HYDROLOGY K17/D7 2 PLANS

K17/D7

2 PLANS

FILE COPY

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DESIGN HYDROLOGY SECTION
1[illegible] Central NW, Albuquerque, NM 87102
(505) 766-7644

March 3, 1986

Chris Weiss
Weiss-Hines Engineering
1100 Alvarado, NE Suite B
Albuquerque, New Mexico 87110

RE: CERTIFICATION FOR SUNSPRING APARTMENTS @ 222 JACKSON, SE
RECEIVED FEBRUARY 26, 1986 (K-17/D7)

Dear Chris:

Based on the information provided on your February 26, 1986 submittal, certification cannot be accepted until copies of construction approval from the appropriate government agencies for construction within their rights-of-way and/or easements have been submitted for our files.

If I can be of further assistance, please feel free to call me at 766-7644.

Cordially,

Bernie J. Montoya

Bernie J. Montoya, C.E.
Engineering Assistant

BJM/bsj

WEISS-HINES ENGINEERING, INC.

February 19, 1986

RECEIVED
FEB 26 1986
HYDROLOGY SECTION

Mr. Fred Aguirre, P.E.
City Hydrology
123 Central N.W.
Albuquerque, NM 87103

Re: Certification of Drainage Improvements for Sunspring [illegible]

Dear Fred:

During February, I inspected the above referenced site for a drainage certification at the request of the job superintendent, Greg Gumbling. While I was there, the landscape contractor was putting the final touches on the fine grading and had already installed shredded bark and turf in some areas.

Overall, the site was constructed with the following characteristics:

Drainage Area 1 - Hard surface improvements are very close to the plan, with noted changes to the location of the trash enclosures. The outlet system is in place and functioning properly.

Drainage Area 2 & 3 - Noted variations to swale locations, but areas comply to the drainage concept.

Drainage Area 4 - One under-walk drain and its associated swale has been repositioned to avoid a bike rack. This swale was rock lined for the portion next to Building C to avoid a large depression next to the walk. The head of the swale between Building A and C was graded to drain east to the 3" drain under the walk, instead of west, as originally shown. Several swales have been reworked where the grade was too flat to properly function, as discussed with Greg, in follow-up inspections.

Drainage Area 5 - The first inlet to the subsurface drainage system was repositioned closer to the existing apartment than shown on the plan. All inlets to this system were changed from open 'T' inlets to grate inlets. The remainder of the subsurface system was constructed per plan.

CIVIL ENGINEERING / HYDROLOGY / ENVIRONMENTAL DESIGN
1100 ALVARADO N.E. SUITE B ALBUQUERQUE, NEW MEXICO 87110 (505) 266-3444

Drainage Area 6 - Noticed variations to swale locations, but area complies to the drainage concept.

The job superintendent showed a positive attitude at all times in response to my requests for site grading changes and I now feel confident that the site will drain as planned. I have added a Certifications Statement to the "As-built" plan.

If you have any questions, please call me.

Sincerely,

Chris Weiss

Christopher L. Weiss
President
Weiss-Hines Engineering, Inc.

tdq

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Sunspring Apts ZONE ATLAS/DRNG. FILE #: K-17/D7

LEGAL DESCRIPTION:

CITY ADDRESS: 222 Jackson S.E.

ENGINEERING FIRM: WEISS-HINES ENGINEERING CONTACT: Chris Weiss

ADDRESS: 1100 ALVARADO NE PHONE: 505-266-3444

OWNER: CONTACT:

ADDRESS: PHONE:

ARCHITECT: Bill Shelton CONTACT:

ADDRESS: 1113 Rhode Island N.E. PHONE: 262-2363

SURVEYOR: Clausen & Assoc. CONTACT: Dave Clausen

ADDRESS: PHONE: 888-0690

CONTRACTOR: Bradbury + Stamm CONTACT: Greg Gumbling

ADDRESS: PHONE:

RECEIVED
FEB 26 1986
HYDROLOGY SECTION

PRE-DESIGN MEETING:

___ YES
X NO
___ COPY OF CONFERENCE RECAP SHEET PROVIDED

DRB NO. ___
EPC NO. ___
PROJ. NO. ___

TYPE OF SUBMITTAL:

___ DRAINAGE REPORT
___ DRAINAGE/GRADING PLAN
___ CONCEPTUAL GRADING & DRAINAGE PLAN
___ RESUBMITTAL
___ EROSION CONTROL PLAN
X ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL BOUGHT:

___ SKETCH PLAT APPROVAL
___ PRELIMINARY PLAT APPROVAL
___ SITE DEVELOPMENT PLAN APPROVAL
___ FINAL PLAT APPROVAL
___ BUILDING PERMIT APPROVAL
___ FOUNDATION PERMIT APPROVAL
___ CERTIFICATE OF OCCUPANCY APPROVAL
___ ROUGH GRADING PERMIT APPROVAL
___ GRADING/PAVING PERMIT APPROVAL
___ OTHER ___ (SPECIFY)

DATE SUBMITTED: February 26, 1986 DATE RECEIVED:

BY: Weiss-Hines Engineering, Inc. RECEIVED BY: B Wolya 2/26/86

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

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

July 9, 1985

Chris Weiss
Weiss-Hines Engineering
1100-B Alvarado, NE
Albuquerque, New Mexico 87110

RE: DRAINAGE PLAN FOR SUNSPRING APARTMENTS
(K-17/D7) RECEIVED JUNE 14, 1985

Dear Mr. Weiss:

The referenced plan dated June 13, 1985, is approved for building permit sign-off. Please be advised that the existing retention ponds may cause some problems. However, we can only recommend that the ponds be changed because they have been approved at an earlier date.

Please attach a copy of the approved plan along with the appropriately approved "Drainage Facilities Within City Right-of-Way" document to the construction set prior to Hydrology sign-off.

If you have any questions regarding this project, please call me at 766-7644.

Cordially,

Carlos A. Montoya

Carlos A. Montoya, P.E.
City/County Floodplain Administrator

CAM/bsj

WEISS-HINES ENGINEERING, INC.

June 12, 1985

RECEIVED
JUN 14 1985
HYDROLOGY SECTION

Mr. Billy Goolsby, P.E.
Design Hydrology Section
123 Central N.W.
Albuquerque, New Mexico 87102

Re: Sunsprings Apartments (K-17/D7)

Dear Billy:

This letter is in response to your comments and corresponds to your letter of June 6, 1985.

1. Replat removing lot lines submitted with this letter.

2. Offsite flows are limited to the auto storage yard adjoining the site on the east, as had been previously indicated in the narrative on sheet 2. The 2' wide under-walk drain was sized for off-site and on-site flows (see section A/2-1). A summary table of the contributing basins and hydraulic capacities of the outlet structures has been added to sheet 2.

3. Plans have been altered to direct all flows to specific approved outflow points.

4. See #2 above.

5. See #2 above.

6. Information from replat added to plan, R/W's noted.

7. See #2 above.

8. Spot elevations moved to PL.

9. After conferring with the architect, it was decided that due to cost constraints of extending a fabric fence around the entire construction area, the contractor would be held responsible for establishing a minimum 1' high earth berm along the property lines to direct the flows to the low points as indicated on the plan. The architect will supervise this condition as part of his inspection service.

CIVIL ENGINEERING / HYDROLOGY / ENVIRONMENTAL DESIGN
1100 ALVARADO N.E. SUITE B ALBUQUERQUE, NEW MEXICO 87110 (505) 266-3444

10. Special order #19 documents had been prepared and will be revised to show additional outlets and revisions.

We feel the above revisions address your comments and respectfully request approval of the drainage plan for a building permit.

Thank you,

Christopher L Weiss

Christopher Weiss
President
Weiss-Hines Engineering

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Sunsprings Apartments ZONE ATLAS/DRNG. FILE #: K-17 / D7

LEGAL DESCRIPTION: Lots 1-36, Blk. 21, Virginia Place Addition

CITY ADDRESS: 222 Jackson S.E., Albuquerque, N.M.

