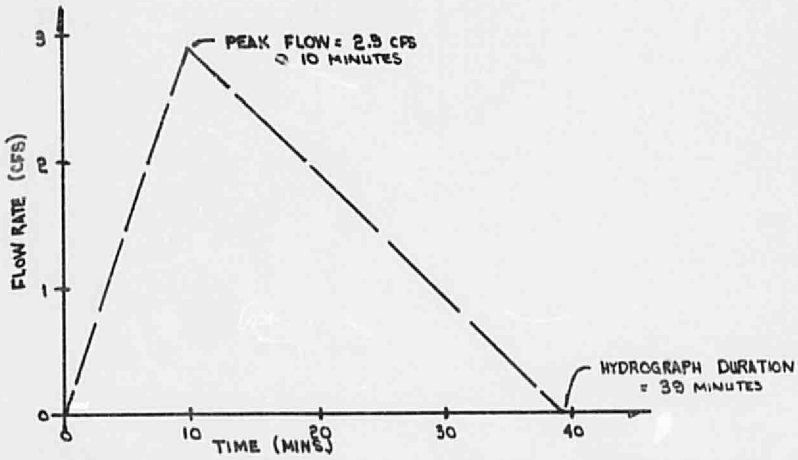


FIGURE VIII-A: INFLOW HYDROGRAPH -- BASIN A TO DETENTION POND

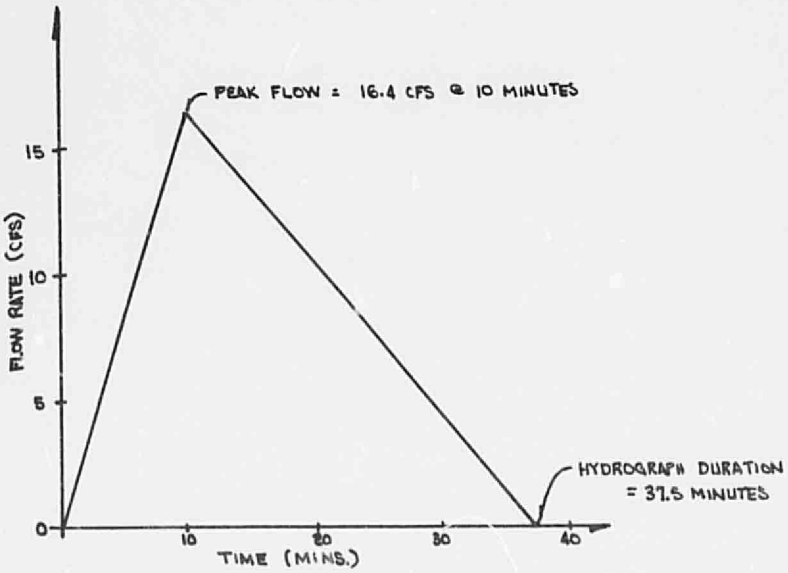


FIGURE VIII-B: INFLOW HYDROGRAPH -- BASIN B TO DETENTION POND

PROJECT NAME	MONTGOMERY MANOR	SHEET	OF
PROJECT NO	J# 20540	BY H.S.	DATE 6-82
SUBJECT	INFLOW HYDROGRAPHS	CH'D	DATE

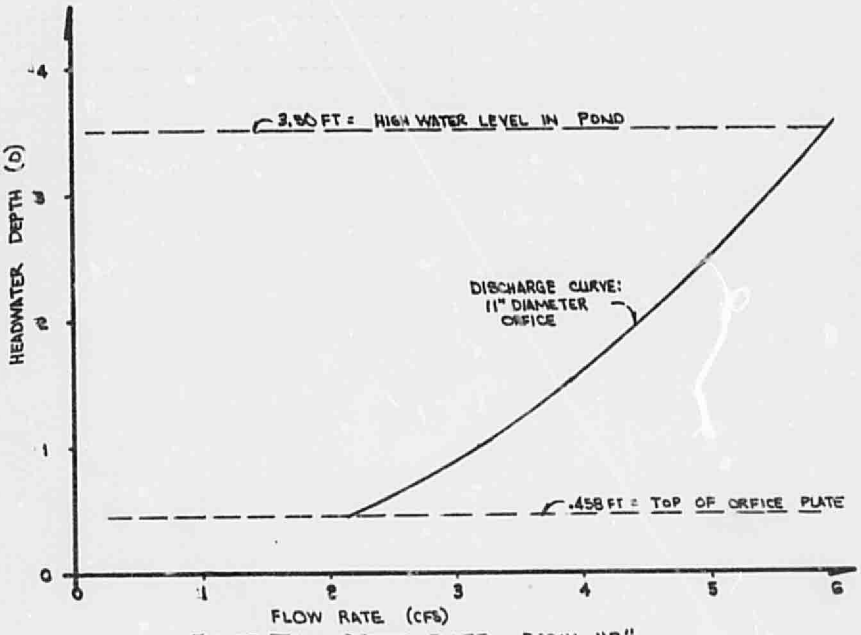


FIGURE IX-A: ORFICE PLATE - BASIN "B"

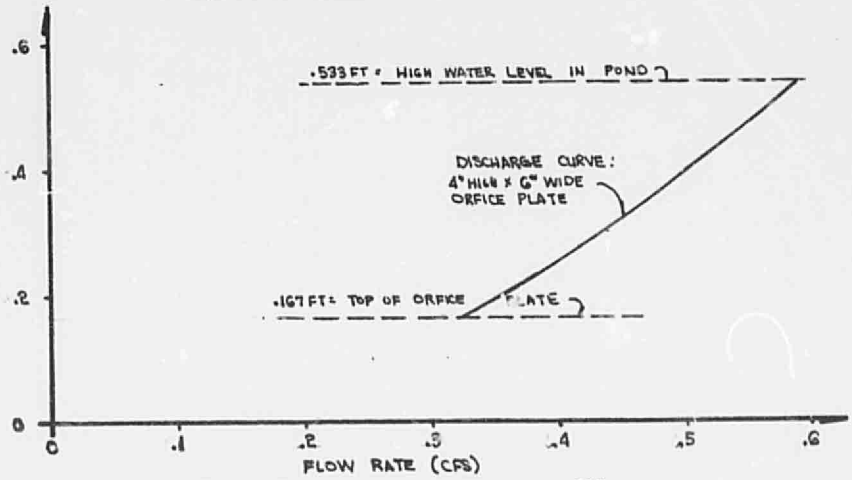


FIGURE IX-B: ORFICE PLATE - BASIN "A"

PROJECT NAME	MONTGOMERY MANOR	SHEET	OF
PROJECT NO.	J# 20540	BY H.S.	DATE 6-82
SUBJECT	ORIFICE PLATE DISCHARGE CURVES	CH'D	DATE

