HYDROLOGY E19/D15 TWO PLAN

E 19-D 15

2 PLANS

August 15, 1977

RECEIVED
AUG 18 1977
CITY ENGINEERS

Mr. Bruno Conegliano
Assistant City Engineer - Hydrology
City of Albuquerque
400 Marquette Avenue
Albuquerque, New Mexico 87102

RE: STORM DRAINAGE STUDY RELATIVE TO DEVELOPMENT OF TRACT "A" AND A PORTION OF TRACT "B", BEAR CANYON VILLAGE FOR THE NORTH TOWNE SHOPPING CENTER, ALBUQUERQUE, NEW MEXICO.

Dear Mr. Conegliano:

In response to letter, your office, dated April 21, 1977, and letter this office dated May 11, 1977, copies of pond soils tests are forwarded for your files.

Sincerely,

George R. Rainhart, A.I.A.

GRR/jc

3736c eubank ne/albuquerque nm 87111/505-296-0739

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

March 28, 1980

E19-D15a

Mr. John A. Segotta
Assistant Civil Engineer
Boyle Engineering Corporation
Suite D, 3939 San Pedro N.E.
Albuquerque, New Mexico 87110

RE: NORTH TOWNE OFFICE PARK

Dear Mr. Segotta:

The following are the comments for the above project:

1. Do not agree exactly with T_c's determined from the nomographs.

2. According to "Interim Drainage Guidelines" Nov. 1979, the outflow to a street or public storm system shall be at the rate of the Q_5 undeveloped. There are 3" drains provided from the ponding areas, however, there is no mention as to their design or if these were provided to comply with the "Guidelines".

3. From the grading plan it appears that runoff is directed toward the east side of the buildings. With sidewalks shown around the buildings, it appears the water will pond against the curbs with no means provided to drain it out of the parking areas. The arrows shown on the drainage plan indicate otherwise but there are no elev. shown to verify.

4. Ponding area 4A and 4C appears to have the bottom of the pond located at the back of the curb for Cubero Drive. How will the curb and pedestrians be protected from this vertical drop?

5. Will the flow through the curb cuts create an erosion problem into the ponds; how will this area be protected?

Sincerely,

Fred J. Aguirre
Civil Engineer

FJA/tsl
cc: Drainage File

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

April 29, 1980

John A. Segotta
Boyle Engineering Corp.
3939 San Pedro N.E.
Albuquerque, New Mexico 87110

Reference: North Towne Office Park

Dear Mr. Segotta:

I have reviewed the revised plan for the referenced project, and the drainage plan submitted is approved in concept.

The construction plan for each individual site will have to contain a detailed grading plan with an acceptable configuration of the ponding areas, a clear indication of the conveyance of the flow from the buildings to the ponding areas and from the ponding areas to the street.

The temporary means, required to control the outside flows before the adjacent parcels are developed, must also be indicated. This apporval is contingent upon concurrence by Mr. Heller, of the treatment and the timing for the construction of Cubro Dr. adjacent to this parcel.

Very truly yours,

Bruno Conegliano
Assistant City Engineer/Hydrology

BC/lc
xc: Richard Leonard, AMAFCA
Richard Heller, City Engineer

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE April 29, 1980 REF. NO. e d

E19-D15a

TO: Richard S. Heller, City Engineer

FROM: Bruno Conegliano, Assistant City Engineer/Hydrology B.C.

SUBJECT: North Towne Office Park

I have made the approval of the drainage report for the referenced development contingent upon your approval of the treatment for the roadway of Cuebro Dr.

I have done so because I feel we have some problems with the requirements for the treatment of the streets that surround parcels coming in for development. The existing procedure to ask for one half street construction, oftentimes with only temporary pavement, is not a satisfactory method to control the runoff.

I'd like to recall the development of Sunset West and the treatment San Ygnacio Rd. The fact that the street cross section may be able to convey the local runoff, does not necessarily reflect the capabilities of the systems downstream: in this case, Academy Blvd., in the case of Sunset West, Sage Rd.

It is the position of the Consultants that their investigation of downstream City's facilities is out of order and an impossible burdened to bear. In a way, this question is related to my memo of April 24, 1980; a method needs to be devised to establish what is the minimum acceptable level of improvements for the downstream facilities. This question has bearing for instance, on the approval of the Country Squire Subdivision and on the treatment of Sage Rd. In the case of the captioned development, I wonder if it is not time to initiate some design for improvements of the conditions in Academy Blvd. given the development of Tanoan, of lands of Gary Swearinger and of Dr. Edwards.

Can you make this topic a subject of discussion at the next staff meeting?

BC/lc

Rec. 5-6-81

GORDON W. SCOTT, M.D., P.A.
EL CAMINO MEDICAL CENTER
SUITE 2000
8100 CONSTITUTION PL. NE
ALBUQUERQUE, NEW MEXICO 87110
TELEPHONE 299-9549

May 1, 1981

RECEIVED
MAY 12 1981
RECEIVED

Mr. Ed Pennybacker
KOAT-TV Station
On Your Behalf
P. O. Box 25982
Albuquerque, New Mexico 87125

Dear Mr. Pennybacker:

There is a recessed basin on the North side of the North Town Shopping Center which is located at the corner of Wyoming and Academy. The purpose of this large basin is to collect the water runoff from the shopping center area. At the East end of this basin is a connection with the sewer to allow the water to run off as it collects. So far, it sounds good.