ENGINEERING FIRM: Weiss-Hines Engineering CONTACT: Chris Weiss

ADDRESS: 1100-B Arado N.E. PHONE: 266-3444

OWNER: CONTACT:

ADDRESS: PHONE:

ARCHITECT: Bill Shelton CONTACT: Bill Winkler

ADDRESS: 1113 Rhode Island N.E. PHONE: 262-2363

SURVEYOR: Ross Howard Survey Co. CONTACT:

ADDRESS: PHONE: 897-0291

CONTRACTOR: CONTACT:

ADDRESS: PHONE:

RECEIVED
JUN 14 1985
HYDROLOGY SECTION

PRE-DESIGN MEETING:

___ YES

X NO

___ COPY OF CONFERENCE RECAP SHEET PROVIDED

DRB NO. ___

EPC NO. ___

PROJ. NO. ___

TYPE OF SUBMITTAL:

___ DRAINAGE REPORT

X DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

___ GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

___ SKETCH PLAT APPROVAL

___ PRELIMINARY PLAT APPROVAL

___ SITE DEVELOPMENT PLAN APPROVAL

___ FINAL PLAT APPROVAL

X BUILDING PERMIT APPROVAL

___ FOUNDATION PERMIT APPROVAL

___ CERTIFICATE OF OCCUPANCY APPROVAL

___ ROUGH GRADING PERMIT APPROVAL

___ GRADING/PAVING PERMIT APPROVAL

___ OTHER ___ (SPECIFY)

DATE SUBMITTED: 6-14-85 DATE RECEIVED: ___

BY: Weiss-Hines Engineering RECEIVED BY: ___

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

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

June 6, 1985

Christopher Weiss
Weiss-Hines Engineering, Inc.
1100-B Alvarado, NE
Albuquerque, New Mexico 87110

RE: DRAINAGE PLAN FOR SUNSPRINGS APARTMENTS
(K-17/D7) RECEIVED MAY 29, 1985

Dear Chris:

I have reviewed the referenced submittal and forward these comments:

1. Please be advised that prior to release of the Certificate of Occupancy, an approved replat for this site, removing the lot lines, will need to be submitted for our records.

2. The off-site flows have not been included for hydraulic analysis. Also, the hydraulics have not been presented for any of the proposed structures.

3. Run-off across the property line will not be allowed. All storm run-off will have to be routed to a sidewalk culvert or drive pad. All nuisance waters will have to be contained on-site.

4. The plan indicates that storm run-off is directed to several different areas. However, the different drainage basins have not been delineated, nor do the calculations address the run-off in this manner.

5. Please provide typical sections and/or hydraulic calculations for all the proposed swales, channels or other appurtenances.

6. All existing easements and right-of-ways on or adjacent to the site should be shown.

7. Internal drainage basins should be indicated.

8. The required spot elevations for standard City drive pads should be shown.

9. The proposed silt fence will have to extend the entire reach of the perimeter of the property where construction activities will occur or another means provided. The disturbed soil typically gets into the street all along its length rather than just at the low point locations.

10. An approved "Drainage Facilities Within City Right-of-Way/Easement" document will be required for each location and will need to be attached to the building permit set prior to Hydrology sign-off.

Should you have any questions or comments regarding this project, please call me at 766-7644.

Cordially,

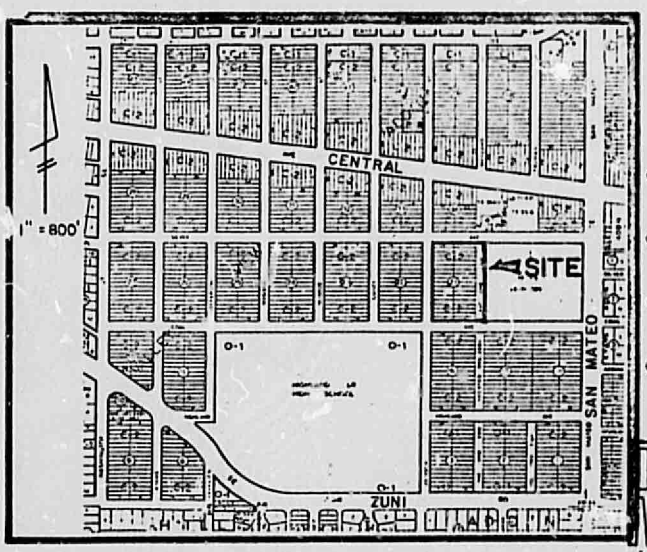
Billy J. Goolsby

Billy J. Goolsby, P.E.
C.E./Design Hydrology

BJG/bsj

CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



DESCRIPTION OF WORK
SEE SHEET 2 OF 7 FOR SITE PLAN AND AREAS OF CONSTRUCTION

1. S/W GRATE ON SILVER AVE. S.E. SEE SHEET 3 OF 7
2. S/W GRATE ON JACKSON ST. S.E. SEE SHEET 4 OF 7
3. DRAIN PIPE ON JACKSON ST. S.E. SEE SHEET 5 OF 7
4. DRAIN PIPE ON JACKSON ST. S.E. SEE SHEET 6 OF 7

RECEIVED
APR 21 1986
HYDROLOGY SECTION

VICINITY MAP K-17

LEGAL: Lots 1-36, Block 21, Virginia Place Addition, together w/vacated Manzano St. S.E., Albuq., N.M.

BENCH MARK: Top of sanitary M.H. Rim, centerline intersection of Jackson St. and Coal Ave., S.E. Elevation = 5251.11

CHRISTOPHER L. ... NEW MEXICO REGISTERED PROFESSIONAL ENGINEER

NOTICE TO CONTRACTOR

1. An excavation/construction permit will be required before beginning any work within City right-of-way. An approved copy of these plans must be submitted at the time of application for this permit.
2. All work detailed on these plans to be performed, except as otherwise stated or provided hereon, shall be constructed in accordance with Public Works Contract No. 85-1
3. Two working days prior to any excavation, contractor must contact Line Locating Service, 765-1234, for location of existing utilities.
4. Prior to construction, the contractor shall excavate and verify the horizontal and vertical locations of all obstructions. Should a conflict exist, the contractor shall notify the engineer so that the conflict can be resolved with a minimum amount of delay.
5. Backfill compaction shall be according to Residential street use.