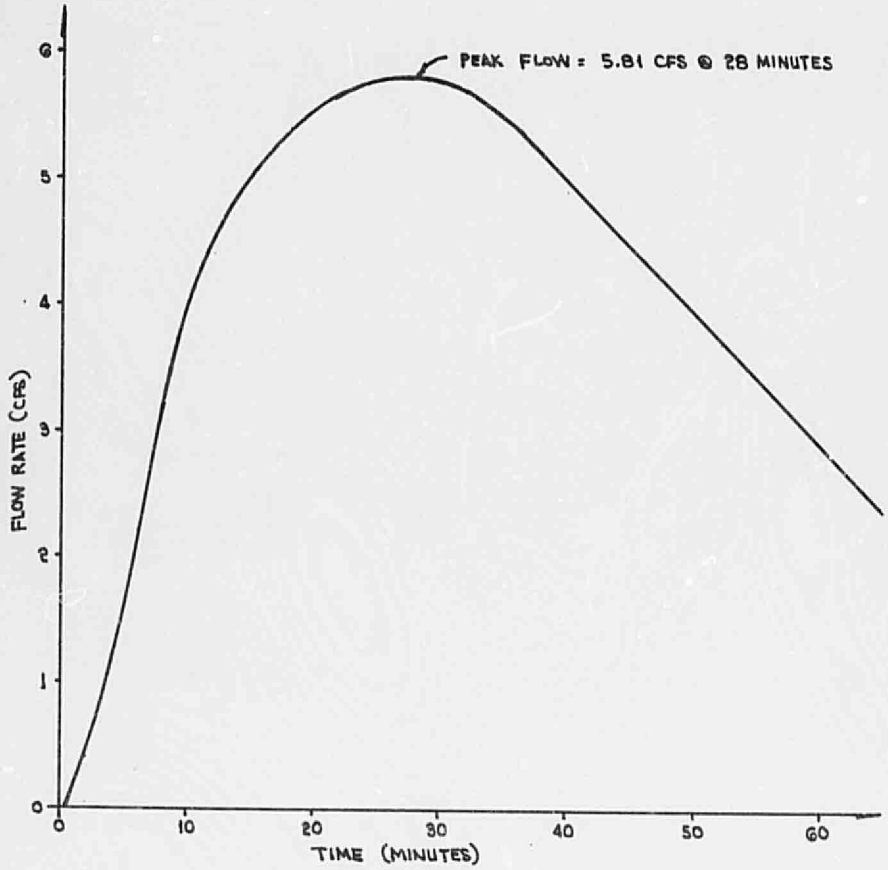


FIGURE X- DISCHARGE HYDROGRAPH TO MONTGOMERY BLVD.

PROJECT NAME	MONTGOMERY MANOR	SHEET		OF	
PROJECT NO.	J# 20540	BY	H.S.	DATE	6-82
SUBJECT	DISCHARGE HYDROGRAPH TO MONT. BLVD.	CH'D		DATE	

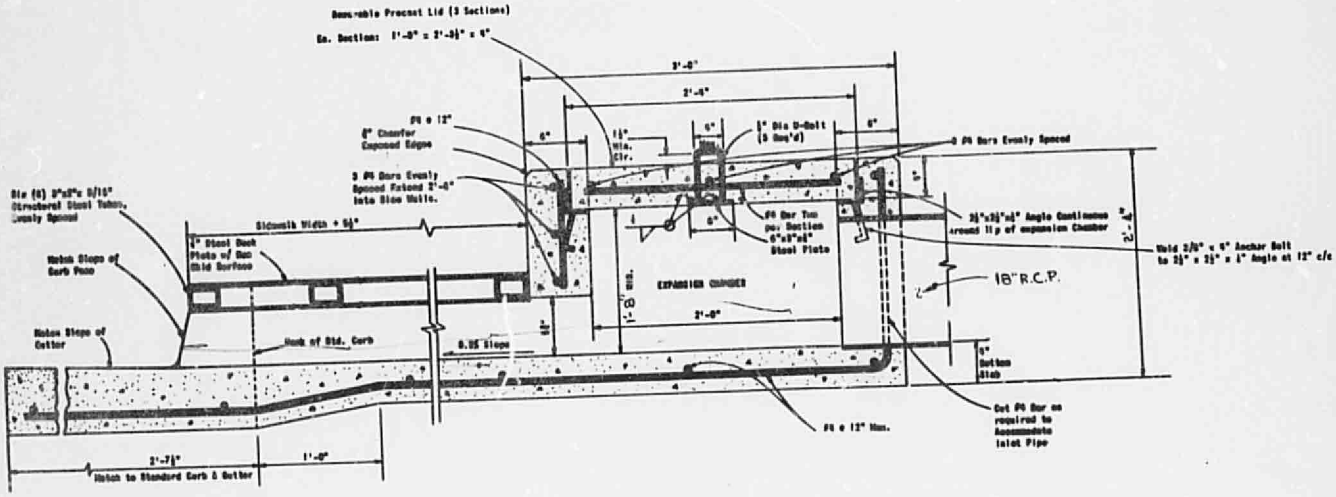


FIGURE XI - CURB OUTLET DETAIL

NO SCALE

APPENDIX

COMPUTER MODEL
OF DETENTION BASIN "B"

```
START                    RAINFALL EXCEL BEGINS AT 6.00 HOURS
*      HYDROGRAPH FOR BASIN "E" IS STORED FOR THE ROUTING SEQUENCE
*
STORE HYD          II=4  HYI ID 104  DELTA TIME=0.017 HOURS (OCE FIRDTE)
                   DRAINAGE AREA=0.0064 SQ MI
                   FLOW RATES: 1.64  3.28  4.92  6.56  8.20  9.84 11.48
                               13.12 14.76 16.40 15.80 15.20 14.60 14.00
                               13.40 12.80 12.20 11.60 11.00 10.40  9.80
                               9.20  8.60  8.00  7.40  6.80  6.20  5.60
                               5.00  4.40  3.80  3.20  2.60  2.00  1.40
                               0.80  0.20  0.00  0.00
```

```
*
*        INFLOW HYDROGRAPH AT DETENTION POND
*        ****** ********** ** ********* ****
*
PRINT HYD              ID=3 COUP=1
```

HYDROGRAPH NUMBER 103

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
6.000	2.	6.217	14.	6.434	6.
6.017	3.	6.234	13.	6.451	6.
6.033	5.	6.250	13.	6.468	5.
6.050	7.	6.267	12.	6.484	4.
6.067	8.	6.284	12.	6.501	4.
6.083	10.	6.301	11.	6.518	3.
6.100	11.	6.317	10.	6.534	3.
6.117	13.	6.334	10.	6.551	2.
6.134	15.	6.351	9.	6.568	1.
6.150	16.	6.367	9.	6.584	1.
6.167	16.	6.384	8.	6.601	0.
6.184	15.	6.401	7.		
6.200	15.	6.417	7.		

```
RUNOFF VOLUME =        0.423 ACRE-FT
PEAK DISCHARGE RATE =        16.4 CFS
PEAK OCCURRED AT  6.15 HRS.

*
*        ROUTE FLOWS THROUGH DETENTION POND AND ORIFICE PLATE
*
*        ***** ***** ******* ********* **** *** ****** *****
*
DESIGN RES              PRINT CODE=2 INFLOW ID=3
                        ORIFICE SIZE=11.0 INCHES ORIFICE INVERT=5621.0 MSL
                        DISCHARGE COEFFICIENT=0.6
                        WEIR ELEVATION=25.0  WEIR LENGTH=3.0 FEET
                        WEIR COEFFICIENT=2.6   PIPE SIZE=18.0 INCHES
                        PIPE GRADE=0.010   MANNINGS "N"=0.013
```

VOLUME(AC FT)	ELEVATION
0.01	21.2
0.03	21.4
0.04	21.6
0.06	21.8
0.07	22.0
0.08	22.2
0.10	22.4
0.11	22.6
0.12	22.8
0.14	23.0
0.15	23.2
0.17	23.4
0.18	23.6
0.19	23.8
0.21	24.0
0.22	24.2
0.23	24.4
0.25	24.6
0.26	24.8
0.28	25.0
0.29	25.2