The only trouble is that the bottom of the basin is not properly sloped and so all during the summer months, there is stagnant water standing in the bottom of this. This provides a place where mosquitos may breed and as the weather becomes warmer, the stagnant water has a definite odor, made worse by garbage and trash which blows in and stays there.

Last summer, I brought this problem to the attention of the management corporation for the shopping center and they refused to take any action. I then spent half an hour on the telephone contacting various city offices, each of which assured me that it was not their job to attend to things like this.

As the warm weather approaches, I would appreciate your looking into this source of odor pollution which I think is also a health hazard. It would seem like a simple thing to put more gravel on the bottom of the area and with a proper slope so that the water would run off as it collects.

Thank you for your help.

Sincerely yours,

Gordon W. Scott M.D.

Gordon W. Scott, M. D.

GWS:*

ON YOUR BEHALF
Ed Pennybacker

RECEIVED
MAY 12 1981

May 6, 1981

Mr. Fred Aguirre
Flood Control
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Dear Mr. Aguirre,

Enclosed please find a letter from Dr. Gordon Scott which is self-explanatory. Would you please be kind enough to review your records on this matter to determine what, if anything, might be done? Or if there are additional factors of which I am not aware, please let me know.

Thank you for your time and attention. I am looking forward to your reply.

Sincerely,

ED PENNYBACKER
On Your Behalf

EP:

Enclosures

KOAT-TV/P.O. Box 25982/Comanche & Carlisle N.E./Albuquerque, New Mexico 87125/(505)884-7777

Bellamah Development Corp.

May 27, 1981

Mr. Fred Aguirre
City Engineer Department
123 Central Avenue, NW
Hydrology Section
Albuquerque, NM

Dear Mr. Aguirre:

Please allow this letter to act as a follow-up to our conversations on Tuesday, May 26, 1981, concerning the ponding area at North Towne Shopping Center. As I mentioned to you at that time, the reason that the ponding area had standing water in it was due to the fact that our maintenance man has been on vacation and has not been able to pump the water out. Be assured that this matter will be corrected by Monday, June 1, 1981.

If you should have any questions regarding this matter, please contact me.

Sincerely,
BELLAMAH DEVELOPMENT CORP.

Jack D. Fullerton

Jack D. Fullerton, Manager
New Mexico Income Properties

JDF:vmd

RECEIVED
JUN 01 1981
RECEIVED

6121 Indian School Road, NE / PO Box 3325 / Albuquerque, New Mexico 87190 / (505) 883-3000

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

June 4, 1981

Mr. Ed Pennybacker
On Your Behalf
KOAT-TV/P. O. Box 25982
Comanche & Carlisle N.E.
Albuquerque, New Mexico 87125

Dear Mr. Pennybacker:

First of all, I want to apologize for the delay in responding to your letter of May 6, 1981.

I contacted the owner of the development (Bellamah Corporation) and was assured in a letter to me (attached) that the problem would be corrected by June 1, 1981.

Also, Mr. Fullerton informed me that these corrective measures are temporary and a permanent solution will be forthcoming when construction plans are submitted for future development.

If you have any further questions, please feel free to contact me.

Very truly yours,

Fred J. Aguirre

Fred J. Aguirre, PE
Civil Engineer

FJA/cc

xc: Check Easterling, PACE/Hydrology
Jack D. Fullerton, Mgr., New Mexico Income Properties

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

June 4, 1981

Mr. Ed Pennybacker
On Your Behalf
KOAT-TV/P. O. Box 25982
Comanche & Carlisle N.E.
Albuquerque, New Mexico 87125

Dear Mr. Pennybacker:

First of all, I want to apologize for the delay in responding to your letter of May 6, 1981.

I contacted the owner of the development (Bellamah Corporation) and was assured in a letter to me (attached) that the problem would be corrected by June 1, 1981.

Also, Mr. Fullerton informed me that these corrective measures are temporary and a permanent solution will be forthcoming when construction plans are submitted for future development.

If you have any further questions, please feel free to contact me.

Very truly yours,

Fred J. Aguirre

Fred J. Aguirre, PE
Civil Engineer

FJA/cc

xc: Check Easterling, PACE/Hydrology
Jack D. Fullerton, Mgr., New Mexico Income Properties

CITY OF ALBUQUERQUE

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE February 4, 1982 REF. NO._____

TO: Chuck Easterling, City Hydrologist

FROM: Carl Rodolph, Director/MDD

SUBJECT: INVASION OF TERRITORIAL RIGHTS

This morning I received a telephone request from Engineering asking if I could do a sign-off for you since all personnel were at KAFB.

Since Mr. Orville Anderson, representing Northtown Plaza, corner of Wyoming and Cubero, was only in town for the day from Denver, I signed off for AMAFCA on the development design.

I realize that I have no authority to do this, but since the plan had been reviewed, and Bob Fosnaugh had signed off, so did I.

If the plan screws up, "The Company Will Dis-avow."