K17-07

CHAVEZ CONCRETE — SHEETS 2, 5, & 6: Revised 6/11/85 — E-65 REVISED

APPROVALS	NAME	DATE
A.C.E./DESIGN		06/07/85
INSPECTOR	T.A.	
A.C.E./FIELD		

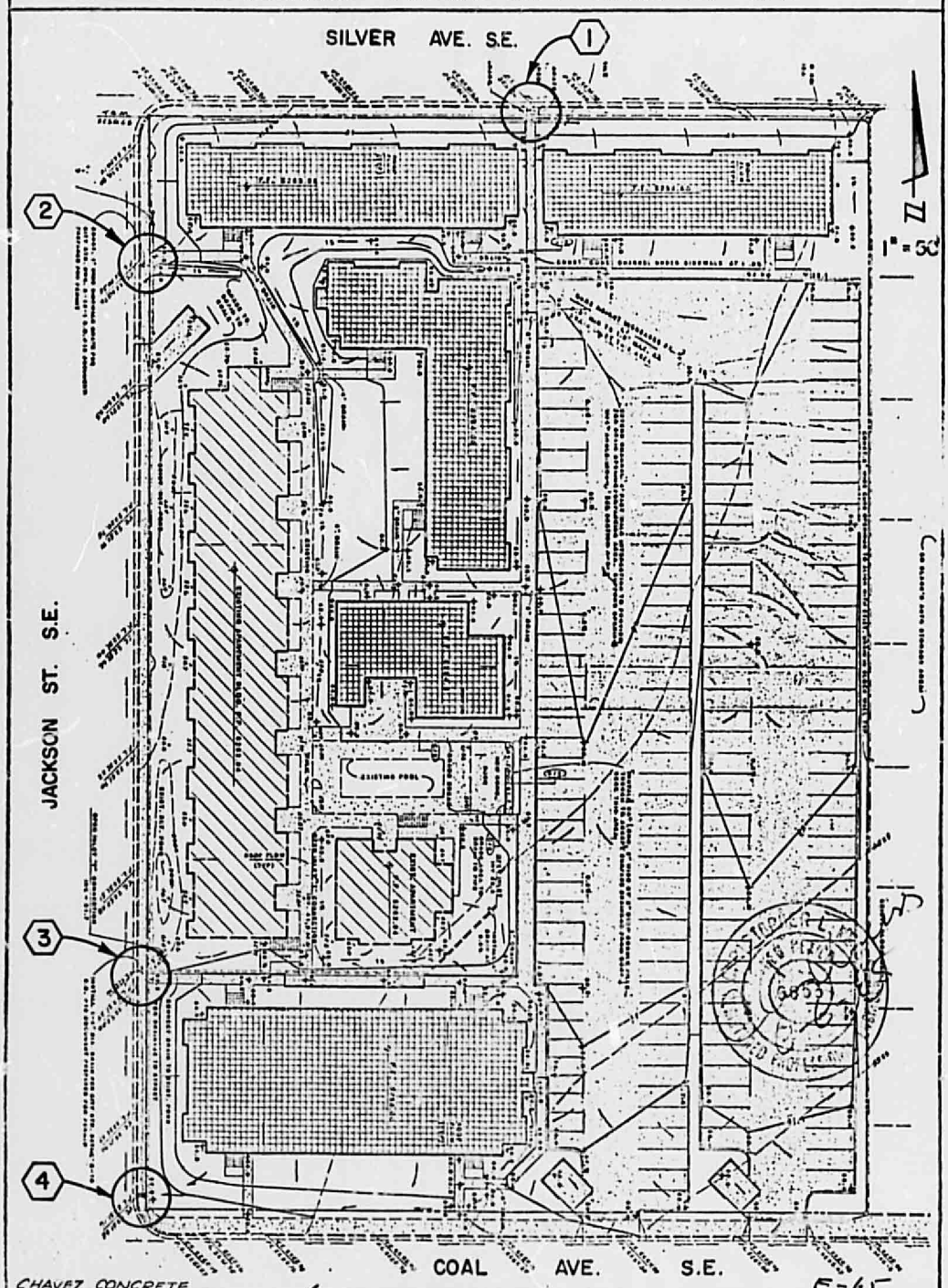
TITLE: Sunsprings Apartments
222 Jackson St. S.E.
Albuquerque, N.M.

PERMIT NO. 23662
SHEET 1 OF 7

MAP NO. K-17

CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



CHAVEZ CONCRETE

APPROVALS	NAME	DATE
A.C.E./DESIGN		06/07/85
INSPECTOR	T.A.	
A.C.E./FIELD	W.J. McManus	6/10/85

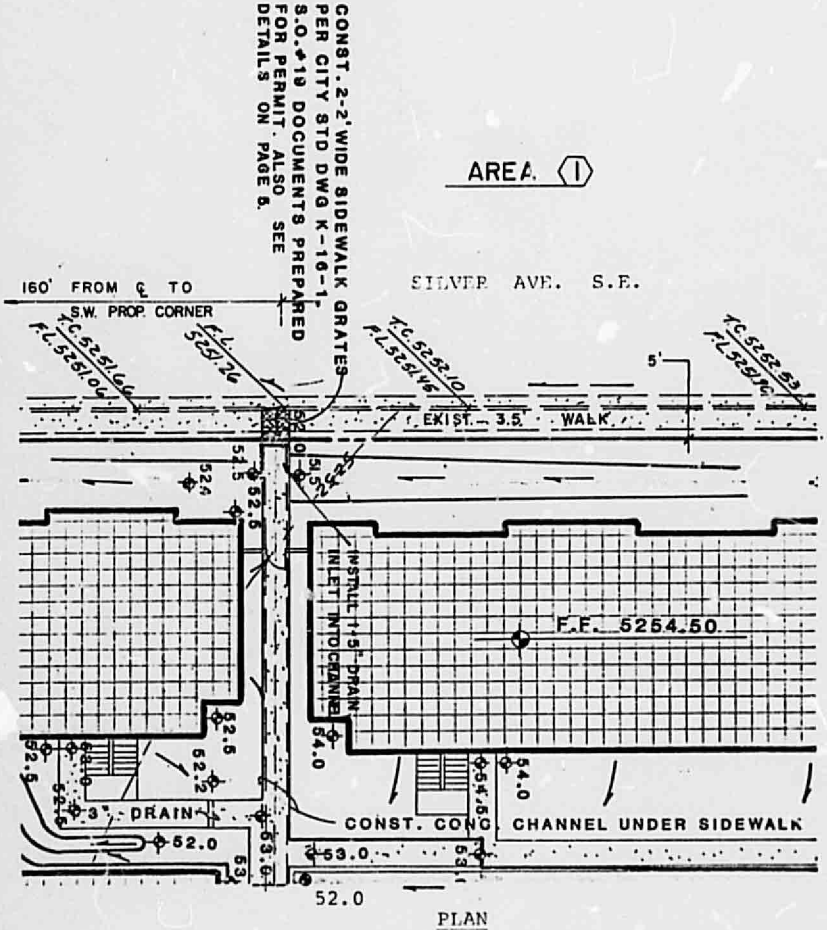
TITLE: Sunsprings Apartments
222 Jackson St. S.E.
Albuquerque, N.M.

PERMIT NO. 23662
SHEET 2 OF 7

MAP NO. F-17

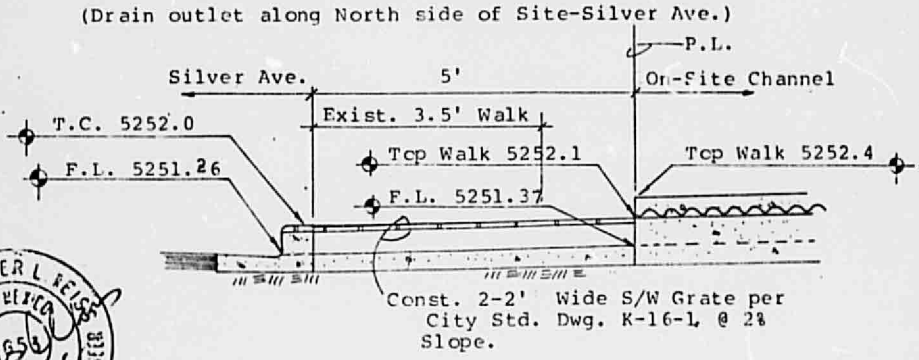
CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



PLAN

(Drain outlet along North side of Site-Silver Ave.)



PROFILE: 1"=2'