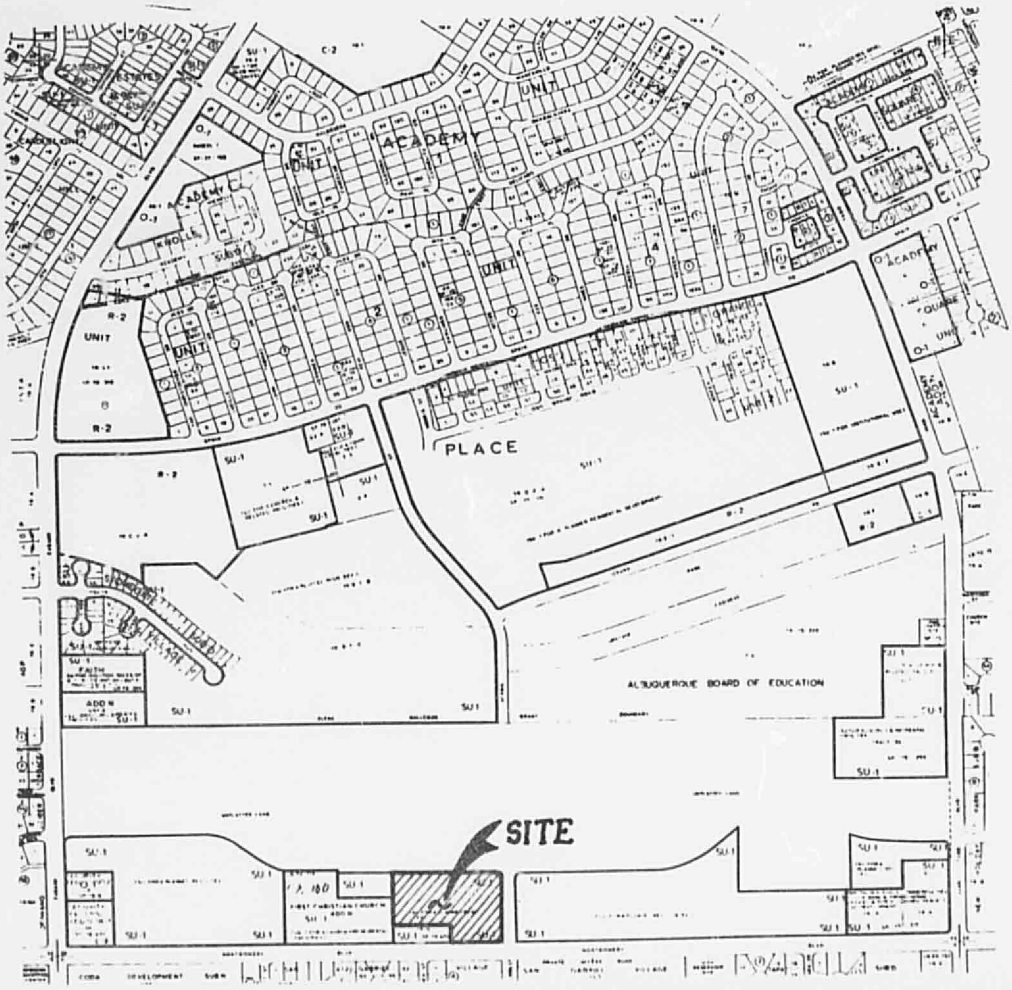
```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

TIME (HRS)	INFLOW DISCHARGE (CFS)	WATER ELEV (FT)	WATER VOLUME (A-F)	CONDUIT OUTFLOW (CFS)	WEIR OUTFLOW (CFS)	TOTAL OUTFLOW (CFS)
0.00	0.00	21.2	0.0	0.0	0.0	0.0
0.03	4.92	21.4	0.0	0.4	0.0	0.4
0.07	9.20	21.5	0.0	1.2	0.0	1.2
0.10	11.48	21.7	0.1	1.8	0.0	1.8
0.13	14.76	22.2	0.1	2.2	0.0	2.2
0.17	15.80	22.7	0.1	2.9	0.0	2.9

0.20	14.60	24.1	0.1	4.4	0.0	4.4
0.23	13.40	24.5	0.2	4.8	0.0	4.8
0.27	12.20	24.8	0.2	5.2	0.0	5.2
0.30	11.00	24.0	0.2	5.4	0.0	5.4
0.33	9.80	24.3	0.2	5.6	0.0	5.6
0.37	8.60	24.5	0.2	5.7	0.0	5.7
0.40	7.40	24.5	0.2	5.8	0.0	5.8
0.43	6.20	24.5	0.2	5.8	0.0	5.8
0.47	5.00	24.5	0.2	5.8	0.0	5.8
0.50	3.80	24.5	0.2	5.8	0.0	5.8
0.53	2.60	24.4	0.2	5.7	0.0	5.7
0.57	1.40	24.3	0.2	5.6	0.0	5.6
0.60	0.00	24.0	0.2	5.3	0.0	5.3
0.63	0.00	23.9	0.2	5.2	0.0	5.2
0.67	0.00	23.6	0.2	4.9	0.0	4.9
0.70	0.00	23.4	0.2	4.7	0.0	4.7
0.73	0.00	23.3	0.2	4.6	0.0	4.6
0.77	0.00	23.1	0.1	4.3	0.0	4.3
0.80	0.00	22.9	0.1	4.2	0.0	4.2
0.83	0.00	22.8	0.1	4.0	0.0	4.0
0.87	0.00	22.6	0.1	3.7	0.0	3.7
0.90	0.00	22.4	0.1	3.5	0.0	3.5
0.94	0.00	22.3	0.1	3.3	0.0	3.3
0.97	0.00	22.2	0.1	3.2	0.0	3.2
1.00	0.00	22.1	0.1	2.9	0.0	2.9
1.04	0.00	21.9	0.1	3.2	0.0	3.2
1.07	0.00	21.8	0.1	3.1	0.0	3.1
1.10	0.00	21.7	0.0	2.5	0.0	2.5
1.14	0.00	21.6	0.0	2.0	0.0	2.0
1.17	0.00	21.5	0.0	1.5	0.0	1.5
1.20	0.00	21.5	0.0	1.2	0.0	1.2

```
PEAK DISCHARGE =     5.81 CFS.
MAXIMUM WATER ELEVATION =    24.5 FT.
MAXIMUM RESERVOIR STORAGE =     0.24 ACRE-FT.
PEAK OCCURRED AT  0.47 HRS.