Carl

Bernie, Fred, FYI
Brian

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

September 22, 1982

E19-D15a

Mr. Victor Chavez
Chavez-Grieves & Associates
6121 Indian School Rd. N.E.
Suite 220
Albuquerque, N.M. 87110

RE: YOUR LETTER OF SEPTEMBER 14, 1982 - NORTH TOWNE SHOPPING CENTER DRAINAGE MODIFICATION

Dear Vic:

I have reviewed your submittal regarding the North Towne pond modifications and concur that the pond bottom may be raised without drastically affecting the capacity of the facility. Since we have suggested this solution several times to the developer of the property, we now need to work out details such as:

1. Who will prepare the construction details for the work?

2. Who will pay for this work and when will it be constructed?

We are quite anxious to see this "project" brought to a conclusion since the facility has been a constant source of complaints for several years. Please contact me to discuss the details of the project.

Thanks for your help.

Very truly yours,

Brian G. Burnett

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl

STORM DRAINAGE STUDY
RELATIVE TO DEVELOPMENT OF
TRACT "A" AND A PORTION OF TRACT "B",
BEAR CANYON VILLAGE
FOR THE NORTH TOWNE SHOPPING CENTER,
ALBUQUERQUE, NEW MEXICO

MARCH, 1977

Boyle Engineering Corporation

consulting engineers

1721 Girard Boulevard, N.E.
Albuquerque, New Mexico 87106

505 / 266-7789

JORGE DE LA TORRE
3736 C Eubank N.E.
Albuquerque, NM 87111

March 30, 1977

Drainage Report: North Towne Shopping Center

Transmitted herewith is the report of studies conducted by this firm relative to storm runoff drainage considerations relative to the proposed development of the subject project.

The criteria and methods of analysis conform to standards of the Albuquerque Metropolitan Arroyo Flood Control Authority, and the City of Albuquerque, New Mexico.

We will be happy to answer any questions you may have about the conclusions and recommendations of this report.

BOYLE ENGINEERING CORPORATION

Fred Burns

Fred Burns, PE
Managing Engineer

FB:bb
Encl.

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LETTER OF TRANSMITTAL DATE: April 7 1977

TO: City of Alby
City Hydrologist

RE: NORTH TOWNE DRAINAGE STUDY

ATTENTION: MR BRUNO CONEGLIANO

Attached herewith are: 2 copies of the grading plan as per your request to compliment the Drainage Report. For your review.

Jorge de la Torre, Architects

JDLT/jk

STORM DRAINAGE STUDY
RELATIVE TO DEVELOPMENT OF
TRACT "A" AND A PORTION OF TRACT "B",
BEAR CANYON VILLAGE
FOR THE NORTH TOWNE SHOPPING CENTER,
ALBUQUERQUE, NEW MEXICO

1. PURPOSE: This report is to present such data as is relative to the estimation of the quantity and proposed means of proper handling of storm runoff drainage with respect to the development of Tract "A" and a portion of Tract "B", Bear Canyon Village Addition for the North Towne Shopping Center, Albuquerque, New Mexico.

2. SCOPE: This report is to establish criteria and means of construction such that the development of the proposed facility will be protected from storm runoff and, further, will not create increased flooding potential for contiguous properties.

3. LOCATION: The land area under study in this report is a parcel located within the City of Albuquerque in the S.W. 1/4 of TSP. 11N, R4E, N.M.P.M. bounded to the northeast by Wyoming Boulevard N.E., to the south and southeast by Academy Road N.E., to the north and northwest by Cubero Drive N.E. and to the west and southwest by a line from a point on the southeasterly right-of-way of Cubero Drive N.E. 15 feet southwest along the right-of-way from the intersection with the centerline of Quemado Drive N.E., extending south 48° 37' east 128.34",

thence south 35° 59'58" east a distance of 198.27' thence south 15°58'16" east a distance of 539.54', thence south 7°35'43" east a distance of 100.52 feet to a point lying on the northerly right-of-way of Academy Road N.E. an arc distance of 642.22' from the point of tangency of the right-of-way line that lies 212.51 feet from the centerline of the Wyoming Boulevard. The land area of this parcel being 15.433 acres of land, more or less.

4. EXISTING DRAINAGE CONDITIONS:

A. General: The parcel under study is presently undeveloped and drains for the most part in a westerly direction to swales that empty into Cubero Drive and ultimately into Academy Road.

B. Topography: The parcel is located on an alluvial slope of the Sandia Mountains on the high ground between the Pino and Bear Canyon Arroyos. The elevation of the land at the high point is approximately 5443.0± from a high point at the intersection of Wyoming and Academy. The area slopes to the west at approximately 3-1/2%.

The area is sparsely vegetated and is for the most part bare soil consisting of coarse, silty to clean sands of decomposed granite. There are no notable geologic features unusual to the area.

C. Drainage Areas: The area in question is located in the watershed of the Bear Canyon Arroyo and does not lie within the 100-year flood plain. The

drainage basins upstream of the site are intercepted by Wyoming Boulevard and Academy Road. The basin contributing to the flow in Academy Road is approximately 56.9 acres and the basins contributing to the flow in Wyoming Boulevard are approximately 14.7 and 34.0 acres, respectively, as can be seen in Figure 1.