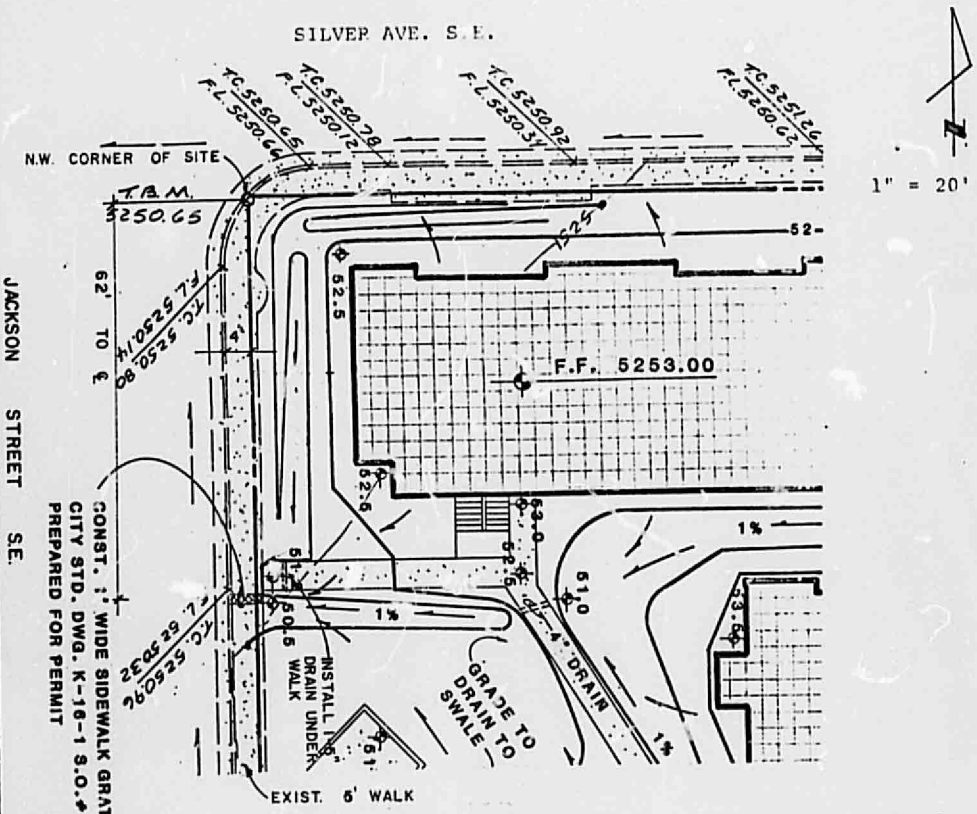
E-61

CHAVEZ CONCRETE

APPROVALS	NAME	DATE	TITLE: Sunsprings Apartments 222 Jackson St. S.E. Albuquerque, N.M.	
A.C.E./DESIGN		06/07/81		
INSPECTOR	T.A.		PERMIT NO. 23662	MAP
A.C.E./FIELD	W.J. McCamman	11/10/81	SHEET 3 OF 7	NO. 1 17

CITY OF ALBUQUERQUE

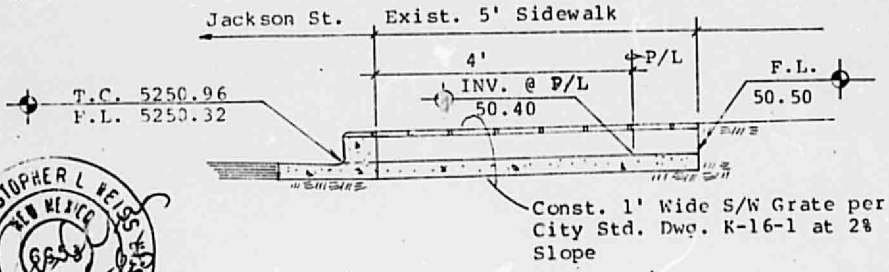
DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



PLAN

(Drain at N.W. Corner of Site - Jackson St.)

AREA (2)



PROFILE: 1"=2'

E-61

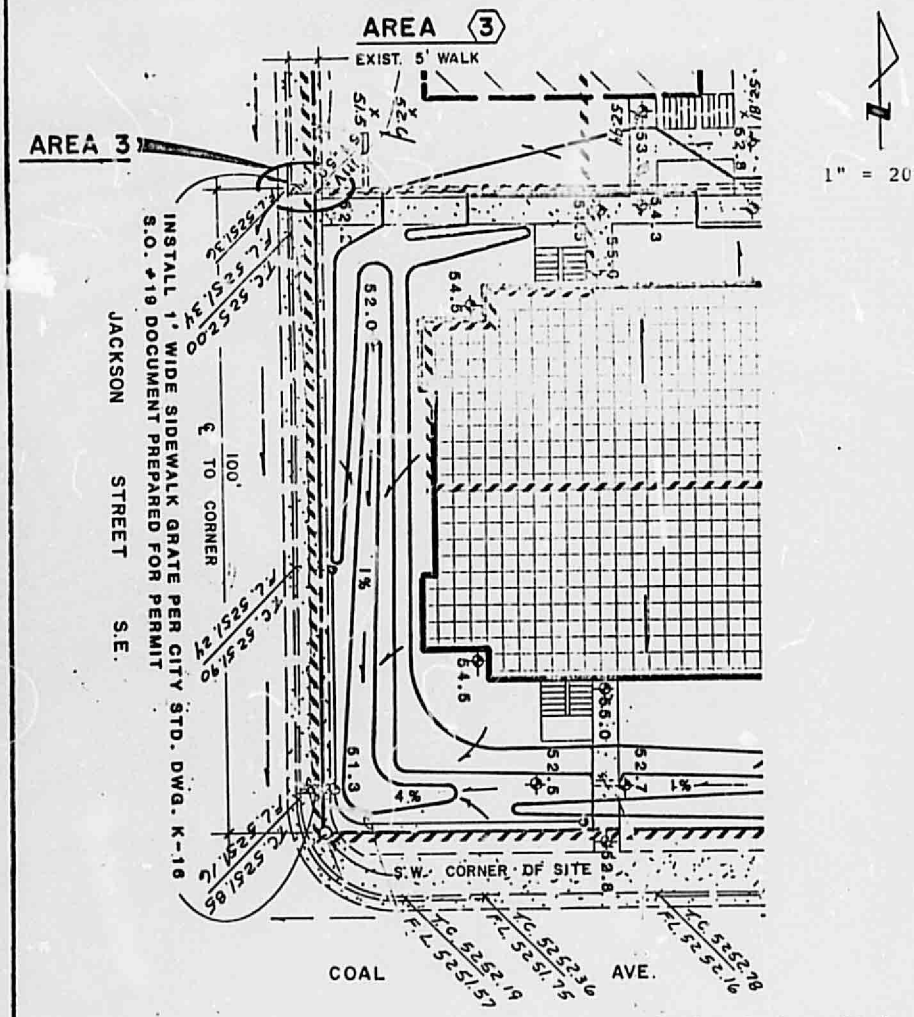
CHRISTOPHER L. WEISS NEW MEXICO 6554 REGISTERED PROFESSIONAL ENGINEER

CHAVEZ CONCRETE

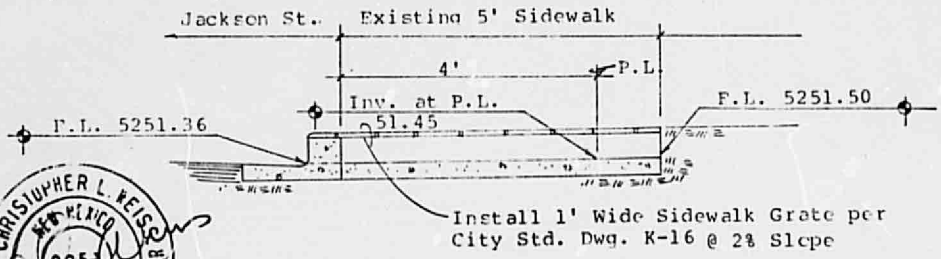
APPROVALS	NAME	DATE	TITLE: Sunsprings Apartments 222 Jackson St. S.E. Albuquerque, N.M.	
A.C.E./DESIGN		06/07/85		
INSPECTOR			PERMIT NO. 23662	MAP
A.C.E./FIELD			SHEET 4 OF 7	NO. K-17

CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



PLAN (Drain at S.W. corner of Site-Jackson St.)