* * * * * * * * * * * * * * * * * * * *
*   GRAVITY FLOW IN CONDUITS          *
*  MAXIMUM GRAVITY FLOW =  10.5 CFS.  *
*  FLOW IN PIPE =    5.8 CFS.         *
* * * * * * * * * * * * * * * * * * * *
   FINISH
```


ACADEMY
UNIT
PLACE
ALBUQUERQUE BOARD OF EDUCATION
SITE
R-2
SU-1
C-2
O-1

F-21-Z

PLATE I

22
BERNALILLO COUNTY, AND PARTS OF SANDOVAL
(Joins sheet 12)
N
2 Miles
10000 Feet
5000
0
1000
2000
3000
4000
5000
Scale 1:24,000
T 11 N
T 10 N
(Joins sheet 21)
(Joins sheet 32)
EtC
EmB
TgB
SITE
ALBUQUERQUE
WATER
TRAMWAY RD

PLATE II

RECEIVED
NOV 30 1982
ENGINEERING

DRAINAGE REPORT
FOR
MONTGOMERY BUSINESS PARK

DRAINAGE REPORT
FOR
MONTGOMERY BUSINESS PARK

NOVEMBER, 1982

PREPARED FOR:

JACK M. CLIFFORD AND COMPANY
2201 SAN PEDRO DRIVE, N.E.
ALBUQUERQUE, NM 87110

PREPARED BY:

BOHANNAN–HUSTON, INC.
4125 CARLISLE BOULEVARD, N.E.
ALBUQUERQUE, NM 87107

DAVID M. Y. MILLIKAN
NEW MEXICO
7547
11-29-82
REGISTERED PROFESSIONAL ENGINEER

David M.Y. Millikan

DAVID M.Y. MILLIKAN
N.M.P.E. NO. 7547

DRAINAGE REPORT
FOR
MONTGOMERY BUSINESS PARK

INDEX

	Page
PURPOSE AND SCOPE	1
SITE LOCATION AND DESCRIPTION	1
METHOD OF ANALYSIS	1
EXISTING DRAINAGE CONDITIONS	2
DEVELOPED DRAINAGE CONSITIONS	3
PHASE I	4
PHASE II	5
ULTIMATE DEVELOPMENT	6
EROSION CONTROL PLAN	6
SUMMARY	7

FIGURES

FIGURE 1 – Location Map
FIGURE 2 – Bernalillo County Soils Map
FIGURE 3 – DPM Plate 22.2 C-1
FIGURE 4 – DPM Plate 22.2 C-2
FIGURE 5 – DPM Plate 22.2 C-4
FIGURE 6 – DPM Plate 22.2 D-1
FIGURE 7 – DPM Plate 22.2 D-2
FIGURE 8 – DPM Plate 22.2 E-1
FIGURE 9 – Undeveloped Upland Basins
FIGURE 10 – Phase II Upland Basins

INDEX (Cont.)

APPENDIX

	Sheet
Undeveloped Runoff	1
Basin 2 Hydrograph	2
Drainage Computations	3
Developed Drainage Computations	4
RPV Derrivation	5
RPV Summary	6

PLATES

PLATE 1 – Undeveloped Drainage

PLATE 2 – Developed Drainage Phase I

PLATE 3 – Developed Drainage Phase II

PLATE 4 – Ultimate Development

DRAINAGE REPORT
FOR
MONTGOMERY BUSINESS PARK
FOR
JACK M. CLIFFORD AND COMPANY

PURPOSE AND SCOPE

This drainage report has been prepared to outline the treatment of storm water flowing onto and generated within Montgomery Business Park for Jack M. Clifford and Company. It has been prepared in conformance with the guidelines of the City of Albuquerque's Development Process Manual (DPM), Chapter 22, entitled "Drainage and Flood Control."

This report is conceptual only. It contains recommendations for satisfactory treatment of upland flows and flows generated on-site. Detailed drainage reports will be required for the individual lots, as they are developed, to demonstrate conformance with the recommendations contained in this report.

SITE LOCATION AND DESCRIPTION

The site is located in the northeast heights of Albuquerque, New Mexico. It is bounded on the south by Montgomery Boulevard and on the west by Morris Street (see Figure 1). The site contains approximately 16.4 acres. It slopes from northeast to southwest at approximately 3%. The soils on the site consist of the Embudo-Tijeras complex (ETC) and Tijeras gravelly fine sandy loam (TgB). The locations of each soil type are indicated on the enclosed copy of the Soil Survey of Bernalillo County prepared by the Soil Conservation Service (see Figure 2). Both soil types are classified as hydrologic soil Group "B."

METHOD OF ANALYSIS

The peak flow rates for the developed and undeveloped drainage basins were determined by application of the Rational Method. The total runoff volumes were

calculated using the SCS Curve Number Method. Both these methods are outlined in the DPM. The time of concentration was found to be less than ten minutes for all basins. Therefore, ten minutes was used in all computations.

Rainfall intensities were determined by applying Plates 22.2 D-1 (Figure 6) and 22.2 D-2 (Figure 7) of the DPM. The 100-year intensity was determined to be 5.28 in./hr. The 10-year intensity is 3.6 in./hr.

The runoff coefficient for all sites was estimated as 0.82. This is based on the assumption that the developed sites, including streets, are 85% impervious (Figure 3).

Flow depths and velocities were computed using Manning's equation. A Manning's n of 0.017 was used for the streets.

Since the time of concentration for all basins is ten minutes, the peak discharge is proportional to the area of each basin.

Detention will be required on-site since there is inadequate capacity in Montgomery Boulevard and the storm sewer downstream from the site. Since the time of concentration, and therefore the intensity, is constant, the required ponding volume is directly related to the area of each developed basin. Derivation of this relationship is included in the appendix of this report (see Appendix, Sheets 4–6).