There exists a low dike along the Wyoming Boulevard right-of-way of Basin I as shown in Figure 1. However, the dike will probably not retain the flows generated in a 100-year event and the total flow is considered to run into Academy Road.

All the upstream basins are presently undeveloped; however, all drainage calculations are based on an anticipated worst case condition of fully developed suburban.

5. PROPOSED DRAINAGE PLANS:

A. Criteria:

(1) General: Resolution No. 1972-2, Albuquerque Metropolitan Arroyo Flood Control Authority.

(2) Project Storm: 100-year Intensity; frequency duration as shown on the Curve of Figure 2, "1963 Master Plan of Drainage for the City of Albuquerque and Environs", as prepared by Gordon Herkenhoff and Associates, Inc., Consulting Engineers.

B. Flood Protection:

(1) Academy Road: Presently undeveloped. Anticipated fully developed suburban.

Basin I

Area	56.9 acres (Fig. 1)
Length	4500 feet
Slope	3.1%
Channel Config.	5:1 side slope Triangular swale

Academy Right-of-Way

Area	2.2 acres
Length	900 feet
Slope	3.02%
Channel Config.	50' Roadway 6" Crown - 8" curb

Overland flow	100' @ 3% bare ground
Character	Fully developed suburban
Total Area	59.1 acres

Time of Concentration	19.76 minutes
Intensity	4.22 in/hr
Peak Flow	114.15 cfs
Flow Gradient	.56'
Energy Gradient	1.38'
Required Berm	.71' (over top of curb)

(2) Wyoming Boulevard below Basin II: Presently undeveloped. Anticipated fully developed suburban.

Basin II

Area	14.7 acres
Length	1400 feet
Slope	3.8 %
Channel Config.	5:1 side slope Triangular swale

Wyoming Right-of-Way

Area	Included above
Length	1000 feet
Slope	2.03%
Channel Config.	50' roadway 6" crown - 8" curb

Overland Flow	50' @ 3.8% bare soil
Character	Fully developed suburban
Total Area	14.7 acres
Time of Concentration	12.77 minutes
Intensity	5.00 in/hr
Peak Flow	33.10 cfs
Flow Gradient	.38 feet
Energy Gradient	.71 feet
Required Berm	.04 feet (over top of curb)

(3) Wyoming Boulevard below Basin III: Presently undeveloped. Anticipated fully developed suburban.

Basin II and III

Area	48.7 acres
Length (Basin III)	5000 feet
Slope	3.2%
Channel Config.	5:1 Side Slope Triangular Swale

Wyoming Right-of-Way

Area	Included above
Length	250 feet
Slope	2.03%
Channel Config.	50' roadway 6" crown - 8" curb
Overland flow	75' @ 3.2% bare soil
Character	Fully developed suburban
Total Area	48.7 acres
Time of Concentration	18.85 minutes
Intensity	4.31 in/hr
Peak Flow	94.46 cfs
Flow Gradient	.56 feet
Energy Gradient	1.12 feet
Required Berm	.45' (over top of curb)

NOTE: SEE EXHIBIT "A" FOR OFF SITE DRAINAGE CALCULATIONS.

C. Site Drainage: The proposed development includes construction of buildings and parking lots which will increase site runoff. To comply with AMAFCA Resolution

No. 1972-2, the calculated increase in peak runoff will be detained on the site for controlled releases so as not to exceed the peak runoff under existing conditions. Site Drainage Calculations are included in Exhibit "B".

6. CONCLUSIONS AND RECOMMENDATIONS: On the basis of the study of this report, the following recommendations are proposed:

A. Provide site grading such that the increased peak runoff from parking and building areas is detained and released at a controlled rate from the site as outlined in Exhibit "B".

B. Should the increased volume of flow released from the site prove to have some detrimental effect at some future date, the outlet structure should be plugged and abandoned, thus converting the detention facility to a retention facility where the flow may be allowed to percolate and evaporate off the site.

C. Provide berms along both Wyoming and Academy to the depth of the energy gradient above the gutter gradient as outlined in "Flood Protection" so as to preclude the intrusion of flow from the 100-year frequency flood.

Provided the above listed recommendations are implemented prior to or concurrent with the development of the Parcel for the North Towne Shopping Center, it is concluded that the proposed development will not create flood hazard to surrounding properties, nor will the property itself be in danger of flooding.

Respectfully submitted:

BOYLE ENGINEERING CORPORATION

Fred Burns

Fred Burns, PE
New Mexico Registration #4000

APPENDIX

Job NORTH TOWNE SHOPPING CENTER Sheet No. 1 of 4
Subject OFF SITE DRAINAGE Job No. D02-100-51
Client DE LA TORRE By GARNAND Date 3/29/79
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

EXHIBIT A

ACADEMY ROAD

FUTURE CONDITION - FULLY DEVELOPED SUBURBAN
RUNOFF COEFICIENT = .45

AREA = 56.9 Ac. (FIG. 1)

LENGTH ≈ 4500'
Δ ELEV. = 140'
SLOPE = 140/4500 = 3.1%

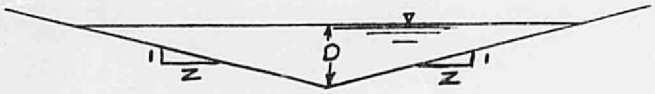
ESTIMATE TIME OF CONCENTRATION 19.8 MIN.