PROFILE: 1"=2'

CHRISTOPHER L. REISCH
NEW MEXICO
6665
REGISTERED PROFESSIONAL ENGINEER

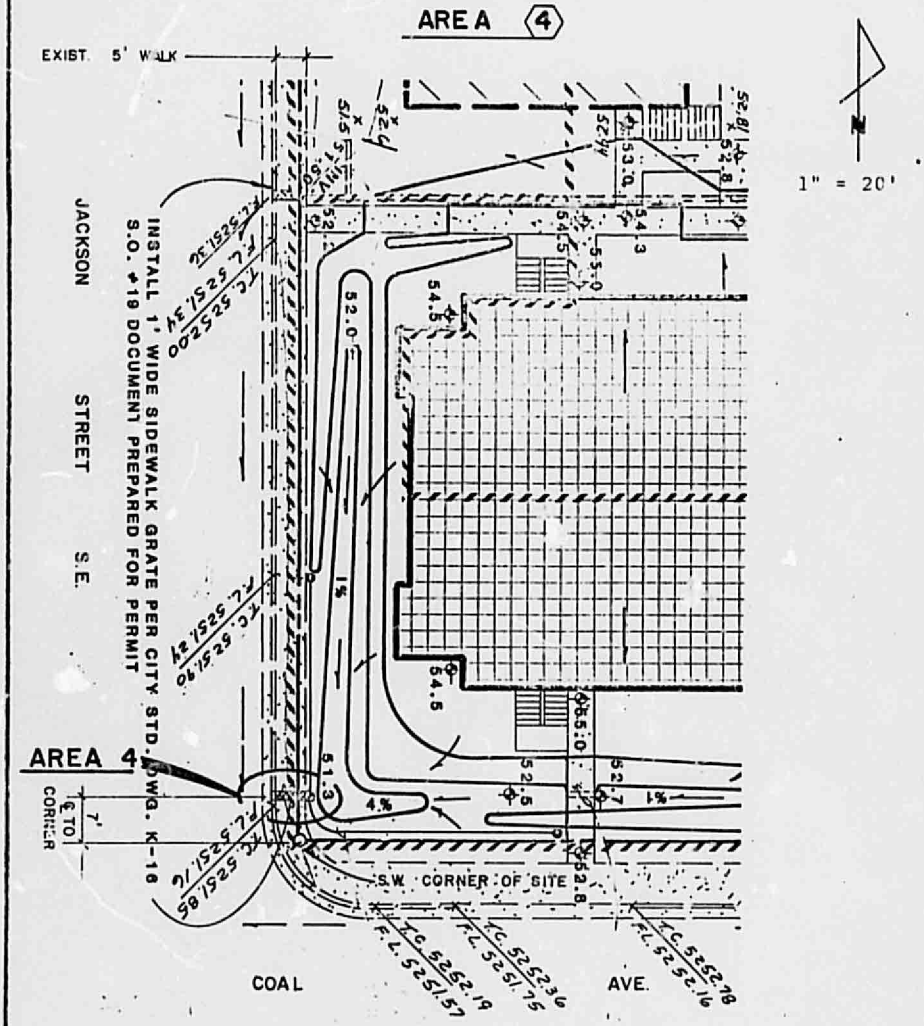
CHAVEZ CONCRETE

E-65 Revised

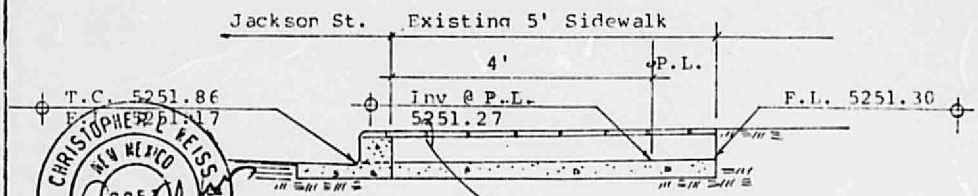
APPROVALS	NAME	DATE	TITLE: Sunsprings Apartments 222 Jackson St. S.E. Albuquerque, N.M.	
A.C.E./DESIGN	G.L. Ochoa	6/19/85		
INSPECTOR	T.A.		PERMIT NO. 23662 SHEET 5 OF 7	MAP NO. K-17
A.C.E./FIELD	W. McNamara	11/1/85		

CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



PLAN (Drain at S.W. Corner of Site - Jackson St.)



PROFILE - 1"=2'

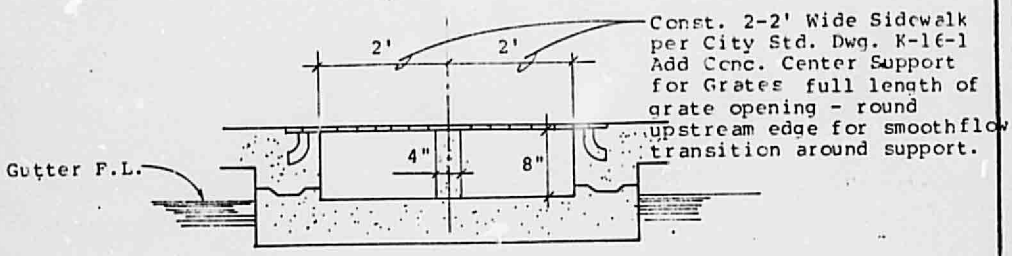
CHAVEZ CONCRETE

E-65 Revised

APPROVALS	NAME	DATE	TITLE: Sunsprings Apartments 222 Jackson St. Albuquerque, N.M.	
A.C.E./DESIGN	HLOha	6/19/85		
INSPECTOR	J. A.		PERMIT NO. 23662	MAP NO. K-17
A.C.E./FIELD	W. McMahan	11/12/86	SHEET 6 OF 7	

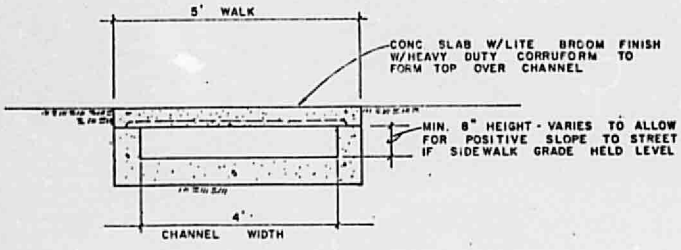
CITY OF ALBUQUERQUE

DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY



Section at Curb
n.t.s.

DRAIN OUTLET THRU R/W (Plan on Sheet 3)



Channel Section
n.t.s.

CHANNEL DRAIN WITHIN SITE (Plan on Sheet 3)

CHRISTOPHER L. FELL
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

E-65

CHAVEZ CONCRETE

APPROVALS	NAME	DATE	TITLE: Sunsprings Apartments 222 Jackson S.E. Albuquerque, N.M.	
A.C.E./DESIGN		06/07/85		
INSPECTOR	T.A.		PERMIT NO. 23662	MAP
A.C.E./FIELD		1/18/86	SHEET 7 OF 7	NO. K-17

STORM DRAINAGE STUDY

FOR

APARTMENT SITE AT THE NORTHEASTERN CORNER

OF

SILVER AVE. & JACKSON ST.

RECEIVED
JAN 16 1979
CITY ENGINEERS

JANUARY 1979

JACOB A VIGIL - CONSULTING ENGINEER

Jacob A. Vigil
Consulting Engineers

SUITE 1206
FIRST NATIONAL BANK
BUILDING - EAST
ALBUQUERQUE,
NEW MEXICO, 87108
(505) 255-5186

January 12, 1979

Mitchell Associates, P.A.
205 Fourth Street, S.W.
Albuquerque, New Mexico 87102

Attention: Mr. Don Mitchell

Dear Sir:

Transmitted herewith is the Storm Drainage Study for the apartment complex site located on the northeastern corner of Silver Avenue and Jackson Street. The recommendations in this report are in accordance with the requirements of the City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority.

Thank you for the opportunity of serving you.

Respectfully submitted,

Jacob A. Vigil

Jacob A. Vigil, P.E.

JAV/bvm

TABLE OF CONTENTS

LETTER OF TRANSMITTAL

STORM DRAINAGE STUDY

1. Purpose..... Page 1
2. Scope..... 1
3. Location..... 1
4. Existing Drainage..... 1-2
5. Proposed Development..... 2
6. Proposed Drainage Plan..... 2
7. Conclusions and Recommendations..... 2

APPENDIX

1. Design Calculations..... Page 1-26
2. Map "A" 27

STORM DRAINAGE STUDY

FOR APARTMENT SITE AT THE NORTHEASTERN

CORNER OF SILVER AVENUE AND JACKSON STREET

I. PURPOSE: The purpose of this report is to formulate a comprehensive study of drainage affecting the site development and to show that the development does not restrict drainage in a manner to cause damage to adjacent land owners.