EXISTING DRAINAGE CONDITIONS

For the purpose of this report, it is assumed that the improvements in Lagrima de Oro and Morris Street are completed. The Albuquerque Master Drainage Study does not indicate flooding in Montgomery Boulevard adjacent to the site; however, it does indicate flooding farther downstream in Montgomery Boulevard. Therefore, adequate capacity does not exist to allow uncontrolled discharge from this site. Since flooding of the site is not a problem, this report only analyzes the flows affected by this development. Flows in Montgomery Boulevard which have been generated by upland basins are included in the Albuquerque Master Drainage Study and are not analyzed here.

Currently, the area between Morris Street and Juan Tabo Boulevard and between Montgomery Boulevard and Lagrima de Oro is mostly undeveloped. It generates an undeveloped discharge of approximately 57.3 CFS to Montgomery Boulevard and 3.2 CFS to Morris Street. Lagrima de Oro receives approximately 38.5 CFS from the basins north of Lagrima de Oro and conveys them to Morris Street. The worse case assumption of all these flows flowing south in Morris Street is used. Morris Street conveys an additional 10 CFS south from the area, which is located north and east of the Lagrima de Oro-Morris Street intersection. These flows combine with the undeveloped site runoff to produce a peak undeveloped flow rate in Morris Street immediately north of Montgomery Boulevard of 51.7 CFS (see Plate 1).

The total undeveloped flow from these basins, at the intersection of Morris Street and Montgomery Boulevard, is 109 CFS. According to the Albuquerque Master Drainage Study, the storm sewer at this intersection has a capacity of 26 CFS. Since total flows in Montgomery Boulevard are substantially greater than this, the storm sewer will be considered incapable of accepting the storm flows generated on this site. However, the storm sewer may be used to remove nuisance waters generated on this site.

DEVELOPED DRAINAGE CONDITIONS

This site shall be developed in two phases, as shown on Plates 2 and 3. Prior to final development of each individual lot, a detailed drainage report for that lot shall be prepared by the developer and submitted to the City for approval. Those reports should be prepared in conformance with the recommendations contained in this report.

Since downstream capacity does not exist, ultimate development shall include on-site detention. "The Drainage Ordinance" (63-1982) requires, "except as necessary for the treatment of nuisance water, all ponds shall be designed and constructed to be emptied in twenty-four (24) hours or less." Therefore, each detention facility requires an outlet. The minimum size outlet recommended to minimize maintenance problems is a four-inch diameter pipe. The required pond volume (RPV) shall be provided according to the formula $5989.5\ A + 79.9/A - 1383 = RPV$ (see Appendix, Sheet 5). This relationship assumes a discharge rate of 0.5 CFS for a four-inch outlet in an 18-inch deep pond. In order to ensure that the capacity of the internal street is not exceeded, it is recommended that only controlled discharge be permitted to the street.

This may be provided by individual lot ponding or by ponding runoff from an entire block in one location. If several lots pond at one location, the allowable discharge will be the equivalent of one four-inch outlet per lot. The allowable discharge for each block shall be the controlling factor for determining compliance as the lots are developed. An outlet will be required for each pond with a maximum of one outlet per lot. The discharge points from each lot shall be as indicated on Plate 4.

Two inlets shall be provided at the Morris Street entrance to the site. These inlets will remove nuisance flows from the internal street before they reach Morris Street. These inlets shall discharge directly into the storm drain in Morris Street. The detention ponds on the lots adjacent to Morris Street shall also be connected to the storm drain in Morris Street. This will ensure nuisance flows are minimized in Morris Street. The ponds shall be graded to retain minor nuisance flows. During the 100-year storm, the Morris Street storm drain will be at capacity. Therefore, an alternate discharge location for the detention ponds must be provided to Morris Street. These alternate discharges shall be installed so they will only function if the storm drain is at capacity and the pond volume is exceeded.