$I = 189/(19.8 + 25) = 4.22$ IN/HR (FIG. 3)

$Q = ACI = 56.9 * .45 * 4.22 = \underline{108.11}$ CFS

ESTIMATE OVERLAND FLOW
150' @ 3.1%, BARE SOIL → 7.9 MIN (FIG. 2)

ASSUME TRIANGULAR CHANNEL SECTION



$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ ESTIMATE $n = .03$, $Z = 5$

$A = D^2 Z$, $R = A/WP$, $WP = 2(1+Z^2)^{1/2} D$

$Q = \frac{1.486}{.03} * 5D^2 * \frac{(5D)^{2/3}}{(2(1+5^2)^{1/2})^{2/3}} * (.031)^{1/2} = 108.11$

→ $D = 1.68'$ $A = 14.11$ $V = Q/A = 7.66$ F.P.S.

TRAVEL TIME = $4500'/7.66 \text{ FPS} \times \frac{1 \text{ min}}{60 \text{ sec}} = \underline{9.8}$ MIN

Job NORTH TOWNE SHOPPING CENTER Sheet No. 2 of 4
Subject OFF SITE DRAINAGE Job No. D02-100-51
Client DE LA TORRE By GARNAND Date 3/29/77
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

ACADEMY ROAD (CONTD.)

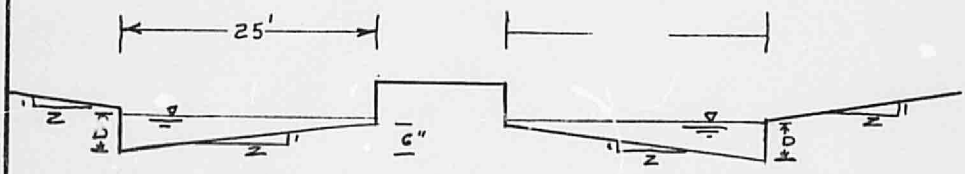
FLOW IN ACADEMY R.O.W. ADJACENT TO SITE

AREA = 2.2 AC. COEF. = .65

$\Sigma AC = 56.9 * .45 + 2.2 * .65 = 27.035$

$Q = 27.035 * 4.22 = 114.15$ CFS

50' ROADWAY 6" CROWN - 8" CURBS



$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ $n = .015$, $Z = 50$

$A^* = D^2 Z$, $R = A/WP$, $WP^* = 2(1 + (1+Z^2)^{1/2}) D$

* EXACT FOR CROWN = CURB HIGHT OR SOLUTION < CROWN
APPROXIMATE FOR SOLUTION > CROWN

$\rightarrow D = .56'$ $A = 15.68$ $V = Q/A = 7.28$ FPS

TRAVEL TIME $900'/7.28 \text{FPS} \times \frac{1}{60} = \underline{2.1}$ MIN

TIME OF CONCENTRATION = 7.9 + 9.8 + 2.1 = <u>19.8</u> OK

FLOW ASSUMES ENERGY GRADIENT DEPTH @ EDDIES & OBSTRUCTIONS ∴ BERM HEIGHT = $D + V^2/2g$ − CURB

$= .56 + \frac{(7.28)^2}{2g} - .67 = \underline{\underline{.71}}$

Job NORTH TOWNE SHOPPING CENTER Sheet No. 3 of 4
Subject OFF SITE DRAINAGE Job No. D02-100-51
Client DE LA TORRE By GARNAND Date 3/30/77
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

WYOMING BLVD BELOW BASIN II

FUTURE CONDITION - FULLY DEVELOPED SUBURBAN
RUNOFF COEFICIENT = .45

AREA = 14.7 ACRES (FIG. 1)
LENGTH = 1400'
Δ ELEV. = 53'
SLOPE = 53/1400 = 3.8%

ESTIMATE TIME OF CONCENTRATION 12.8 min

I = 189/(12.8+25) = 5 IN./HR

Q = A * C * I = 14.7 * .45 * 5 = 33.1 C.F.S.

ASSUME SAME SECTION AS BASIN I

$$Q = 33.1 = \frac{1.486}{.03} * 5D^2 * \frac{(5D)^{2/3}}{(2(1+5^2)^{1/2})^{2/3}} * (.038)^{1/2}$$

→ D = 1.04' A = 5.38 □' V = Q/A = 6.15 FPS

TRAVEL TIME = 1400'/6.15'/SEC * 1 min/60 SEC = 3.8 min

ASSUME SAME SECTION ACADEMY ROAD

→ D = .38' A = 7.20 V = Q/A 4.60

TRAVEL TIME = 1000'/4.6/60 = 3.6 min

ESTIMATE OVERLAND FLOW 60' @ 3.8% BARE SOIL → 5.4 min (FIG. 2.)