II. SCOPE: This report is limited to runoff originating within the development. General engineering procedures are presented for the calculation of storm runoff and storage.

III. LOCATION: The site is located south of Central Avenue and west of San Mateo Boulevard in Albuquerque, New Mexico. It is bounded on the north by Silver Avenue, on the south by Coal Avenue, on the east by San Mateo Boulevard and on the west by Jackson Street. The site consists of Block 21 of the Valley View Addition directly behind the Ed Black's Chevrolet Truck and Camper Center. The area consists of approximately 135,450 square feet of sparse grass to bare soil.

IV. EXISTING DRAINAGE: A storm drainage system with drop inlets is not utilized. Instead, the existing paved streets with

curb and gutter serve as water carrying improvements to handle existing runoff. The general slope of the land is from east to west at approximately 1.5%. There are no significant geological or topographical features.

V. PROPOSED DEVELOPMENT: The proposed development will consist of an apartment complex containing fourteen buildings, a swimming pool and parking areas. The coefficient of runoff "C" has been estimated at 0.90 for impervious pavement conditions, and 0.15 for moderately sloped grass areas.

VI. PROPOSED DRAINAGE PLAN: The proposed drainage plan is to contain excess runoff after development by the use of landscaped ponding. The peak discharge after development will be maintained to the peak discharge before development.

VII. CONCLUSIONS AND RECOMMENDATIONS: On the basis of this study, the property under consideration can be adequately developed as proposed, if the proposed pond location and grading are incorporated into the construction stage.

RETENTION BASIN DESIGN
SECTION 1

$Q = CIA$

$I = \frac{189}{10+25} = \frac{189}{35} = 5.4$ inches/hr

$A = 0.138$ acres

$Q = 0.45 \times 5.4 \times 0.138 = 0.335$ cfs (undeveloped)

$Q = 0.90 \times 5.4 \times 0.138 = 0.671$ cfs (developed)

VOLUME OF RUNOFF:

$Vol = \frac{1.90}{12} \times 0.138 \times 43560 = 951.786 ft^3$ (100% runoff)

$= 856.6 ft^3$ (90% runoff)

$= 428.3 ft^3$ (45% runoff)

REQUIRED AREA:

assume depth = 2'

$= \frac{428.3 ft^3}{2 ft} = 214.2$ sq ft

ACTUAL DESIGNED AREA:

$15 \times 17 = 255$ sq ft

BERNICE MADRID
DECEMBER 29, 1978

RETENTION BASIN DESIGN - SECTION 2

1. $Q = CIA$

$I = \frac{189}{10+25} = 5.1$ inches/hr.

$A = 0.146$ acres

$Q = 0.45 \times 5.1 \times 0.146 = 0.354$ (undeveloped)

$Q = 0.90 \times 5.1 \times 0.146 = 0.710$ (developed)

2. VOLUME OF RUNOFF:

$Vol = \frac{1.90}{12} \times 0.146 \times 43560 = 1007.0$ cu.ft (100% runoff)

$= 906.3$ cu.ft (90% runoff)

$= 453.15$ cu.ft (45% runoff)

3. REQUIRED AREA:

assume depth = 2'

$\text{area req} = \frac{453.15 \text{ cuft}}{2 \text{ ft}} = 226.15$ sq. ft

4. ACTUAL DESIGNED AREA:

$26.5 \times 16 = 424$ sq. ft

BERNICE MADRID
JANUARY 3, 1979

RETENTION BASIN DESIGN – SECTION 3

1. Q = CIA

$I = 189/(10+25) = 5.1$ inches/hour
$A = 0.248$ acres

$Q = 0.15 \times 5.1 \times 0.248 = 0.60$ cfs (undeveloped)
$Q = 0.90 \times 5.1 \times 0.248 = 1.21$ cfs (developed)

2. VOLUME OF RUNOFF

$Vol = \frac{1.9}{12} \times 0.248 \times 43560 = 1710.5$ cu. ft (100% runoff)

$= 1539.4$ cu. ft (90% runoff)

$= 769.7$ cu. ft (45% runoff)

3. REQUIRED AREA

assume depth = 2'

$AREA_{req} = \frac{769.7}{2} = 384.9$ sq. ft

4. ACTUAL DESIGNED AREA

$51 \times 9.5 = 484.5$ sq. ft > 384 sq. ft ok

SECTION 4

1. Q = CIA

$I = 5.1$ inches/hr
$A = 0.122$ acres

$Q = 0.15 \times 5.1 \times 0.122 = 0.30$ cfs (undeveloped)
$Q = 0.90 \times 5.1 \times 0.122 = 0.59$ cfs (developed

BERNICE MADRID
JANUARY 3, 1979

RETENTION BASIN DESIGN - SECTION 4

2. VOLUME OF RUNOFF:

$$VOL = \frac{1.9}{12} \times 0.122 \times 43560 = 841.4 \text{ cu ft (100\% runoff)}$$
$$= 757.3 \text{ cu. ft (90\% runoff)}$$
$$= 378.6 \text{ cu. ft (45\% runoff)}$$

3. REQUIRED AREA

assume 2' depth

$$\text{AREA req} = \frac{378.6}{2} = 189.3 \text{ sq. ft}$$

4. ACTUAL AREA

$$15 \times 16 = 240 \text{ sq. ft} > 189.3 \text{ sq. ft} \quad \text{OK}$$

RETENTION BASIN DESIGN - SECTION 5

1. Q = CIA

I = 5.1 inches/hr
A = 0.231 acres

Q = 0.15 x 5.1 x 0.231 = .57
Q = 0.90 x 5.1 x 0.231 = 1.14

2. VOLUME OF RUNOFF:

$$VOL = \frac{1.90}{12} \times 0.231 \times 43560 = 1613.9 \text{ cu. ft (100\% runoff)}$$

= 1452.5 cu. ft (90% runoff)
= 726.3 cu. ft (45% runoff)

3. REQUIRED AREA:

$$\text{AREA req} = \frac{726.3}{2} = 363.1 \text{ sq. ft}$$

assuming 2' depth

4. ACTUAL AREA:

$$2[(31 \times 8) + \tfrac{1}{2}(8)(1)] = 576 \text{ sq. ft} > 363.1 \text{ sq. ft}$$

ok.

SECTION 6

1. Q = CIA

I = 5.1 inches/hr
A = 0.108 acres

Q = 0.15 x 5.1 x 0.108 = 0.262 cfs
Q = 0.90 x 5.1 x 0.108 = 0.525 cfs

2. VOLUME OF RUNOFF:

$$VOL = \frac{1.90}{12} \times 0.108 \times 43560 = 744.9 \text{ cu ft (100\% runoff)}$$

= 670.4 (90% runoff)

3. REQUIRED AREA:

$$A_{req} = \frac{335.2}{2} = 167.6 \text{ sq ft assuming 2' depth}$$

4. ACTUAL AREA:

$$22 \times 11.5 = 253 \text{ sq. ft} > 167.6 \text{ sq ft} \quad \text{ok}$$

SECTION 7

1. $Q = CIA$

$I = 5.4$ inches/hr
$A = 0.318$ acres

$Q = 0.45 \times 5.4 \times 0.318 = 0.773$
$Q = 0.90 \times 5.4 \times 0.318 = 1.545$

2. VOLUME OF RUNOFF:

$$\text{Vol} = \frac{1.90}{12} \times 0.318 \times 43560 = 2193.2 \text{ cu. ft (100\% runoff)}$$
$$= 1973.9 \text{ cu. ft (90\% runoff)}$$
$$= 987.0 \text{ cu. ft (45\% runoff)}$$