PHASE I

The grading and drainage plan for Phase I development is shown on Plate 2. The site will be divided into five drainage basins.

Basin C consists of two lots which will be graded to drain to Lagrima de Oro. Each lot shall be allowed to discharge through a four-inch outlet. Their maximum discharge shall be 0.5 CFS each.

Basin D consists of eight lots which will be graded to drain to the internal street. These flows will be conveyed within the internal street to Morris Street. Upon development, each lot shall detain the required volume due to a 100-year storm and discharge it through a four-inch outlet.

Basin E consists of six lots which will discharge to Montgomery Boulevard. These lots will be left undisturbed until their final development. Until final development occurs, each lot will be allowed to discharge at its present undeveloped rate (0.9–2.5 CFS) to Montgomery Boulevard.

If an individual lot is developed, the developer will be required to protect his lot from the runoff from the upland lots. Each developed lot shall detain the required volume due to a 100-year storm. Each lot may discharge through a four-inch outlet to Montgomery Boulevard.

Basin F includes Block C and Block D. Block D is under separate ownership. It is recommended that Block D discharge to Lagrima de Oro in the same manner as the lots in Basin C. Block C shall be left ungraded with exception of a wind row along the downstream edge, as shown on Plate 2. Upon development, each of these lots will be allowed to discharge through a four-inch outlet.

All improvements to Basin G are a part of Phase II. Basin G shall remain in its present state until the Phase II improvements are implemented. The runoff from this basin, after Phase I improvements, will be unchanged due to Phase I construction.

Phase I construction will have no effect on Lagrima de Oro and will increase the flow in Morris Street to 53.4 CFS. The flow in Montgomery Boulevard will be decreased to 48.5 CFS. The combined flow at the intersection of Morris Street and Montgomery Boulevard, from these areas, will be reduced to 101.9 CFS.

PHASE II

Phase II construction (see Plate 3) will extend Basin D to include Block C and one Lot from Block E. These lots shall be handled as described for Basin D above.

No substantial grading will take place in Blocks E and F. A berm shall be constructed within Hahn Park along the north property line of Block F. This berm will concentrate the upland runoff (11.0 CFS) at one point. From this point, it will be discharged through Block F to Montgomery Boulevard within an asphalt-lined swale. Minor nuisance flows from Hahn Park will be retained within the park. The southern lots shall be allowed to discharge at a controlled rate directly to Montgomery Boulevard. Each lot shall protect itself from upland flows, detain the required volume due to a 100-year storm, and discharge through a four-inch outlet. Discharge from the northeast lot in Block F shall be conveyed to the asphalt swale within the access easement.

Block G is under separate ownership. Runoff from Block G should be handled in the same manner as Block F. An asphalt-lined swale should be constructed along the west property line to convey the runoff (4.0 CFS) from the upland basin to Montgomery Boulevard. An additional asphalt swale, or a diversion berm, should be constructed within the proposed utility and access easement at the east property line to convey the upland runoff (16.4 CFS) to Montgomery Boulevard.

Phase II development will have no effect on the Lagrima de Oro flows but will increase the Morris Street flow to 53.5 CFS. The Montgomery Boulevard flow will decrease to 45.5 CFS which will decrease the flows at Morris Street-Montgomery Boulevard intersection from these areas to 99.0 CFS.

ULTIMATE DEVELOPMENT

At the time the entire project is developed (including Block D and Block G) and each lot discharges through a four-inch outlet. The Lagrima de Oro flows will increase to 40 CFS. The Morris Street flows will increase to 58.0 CFS. Each of these streets has adequate capacity to carry these flows (see Appendix 3).

The Montgomery Boulevard flows will decrease to 39.0 CFS. The largest point source will be at the east end of the project (16.4 CFS from the upland basins). The flows at the Morris Street and Montgomery Boulevard intersection will be decreased to 97.0 CFS as compared to the undeveloped flow rate of 109.0 CFS.

EROSION CONTROL PLAN