TIME OF CONCENTRATION = 3.8 min + 3.6 min + 5.4 = 12.8 min OK

BERM = D + $V^2/2g$ - CURB = .38 + $\frac{(4.6)^2}{2 \times 32.174}$ - .67 = .04'

USE 1/4"/FT. SIDE SLOPE IN PARKWAY

Job NORTH TOWNE SHOPPING CENTER Sheet No. 4 of 4
Subject OFF SITE DRAINAGE Job No. D02-100-51
Client DE LA TORRE By GARNAND Date 03/30/7
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

WYOMING BLVD. BELOW BASIN III

FUTURE CONDITION - FULLY DEVELOPED SUBURBAN
RUNOFF COEF. = .45

AREA = 34.0 AC. (FIG. 1)
LENGTH = 5000 FT.
Δ ELEV = 160'
SLOPE = 160'/5000' = 3.2%

ESTIMATE TIME OF CONCENTRATION = 18.9 MIN

$I = 189/(18.9+25) = 4.3$ "/HR (FIG. 3)

$Q = C * A * I = .45 * 34 * 4.3 = 65.9$ CFS

ESTIMATE OVERLAND FLOW TIME (FIG. 2)
75' @ 3.2% - BARE SOIL → 6 MIN

ASSUME TRIANGULAR CROSS SECTION AS IN BASIN I

$Q = \frac{1.486}{.03} * 5D^2 * \frac{(5D)^{2/3}}{(2(1+5^2)^{1/2})^{2/3}} * (.032)^{1/2} = 65.9$

→ D = 1.39', A = 9.62 □', V = Q/A = 6.85 FPS

TRAVEL TIME = 5000/6.85/60 = 12.2 MIN

ASSUME STREET SECTION LIKE ACADEMY
INCLUDE AREA OF BASIN II

Q = .45*(34 + 14)* 4.3 = 94.5 CFS

→ D = .56' A = 15.80 V = Q/A = 5.98 FPS

TRAVEL TIME = 250'/5.98/60 = .7 MIN

TIME OF CONCENTRATION = 6 + 12.2 + .7 = 18.9 MIN OK

BERM HEIGHT = $D + V^2/2g$ − CURB = $.56 + \frac{5.98^2}{2 \times 32.14} - .67$
= .45'

Job NORTH TOWNE SHOPPING CENTER Sheet No. 1 of 4
Subject ON SITE DRAINAGE Job No. D02-100-61
Client DE LA TORRE By GARNAND Date 3/18/77
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

EXHIBIT B PROPOSED

CONTROLLED RUNOFF:

ALL AREA CONTRIBUTING TO POND

DESCRIPTION	AREA	x	COEFICIENT	=	EFFECTIVE AREA
GRASSED	.675	x	.30	=	.202
ROOF	2.386	x	.90	=	2.147
ASPHALT	8.387	x	.95	=	7.968
CONCRETE & POND	1.233		1.00	=	1.233
	12.681				11.550

TOTAL 100 YR 6HR RAINFALL = 3"

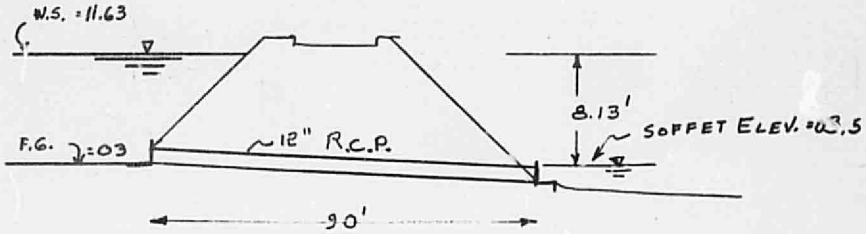
TOTAL POND VOLUME *REQUIRED = 3/12 x 11.55 = 2.888 Ac-ft

*ASSUME DRAIN INOPERATIVE

SEE SHEET 2 FOR VOLUME CALCS

MAXIMUM FLOW FOR OUTLET STRUCTURE:

USE 12" R.C.P



TOTAL ENERGY LOSS $= L * (Q/1.318 C_H A R^{.63})^{1/.54} + (Q/A)^2 * \frac{\Sigma K}{2g}$

(FRICTION LOSS) (MINOR LOSS)

$L = 90'$, $C_H = 110$, $A = \pi/4$, $R = 1/4$, $\Sigma K = 1.5$, $g = 32.174$

ASSUME Q = 9.60 CFS

$\Delta E = 90 * (9.60/(1.318 * 110 * \pi/4 * (1/4)^{.63}))^{1/.54} + \left(\frac{9.60}{\pi/4}\right)^2 * \frac{1.5}{2 * 32.174}$

$= 4.65' + 3.48$

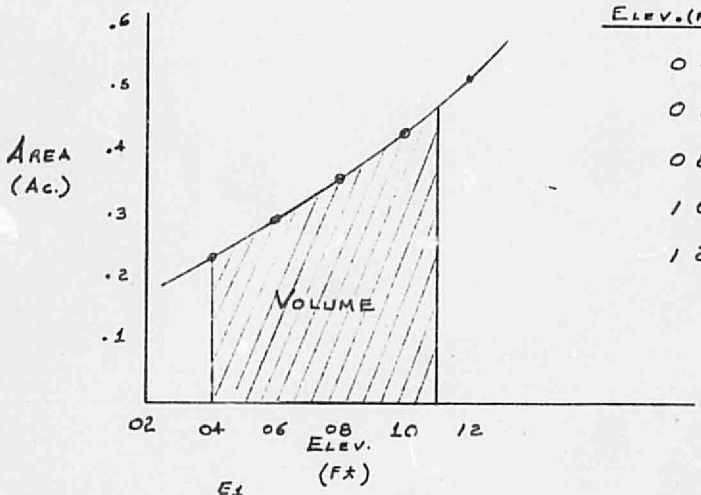
$= \underline{8.13}$ OK MAX Q = 9.60 CFS

Job NORTH TOWNE SHOPPING CENTER Sheet No. 2 of 4
Subject ON SITE DRAINAGE Job No. D08-100-51
Client DE LA TORRE By GARNAND Date 3/28/91
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

PROPOSED

RETENTION BASIN:

AREA - ELEVATION CURVE



ELEV. (Ft)	AREA (Ac)
04	.227
06	.288
08	.353
10	.424
12	.508

$$V = \int_{E_0}^{E_1} A \, dE$$

V = VOLUME (Ac-Ft)
E_0 = BOTTOM ELEV. (Ft.)
E_1 = SPILLWAY ELEVATION (Ft.)
A = AREA (ACRES) f(E)

BY 2ND ORDER POLYNOMIAL CURVE FIT

$$A = .1328 + 2.00428571 \times 10^{-2} E + 9.28571428 \times 10^{-4} E^2$$

$$V = \int_{E_0}^{E_1} A \, dE = 2.888 \text{ Ac-Ft (REQUIRED)}$$

$$V = \int_{3}^{11.63} A \, dE = \underline{2.890} > 2.888 \quad \underline{OK}$$

Job NORTH TOWNE SHOPPING CENTER Sheet No. 3 of 4
Subject ON SITE DRAINAGE Job No. D02-100-51
Client DE LA TORRE By GARNAND Date 3/18/91
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

PROPOSED DIRECT RUNOFF

SOUTH SHOP PARKING AREA:

DESCRIPTION	AREA	× COEFICIENT	=	EFFECTIVE AREA
GRASSED	.143 AC	.3	=	.043
CONCRETE	.162 AC	1.0	=	.162
ASPHALT	1.150 AC	.95	=	1.093
		TOTAL		1.298

TIME OF CONCENTRATION

590' OVERLAND PAVED
AVERAGE SLOPE = 2.5% → T_c = 7 min (NOMAGRAPH)

$I = 189/(t_c+25) = 5.91$ IN/HR

$Q_P = CAI = 1.298 \times 5.91 = \underline{7.67}$ CFS

NORTH EAST CORNER SITE: (FUTURE DEVELOPMENT)

DESCRIPTION	AREA	× COEFICIENT	=	EFFECTIVE AREA
GRASSED	.076	× .3	=	.023
CONCRETE	.170	× 1.0	=	.170
ASPHALT	.889	× .95	=	.845
ROOF	.162	× .9		.146
				1.184

$Q_P = CAI = 1.184 \times 5.91 = \underline{7.00}$ CFS

MAX SITE RUNOFF = 9.60 + 7.67 + 7.00 = <u>24.27 CFS</u>

Job NORTH TOWNE SHOPPING CENTER Sheet No. 4 of 4
Subject ON SITE DRAINAGE Job No. D02-100-51.
Client DE LA TORRE By GARNAND Date 3/29/77
MAC CORNACK & BURNS Consulting Engineers, Inc., Albuquerque, NM

EXISTING.

$Q = C*A*I$

AREA = 15.433 Ac.
RUNOFF COEF. = .35
100 YR INTENSITY = $189/(t_c+25)$ = 4.53" (Fig. 3)

t_c = TIME OF CONCENTRATION = *16.7 min (Fig. 2)
* 1100' @ 3.45% BARE SOIL → 16.7 min

PEAK RUNOFF = Q = .35 * 15.433 * 4.53 = 24.47 CFS

24.47 CFS > 24.27 CFS OK

DRAINAGE BASIN SPILLWAY CALCULATION

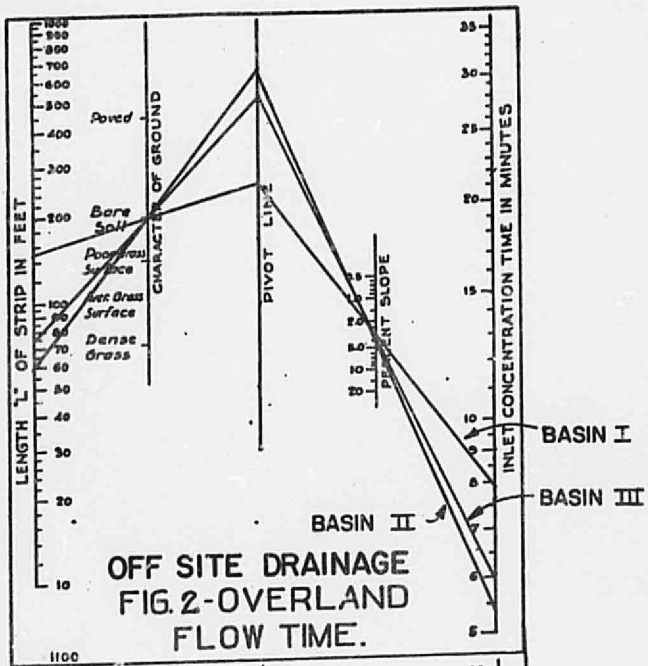
TO PRECLUDE THE POSSIBILITY OF FLOW OVERTOPPING THE DETENTION BASIN DIKE WITH ITS SUBSEQUENT LOSS OF PROPERTY & POSSIBLY LIFE IT IS NECESSARY TO PROVIDE SPILLWAY CAPACITY FOR THE PROBABLE MAXIMUM PRECIPITATION. (PMP).