Upon the completion of rough grading for any lot, a windrow shall be graded along the downhill edges of each lot so that the entire volume of runoff generated during a 10-year storm will be ponded on that lot. The windrow will be large enough to provide six-inches of freeboard along its entire length. A temporaty discharge point will be provided. The runoff will discharge at this point if the volume of the temporary retention pond is exceeded.

Any lot which remains undisturbed during rough grading will be exempted from this requirement. Upon ultimate development of any lot, this requirement is no longer applicable to that lot.

The amount of retention required (in cubic feet) shall be calculated by multiplying the lot area (in acres) by 2027.

SUMMARY

- The project will be constructed in two phases. Each phase will reduce the total runoff reaching the intersection of Morris Street and Montgomery Boulevard.

- The lots will be partially prepared for development during rough grading. Upon completion of this grading and until each lot is developed, they will be required to retain the runoff generated during the 10-year storm. Yes?

- Undisturbed lots adjoining Montgomery Boulevard shall be allowed to continue discharging at their undeveloped rate to Montgomery Boulevard.

- Upon ultimate development, each lot shall detain the required volume (see Appendix, Sheets 5 and 6) due to a 100-year storm. Each lot shall be allowed to discharge through a four-inch outlet.

- If any of the lots desire to utilize a common pond:

  - The required pond volume shall be the sum of the volumes required for the individual lots.

  - The allowable discharge shall be the equivalent of one four-inch outlet for each lot

- All lots shall meet the requirements of the erosion control plan specified in this report.

DRAINAGE CRITERIA

DETERMINATION OF RATIONAL FORMULA 'C' FACTOR

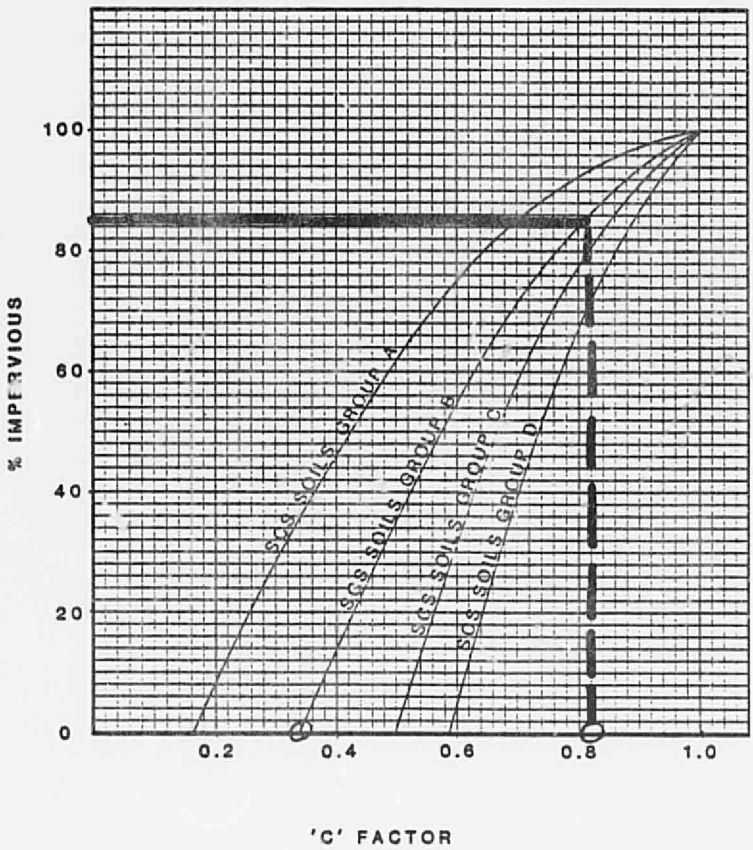


FIGURE 3

4-82

RUNOFF CURVE NUMBER (CN) CALCULATION

LAND USE DESCRIPTION	Hydrologic Soil Group				Present Area				Future Area			
	A	B	C	D	A	B	C	D	A	B	C	D
Cultivated land[1]: without conservation treatment	72	81	88	91								
: with conservation treatment	62	71	78	81								
Pasture or range land: poor condition	68	79	86	89								
: fair condition	54	70	80	85								
: good condition	39	61	74	80								
Meadow: good condition	30	58	71	78								
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83								
good cover[2]	25	55	70	77								
Open Spaces, lawns, parks, golf courses, cemeteries, etc.												
good condition: grass cover on 75% or more of area	39	61	74	80								
fair condition: grass cover on 50% to 75% of the area	49	69	79	84								
Commercial and business areas (85% impervious)	89	92	94	95								
Industrial districts (72% impervious)	81	88	91	93								
Residential[3]												
Average lot size / Average % impervious[4]												
1/8 acre or less / 65	77	85	90	92								
1/4 acre / 38	61	75	83	87								
1/3 acre / 30	57	72	81	86								
1/2 acre / 25	54	70	80	85								
1 acre / 20	51	68	79	84								
Paved parking lots, roofs, driveways, etc.[5]	98	98	98	98								
Streets and roads:												
paved with curbs and storm sewers[6]	98	98	98	98								
gravel	76	85	89	91								
dirt	72	82	87	89								

[1] For a more detailed description of agricultural land use curve numbers, refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, August 1972

[2] Good cover is protected from grazing and litter and brush cover soil

[3] Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur

[4] The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

[5] In some warmer climates of the country, a curve number of 95 may be used

Present CN	Future CN
Runoff Volume = _____ in.	Runoff Volume = _____ in.
=DA(AC) x $\frac{\text{RO(in.)}}{12}$ = _____ ac.ft.	=DA(AC) x $\frac{\text{RO(in.)}}{12}$ = _____ ac.ft.

Area, Acres _____ Date _____

Project _____

Approved By _____

9

PLATE 22.2 C-2

22.2

FIGURE 4

HYDROLOGY: SOLUTION OF RUNOFF EQUATION

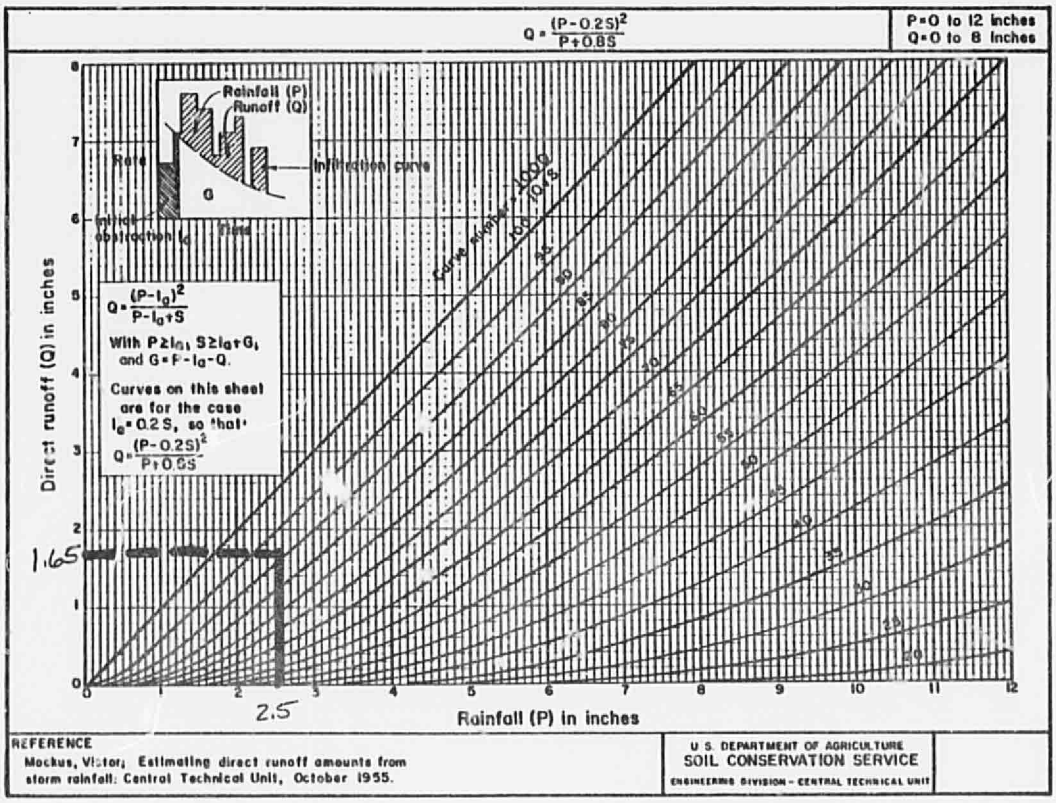


FIGURE 5

RUNOFF HYDROGRAPH (for on-site routing purposes)

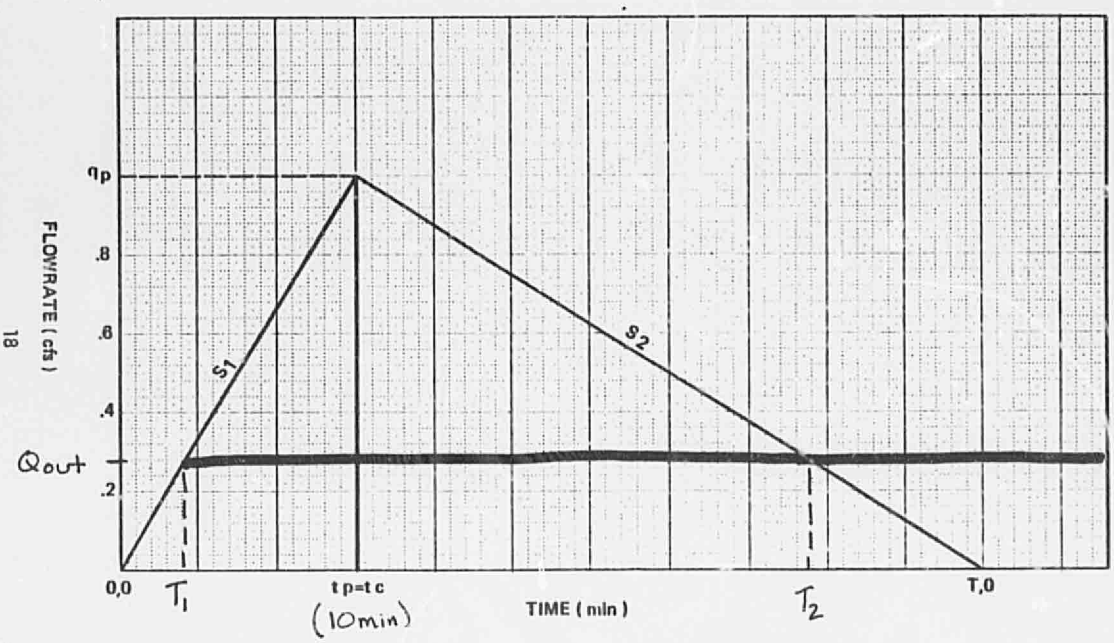


FIGURE 8

q_p = maximum runoff rate (in cfs)

t_p = time to peak

t_c = time of concentration

$\forall$ = volume of runoff

T = total duration of runoff $= 2\forall / q_p$

S_1 = slope of rising side $= q_p / t_p$

S_2 = slope of recession side $= q_p / t_p$

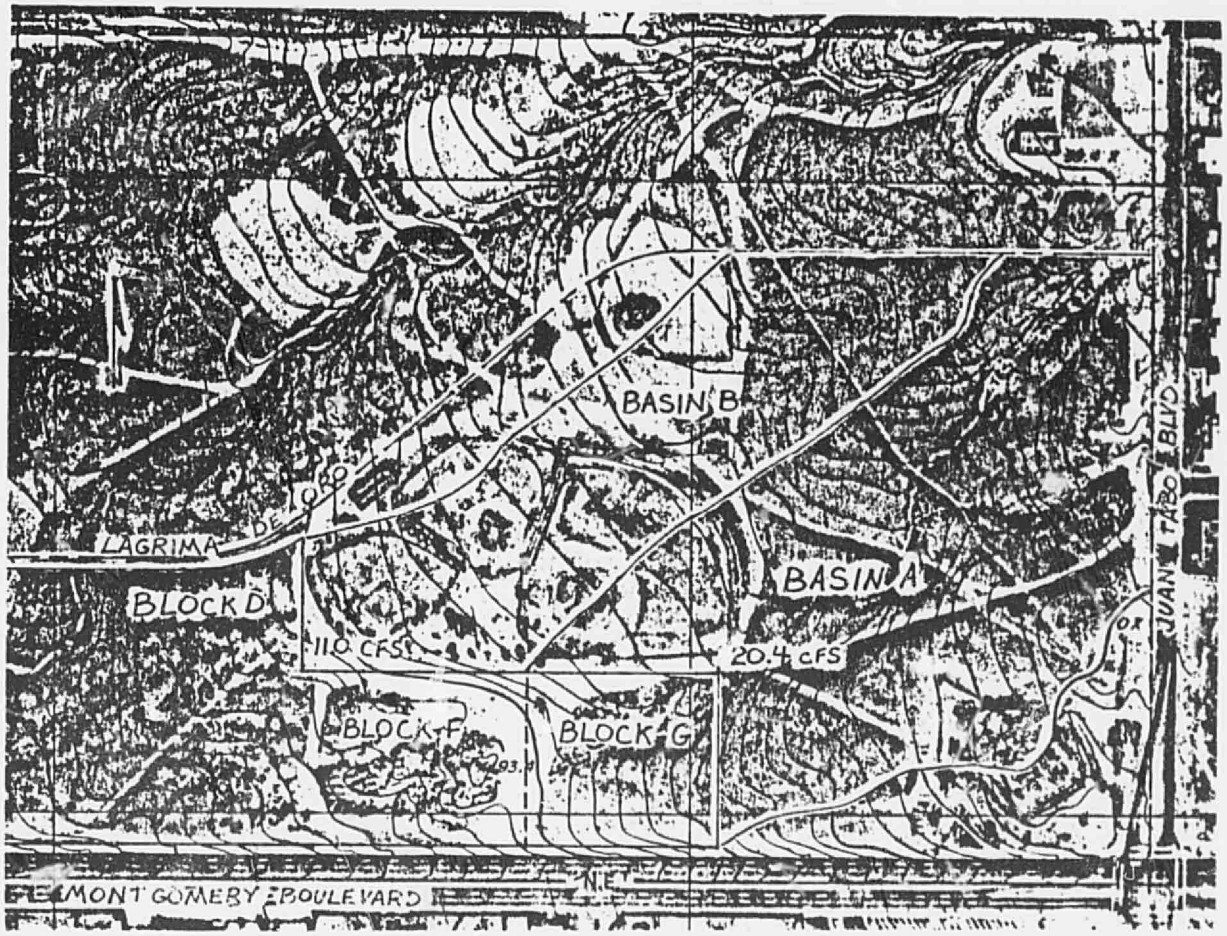

BASIN B
LAGRIMA DE ORO
BASIN A
BLOCK D
110 CFS
20.4 CFS
BLOCK F
BLOCK G
JUAN TABO BLVD
N.E.
FREMONT GOMEBY BOULEVARD

FIGURE 10

HYDROLOGY F21/D37 2 OF 2

CLIFFORD M+M
UNDEVELOPED

2.5	6HRV
0.34	C

BASIN 1

14.02661157	A
60.	ΔH
1450.	ΔL
.0413793103	S