ASSUMING A TIME OF CONCENTRATION OF 15 min THE INTENSITY WOULD BE 14.08 INCHES/HR AS PER CORP. OF ENGINEERS & U.S. WEATHER BEAURAU TECHNICAL PAPER 40 RECOMMENDATIONS

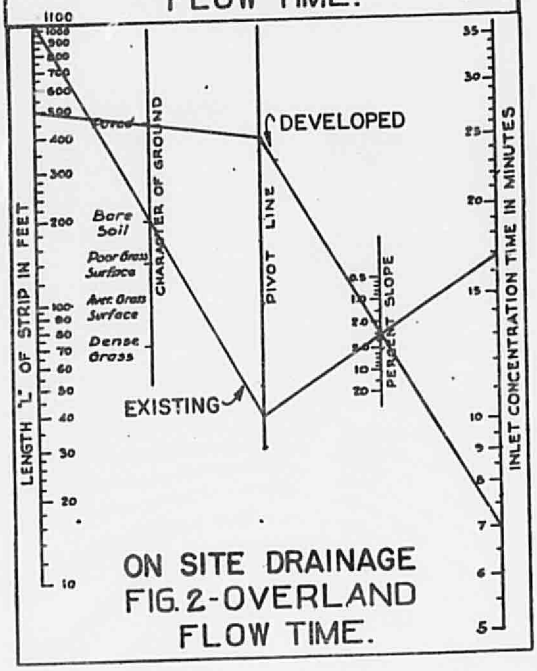
Q = 12.681* * 14.08 = 178.55 CFS

* SEE PAGE 2

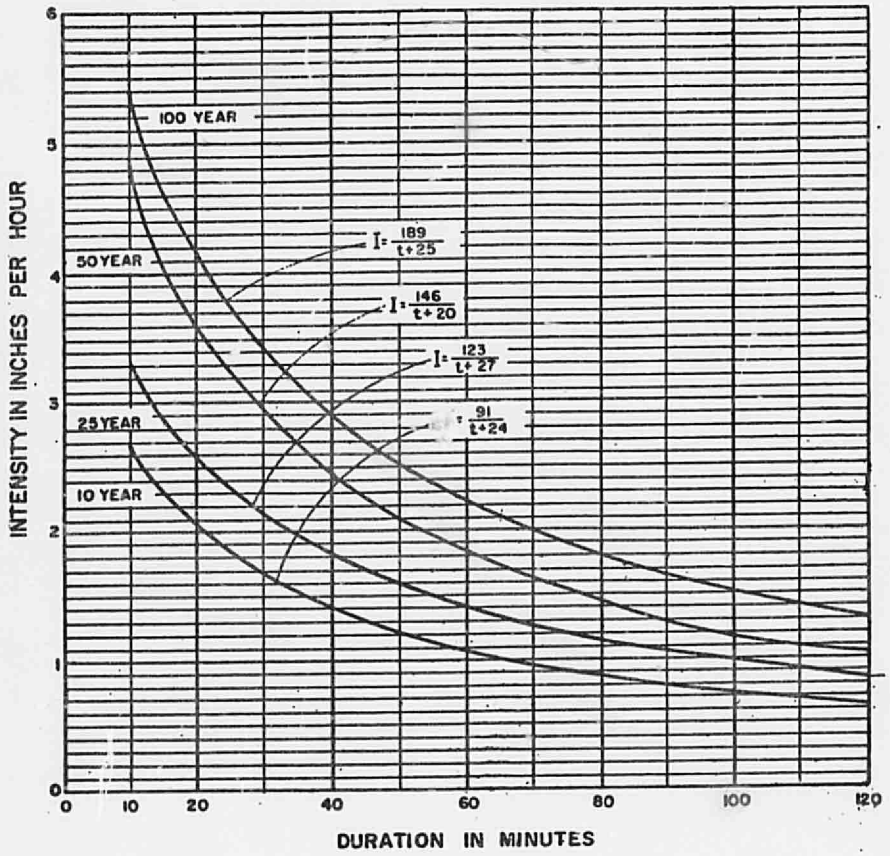
BASED ON $Q = LCH^{3/2}$
C = WIER COEF. = 3 (BROAD CRESTED WIER)
H = HEAD = TOP OF DIKE ELEV. − SPILLWAY ELEV. = 13-11.63 = 1.37'
MINIMUM WIER LENGTH = $Q/CH^{3/2} = 178.55/(3*1.37^{3/2})$
= 37.12' USE 40'



OFF SITE DRAINAGE
FIG. 2-OVERLAND
FLOW TIME.



ON SITE DRAINAGE
FIG. 2-OVERLAND
FLOW TIME.



MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO
AND ENVIRONS

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

FIG. 3

1 8 4 3