3.344493059	V
10.	TC
5.28440519	I100
3.47185421	I10
25.20158165	Q100
16.55743914	Q10

BASIN 2
SEE HYDROGRAPH

BASIN 3

9.4840948	A
70.	ΔH
1600.	ΔL
0.04375	S
3.495250408	V
10.	TC
5.28440519	I100
3.47185421	I10
17.04005193	Q100
11.19531411	Q10

BASIN 4

5.4068204	A
60.	ΔH
1600.	ΔL
0.0375	S
3.293849721	V
10.	TC
5.28440519	I100
3.47185421	I10
9.714422126	Q100
6.382375336	Q10

BASIN 5

2.409148041	A
25.	ΔH
600.	ΔL
.0416666667	S
2.737458894	V
10.	TC
5.28440519	I100
3.47185421	I10
4.3285109	Q100
2.843831661	Q10

BASIN 6

1.591055522	A
18.	ΔH
460.	ΔL
.0391304348	S
2.513660366	V
10.	TC
5.28440519	I100
3.47185421	I10
2.858645899	Q100
1.878130356	Q10

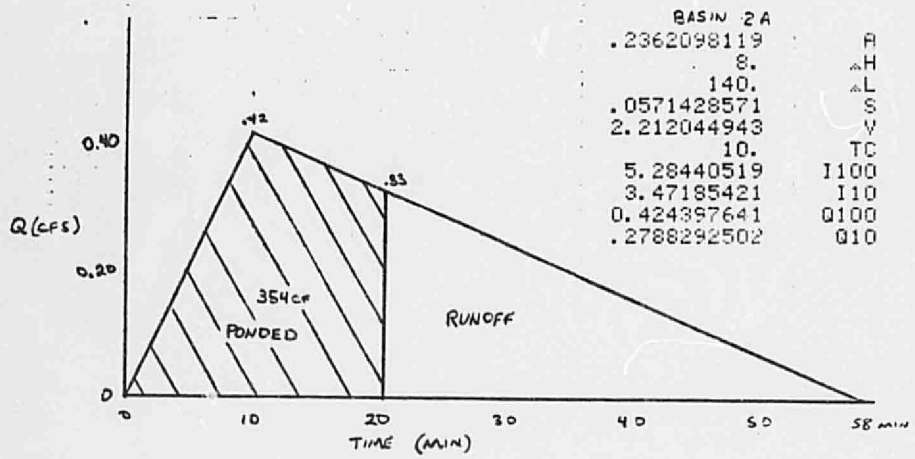
BASIN 7

1.726444073	A
29.	ΔH
540.	ΔL
.0537037037	S
2.946160099	V
10.	TC
5.28440519	I100
3.47185421	I10
3.101899206	Q100
2.037947121	Q10

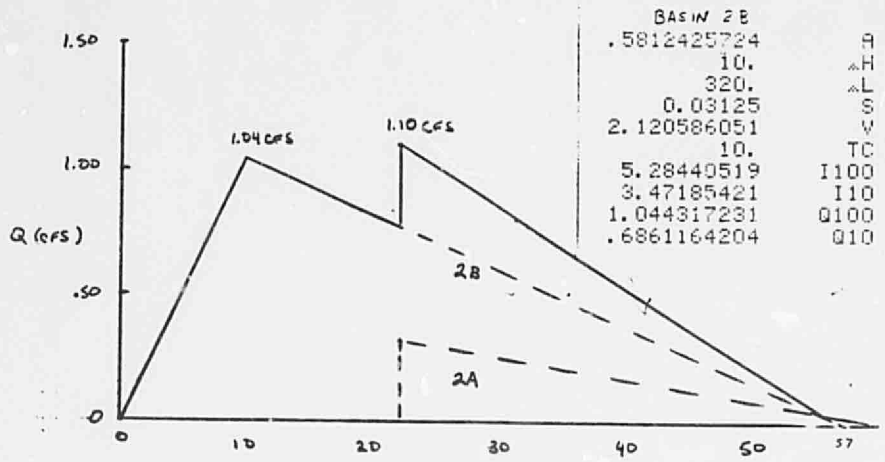
BASIN 8

.1731565152	A
6.	ΔH
100.	ΔL
0.06	S
2.08613485	V
10.	TC
5.28440519	I100
3.47185421	I10
.3111099238	Q100
0.20439922	Q10

PROJECT NAME MONTGOMERY BUISNESS PARK SHEET 1 OF 6
PROJECT NO. 21440 BY M DATE 11/4/92
SUBJECT UNDEVELOPED RUNOFF CH'D DATE



BASIN 2A HYDROGRAPH



BASIN 2 COMBINED HYDROGRAPH

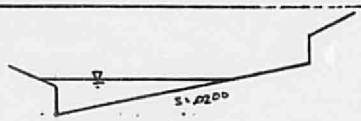
PROJECT NAME MONTGOMERY BUISNESS PARK SHEET 2 OF 6
PROJECT NO. 21440 BY MW DATE 11/4/92
SUBJECT BASIN 2 UNDEVELOPED HYDROGRAPH CH'D DATE

ADDITIONAL RUNOFF CONTRIBUTED BY DEVELOPMENT (CFS)

LOCATION	UNDEVELOPED	PHASE I	PHASE II	COMPLETED DEV.
LAGRIMA DE ORO	38.5	38.5	38.5	40.0
MORRIS STREET	51.7	53.4	53.5	58.0
MONTGOMERY BLVD.	57.3	48.5	45.5	39.0
MORRIS MONTGOMERY INTERSECTION	109.0	101.9	99.0	97.6

DEVELOPED

MORRIS STREET FLOW DEPTH



100 YR FLOW 58.0 CFS (DEV)

S= .0250 CROSS SLOPE = .0200 n= .017 d= 0.83'

10 YR DEVELOPED FLOW 38.1 CFS d= 0.71'

100 YR UNDEVELOPED FLOW DEPTH

Q= 51.7 CFS d= 0.79'

10 YEAR RETENTION POND VOLUME (PRELIMINARY DEVELOPMENT)

C= .34 10 YR 6 HR STORM VOLUME = 1.64"/ACRE

Q= CIA = 0.56 ACRE INCHES = 2027 CUFT

UPLAND BASINS (FIGURE 10)

BASIN A		BASIN B	
11.33188754	A	6.154387193	A
38.	ΔH	40.	ΔH
1100.	ΔL	1200.	ΔL
.0345454545	S	.0333333333	S
2.927891409	V	2.946287901	V
10.	TC	10.	TC
5.28440519	I100	5.28440519	I100
3.47185421	I10	3.47185421	I10
20.35997701	Q100	11.05757372	Q100
13.3765049	Q10	7.264821935	Q10

PROJECT NAME MONTGOMERY BUISNESS PARK SHEET 3 OF 6

PROJECT NO. 21440 BY DW DATE 11/11/82

SUBJECT DRAINAGE CALCULATIONS CH'D DATE

Soil Type "B"

Undeveloped Runoff Coefficient (C_D) = 0.36

Plate 22.2 C-1

85% Impervious

Developed Runoff Coefficient (C_D) = 0.82

Plate 22.2 C-1

CN = 92

Plate 22.2 C-2

6hour Rainfall Volume = 2.5 in (100yr storm)

Plate 22.2 D-1

Direct Runoff = 1.65 in

Plate 22.2 C-4

I = 6-hour Rainfall Volume × I/6

I/6 = 2.112 Plate 22.2 D-2

I_{100} = 5.28

$Q_P = I_{100} \times C_D \times A = 5.28 \times .82 \times A = 4.33\,A$

Q_{OUT} (use 4" outlet pipe) $= cA\sqrt{2gh} = .6\,(1.33)\sqrt{2(32.2)(1.33)}$

Q_{OUT} = 0.5 cfs (18" deep pond)

Runoff Volume = Direct Runoff × Area × $\frac{43560}{12}$

= 5989.5 A (cf)

PROJECT NAME Montgomery-Morris Development SHEET 4 OF 6

PROJECT NO. 21440 BY Dmyn DATE 11-8-82

SUBJECT Drainage Computations CH'D DATE

Method of Determining Required Pond Volume (RPV)
Based Upon Area of Lot
(see Plate 22.2 E-1)

$$T_1 = \left(\frac{Q_{OUT}}{Q_P}\right) 10 = \frac{.5 \times 10}{.82 \times 5.28\,A} = \frac{1.155}{A}$$

$$T_2 = T - \left[\left(\frac{Q_{OUT}}{Q_P}\right)(T - 10)\right] = 46.11 - \left[\frac{.1155}{A}(46.11 - 10)\right] = 46.11 - \frac{4.1707}{A}$$

$$T = \frac{\text{Volume}}{30\,Q_P} = \frac{5989.5\,A}{.30 \times 4.3296\,A} = 46.11$$

$$RPV = (T_2 - T_1)(Q_P - Q_{OUT})(30)$$

$$RPV = \left(46.11 - \frac{4.1707}{A} - \frac{1.155}{A}\right)(4.33\,A - .5)(30)$$

$$RPV = 5989.5\,A - 1383.4 + \frac{79.9}{A}$$

Example:

$A = 0.50$ acre

$$RPV = 5989.5(0.50) - 1383.4 + \frac{79.9}{(0.50)} = 1771 \text{ cf}$$

PROJECT NAME Montgomery-Morris Development SHEET 6 OF 6

PROJECT NO. 21440 BY [illegible] DATE 11-8-82

SUBJECT Required Pond Volume Summary CH'D DATE

$Q_p = 4.28\ A$ $Q_{out} = 0.5$ $RPV = 5989.5A - 13834 + \frac{79.9}{A}$

Block	Total Acres	# Lots	Ave. Lot Size	Q_p/Lot	Total Q_p	Q_{out}/Lot	Total Q_{out}	RPV/Lot	Total RPV
A	3.17	7	.45	1.93	13.5	0.5	3.5	1489	10426
B	2.26	6	.38	1.63	9.8	0.5	3.0	1103	6617
C	0.43	1	.43	1.84	1.8	0.5	0.5	1378	1378
D	1.10	1	1.10	4.71	4.7	0.5	0.5	5278	5278
E	1.15	2	.58	2.48	5.0	0.5	1.0	2228	4456
F	3.02	6	.50	2.14	12.8	0.5	3.0	1771	10626
G	2.10	2	1.05	4.49	9.0	0.5	1.0	4982	9963
Rest A	1.13	1	1.13	4.84	4.8	0.5	0.5	5455	5455
Rest B	2.02	1	2.02	8.65	8.7	0.5	0.5	10755	10755
Total	16.38				70.1		13.5		64494