3. REQUIRED AREA

$$A_{req} = \frac{987.0}{2} = 493.5 \text{ sq. ft (assuming 2' depth)}$$

4. ACTUAL AREA

$$41 \times 17 = 697 \text{ sq. ft} \quad \text{ok}$$

RETENTION BASIN DESIGN - SECTION 8

1. Q = CIA

I = 5.4 inches/hr
A = 0.241 acres

Q = 0.45 x 5.4 x 0.241 = 0.586 cfs
Q = 0.90 x 5.4 x 0.241 = 1.171 cfs

2. VOLUME OF RUNOFF

$$Vol = \frac{1.9}{12} \times 0.241 \times 43560 = 1662.2 \text{ cu. ft (100\% runoff)}$$
$$= 1496.0 \text{ cu. ft (90\% runoff)}$$
$$= 748.0 \text{ cu ft (45\% runoff)}$$

3. REQUIRED AREA:

$$A_{req} = \frac{748}{2} = 374 \text{ sq. ft (assuming 2' depth)}$$

4. ACTUAL AREA:

$$2[(32 \times 8) + \tfrac{1}{2}(8 \times 4)] = 544 \text{ sq. ft} > 374 \text{ sq. ft ok}$$

SECTION 9

1. Q = CIA

I = 5.4 inches/hr
A = 0.120 acres

Q = 0.45(5.4)(0.120) = 0.292 cfs
Q = 0.90(5.4)(0.120) = 0.583 cfs

2. VOLUME OF RUNOFF

$$Vol = \frac{1.9}{12} \times 0.120 \times 43560 = 827.6 \text{ cu. ft (100\% runoff)}$$
$$= 744.9 \text{ cu. ft (90\% runoff)}$$
$$= 372.4 \text{ cu. ft (45\% runoff)}$$

RETENTION BASIN DESIGN - SECTION 9

3. REQUIRED AREA

Assume a 2 ft. depth

$A_{req} = \frac{372.4}{2} = 186.2$ sq. ft

4. ACTUAL AREA

$16.5 \times 17 = 280.5$ sq. ft > 186.2 sq. ft ok

SECTION 10

1. Q = CIA

I = 5.4 inches/hr
A = 0.129 acres
Q = 0.15 (5.4)(0.129) = 0.313 cfs
Q = 0.90 (5.4)(0.129) = 0.627 cfs

2. VOLUME OF RUNOFF

$VOL = \frac{1.9}{12} \times 0.129 \times 43560 = 889.7$ cu. ft. (100% runoff)
= 800.7 cu. ft (90% runoff)
= 400.4 cu. ft (45% runoff)

3. REQUIRED AREA

assume a 2 ft depth
$\frac{400.4}{2} = 200.2$ sq. ft.

4. ACTUAL AREA

A = 16 x 16 = 256 sq. ft > 200.2 sq. ft ok

RETENTION BASIN DESIGN - SECTION 11

1. Q = CIA

I = 5.4 inches/hr
A = 0.198 acres

Q = 0.45 (5.4)(0.198) = 0.481
Q = 0.90 (5.4)(0.198) = 0.962

2. VOLUME OF RUNOFF

$$VOL = \frac{1.9}{12} \times 0.198 \times 43560 = 1365.6 \text{ cu.ft (100\% runoff}$$

= 1229.0 cu.ft (90% runoff)
= 614.5 cu.ft (45% runoff)

3. REQUIRED AREA

assume 2 ft depth

$$A_{req} = \frac{614.5 \text{ cu.ft}}{2 \text{ ft}} = 307.3 \text{ sq. ft}$$

4. ACTUAL AREA

A = 26 x 12 = 312.0 sq. ft < 307.3 sq. ft

ok

SECTION 12

1. Q = CIA

I = 5.4 inches/hr
A = 0.351 acres

Q = 0.45(5.4)(0.351) = 0.853 cfs (undeveloped)
Q = 0.90(5.4)(0.351) = 1.706 cfs (developed)

2. VOLUME OF RUNOFF

$$VOL = \frac{1.9}{12} \times 0.351 \times 43560 = 2420.8 \text{ cu.ft. (100\% runoff)}$$

= 2178.8 cu.ft (90% runoff)
= 1089.4 cu.ft (45% runoff)

RETENTION BASIN DESIGN - SECTION 12

3. REQUIRED AREA:

$$A_{req} = \frac{1089.4 \text{ cu. ft}}{2 \text{ ft}} = 544.7 \text{ sq. ft}$$

4. ACTUAL AREA:

$$A = 33.5 \times 21 = 703.5 \text{ sq. ft} \quad \text{OK}$$

BERNICE MADRID
JANUARY 7, 1979

RETENTION BASIN DESIGN
SECTION 13

$Q = CIA$

$I = \frac{189}{35} = 5.4$ inches/hr

$A = 0.144$ acres

$Q = 0.45\,(5.4)(0.144) = 0.350$ cfs (undeveloped)
$Q = 0.90\,(5.4)(0.144) = 0.700$ cfs (developed)

VOLUME OF RUNOFF:

$Vol = \frac{1.90}{12}(0.144)(43560) = 993.17\ ft^3$ (100% runoff)

$= 893.9\ ft^3$ (90% runoff)
$= 446.9\ ft^3$ (45% runoff)

REQUIRED STORAGE AREA:

$A_{req} = \frac{446.9}{2} = 223.45$ sq. ft

ACTUAL AREA:

$A = 11 \times 11 = 121 < 223.45$ sq. ft

Must increase dimensions to 15 x 15 x 2

USE 15 x 15 x 2

BERNICE MADRID
JANUARY 7, 1979

RETENTION BASIN DESIGN
SECTION 14

$Q = CIA$ where $I = 5.4$ inches/hr.
$A = 0.167$ acres

$Q = 0.45(5.4)(0.167) = 0.406$ cfs (undeveloped)
$Q = 0.90(5.4)(0.167) = 0.812$ cfs (developed)

VOLUME OF RUNOFF:

$VOL = \frac{1.9}{12}(0.167)(43560) = 1151.8\ ft^3$ (100% runoff)
$= 1036.6\ ft^3$ (90% runoff)
$= 518.3\ ft^3$ (45% runoff)

REQUIRED STORAGE AREA:

$A_{req} = \frac{518.3}{2} = 259.2$ sq. ft.

ACTUAL AREA:

$14.5 \times 13.5 = 195.75$ sq. ft. < 259.2 sq. ft

Increase dimensions of pond to $16.5 \times 16 \times 2$

BERNICE MADRID
JANUARY 7, 1979

RETENTION BASIN DESIGN
SECTION 15

Q = CIA ; where I = 5.4 inches/hr.
A = 0.145 acres

Q = 0.45(5.4)(0.145) = 0.352 cfs
Q = 0.90(5.4)(0.145) = 0.705 cfs

VOLUME OF RUNOFF:

Vol. = $\frac{1.9}{12}$(0.145)(43560) = 1000.1 ft³ (100% runoff)
= 900.1 ft³ (90% runoff)
= 450.0 ft³ (45% runoff)

REQUIRED STORAGE AREA

Areq = $\frac{450.0}{2}$ = 225.0 sq. ft

USE 15 x 15 x 2

RETENTION BASIN DESIGN:
SECTION 16

$Q = CIA$

$I = 5.4$ inches/hr

$A = 0.165$

$Q = 0.45(5.4)(0.165) = 0.401$ cfs (undeveloped)

$Q = 0.90(5.4)(0.165) = 0.802$ cfs (developed)

VOLUME OF RUNOFF:

$VOL = \frac{1.9}{12}(0.165)(43560) = 1138.0\ ft^3$ (100% runoff)

$= 1024.2\ ft^3$ (90% runoff)

$= 512.1\ ft^3$ (45% runoff)

REQUIRED STORAGE AREA:

$Area = \frac{512.1}{2} = 256.1$ sq ft

ACTUAL AREA:

$12 \times 14 = 168$ sq. ft < 256.1 sq. ft

Increase dimensions of pond to:

$16 \times 16 = 256$ sq ft

USE $16 \times 16 \times 2$

3.0 PONDING SCHEDULE AND CAPACITIES

SECTION	POND	SIZE (FT)	CAPACITY (CF)
13	A	15 x 15 x 2	450
14	B	16.5 x 16 x 2	528
15	C	15 x 15 x 2	450
16	D'	16 x 16 x 2	512
11	E	26 x 12 x 2	624
2	F	26.5 x 16 x 2	848
7	G	41 x 17 x 2	1394
6	H	22 x 11.5 x 2	506
3	I	51 x 9.5 x 2	969
12	J	33.5 x 21 x 2	1407
1	K	15 x 17 x 2	510
4	L	15 x 16 x 2	480
10	M	16 x 16 x 2	512
9	N	16.5 x 17 x 2	561
5	O	as proposed	1152
8	P	"	1088
TOTAL RETENTION PROVIDED			

4. RETENTION BASIN DESIGN

SECTION 1:

$Q = CIA$ (undeveloped)
$= 0.45 (5.4)(0.138)$
$Q = 0.335$ cfs

$Q_o = \frac{\text{allowable outflow}}{(\text{acreage})(\text{runoff coefficient})}$

$= \frac{0.335}{(0.138)(0.90)} = 2.70$ cfs/acre imperviousness

RETENTION BASIN DESIGN - SECTION 1

$$T = -25 + \sqrt{\frac{7{,}087.5}{Q_o}} = -25 + \sqrt{\frac{7087.5}{2.7}}$$

= 26.23 min = storage time

$$V_s = \frac{11340}{T+25}T - 40Q_oT = \frac{11340(26.23)}{26.23+25} - 40(2.7)(26.23)$$

= 2973.29 ft^3
= max. volume of storage per acre imperviousness

V_T = V_s (acreage)(runoff coefficient)
= 2973.29(0.138)(0.90)
= 369.28 ft^3
= total volume of storage required for the section

by design:

$$A_{req} = \frac{V_T}{2' \text{ depth}} = \frac{369.28}{2} = 184.64 \text{ sq. ft}$$

A (actual) = 15(17) = 255 sq. ft > 184.64 sq. ft ok

SECTION 2

Q = CIA (undeveloped) = 0.45(5.4)(0.146)
= 0.355 cfs

$$Q_o = \frac{0.355}{0.146(0.90)} = 2.70 \text{ cfs/acre imperviousness}$$

$$T = -25 + \sqrt{\frac{7087.5}{Q_o}} = -25 + \sqrt{\frac{7087.5}{2.70}}$$

= 26.23 min

BERNICE MADRID
JANUARY 4, 1979

$$V_s = \frac{11340T}{T+25} - 40Q_oT = \frac{11340(26.23)}{26.23+25} - 40(2.7)(26.23)$$

$$= 2973.29 \text{ ft}^3$$

$$V_T = 2973.29(0.146)(0.90) = 390.69 \text{ ft}^3$$

by design:

$$A_{req} = \frac{V_T}{2' \text{depth}} = \frac{390.69}{2} = 195.3 \text{ sq. ft}$$

$$A_{actual} = 26.5(16) = 424. \text{ sq. ft} > 195.3 \text{ sq. ft.}$$

SECTION 3

$$Q = CIA \text{ (undeveloped)}$$
$$= 0.45(5.4)(0.248) = 0.603 \text{ cfs}$$

$$Q_o = \frac{0.603}{0.248(0.90)} = 2.701$$

$$T = -25 + \sqrt{\frac{7087.5}{2.701}} = 26.22 \text{ min}$$

$$V_s = \frac{11340T}{T+25} - 40Q_oT = \frac{11340(26.22)}{26.22+25} - 40(2.701)(26.22)$$

$$= 2972.24 \text{ ft}^3$$

$$V_T = 2972.24(0.248)(0.90) = 663.40 \text{ ft}^3$$

by design:

$$A_{req} = \frac{663.40}{2' \text{ depth}} = 331.7 \text{ sq. ft} \qquad A_{actual} = 19.5 \times 20 = 390 \text{ sq.}$$

ok

RETENSION BASIN DESIGN - SECTION 1

$Q = CIA$ (undeveloped)
$= 0.15(5.1)(0.122) = 0.296$ cfs

$Q_o = \frac{0.296}{0.122(0.90)} = 2.70$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{Q_o}} = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.235$ min

$V_s = \frac{11340(26.235)}{26.235 + 25} - 40(2.70)(26.235)$

$= 2973.29$ ft^3

$V_T = 2973.29(0.122)(0.90) = 326.47$ ft^3

by design:

$Area = \frac{V_T}{2' \text{depth}} = \frac{326.47}{2} = 163.24$ sq. ft

$A_{actual} = 15 \times 16 = 240$ sq ft > 163.24 sq. ft ok

SECTION 5

$Q = CIA$ (undeveloped)
$= 0.15(5.4)(0.234) = 0.569$ cfs

$Q_o = \frac{0.569}{0.234(0.90)} = 2.702$

$T = -25 + \sqrt{\frac{7087.5}{2.702}} = 26.218$ min.

$V_o = \frac{11340(26.218)}{26.218 + 25} - 40(2.702)(26.218) = 2971.20$

$V_T = 2971.20(0.234)(0.90) = 625.73 \text{ ft}^3$

by design:

$A_{req} = \frac{625.73}{2' \text{ depth}} = 312.9 \text{ sq. ft}$

$A_{actual} = 576 \text{ sq. ft} > 312.9 \text{ sq. ft}$ ok

SECTION 6

$Q = CIA$ (undeveloped)
$= 0.45(5.4)(0.108) = 0.262 \text{ cfs}$

$Q_o = \frac{0.262}{0.108(0.90)} = 2.70$ cfs/acres imperviousness

$T = -25 + \sqrt{\frac{7087.5}{Q_o}} = -25 + \sqrt{\frac{7087.5}{2.70}} = 26.235 \text{ min}$

$V_s = \frac{11340(26.235)}{26.235 + 25} - 40(2.7)(26.235) = 2973.29 \text{ ft}^3$

$V_T = 2973.29(0.108)(0.90) = 289.0 \text{ sq. ft}$

by design:

$A_{req} = \frac{289.0}{2' \text{ depth}} = 144.5 \text{ sq. ft}$

$A_{actual} = 22 \times 11.5 = 253 \text{ sq ft} > 144.5 \text{ sq. ft.}$ ok

RETENTION BASIN DESIGN - SECTION 7

$Q = CIA$ (undeveloped) $= 0.45(5.4)(0.318)$
$= 0.773$ cfs

$Q_o = \frac{0.773}{0.318(.90)} = 2.70$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.70}} = 26.226$ min

$V_s = \frac{11340(26.226)}{26.226 + 25} - 40(2.7)(26.226) = 2973.28$ ft^3

$V_T = 2973.29(0.318)(0.90) = 850.952$ ft^3

by design:

$A_{req} = \frac{850.96}{2' \text{depth}} = 425.5$ sq. ft

$A_{actual} = 41 \times 17 = 697$ sq. ft > 425.5 sq. ft

SECTION 8

$Q = CIA$ (undeveloped)
$= 0.45(5.4)(0.241) = 0.586$ cfs

$Q_o = \frac{0.586}{0.241(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.234$ min

$V_s = \frac{11340(26.234)}{26.234 + 25} - 40(2.7)(26.234) = 2973.38$ ft^3

RETENTION BASIN DESIGN: - SECTION 8

$V_T = 2973.38(0.244)(0.90) = 644.92 \ ft^3$

by design:

$A_{req} = \frac{V_T}{2' \text{depth}} = \frac{644.92}{2} = 322.46$ sq. ft.

$A_{actual} = 544$ sq. ft > 322.46 sq. ft. ok

SECTION 9

$Q = CIA$ (undeveloped) $= (0.45)(5.4)(0.120) = 0.292$ cfs

$Q_0 = \frac{0.292}{0.120(0.90)} = 2.70$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.235$ min.

$V_T = \frac{11340(26.235)}{26.235 + 25} - 40(2.7)(26.235) = 2973.29 \ ft^3$

$V_T = 2973.29(0.120)(0.90) = 321.12 \ ft^3$

$A_{req} = \frac{321.12}{2} = 160.56$ sq. ft

$A_{actual} = 16.5 \times 17 = 280.5 > 160.56$ sq. ft ok

RETENTION BASIN DESIGN - SECTION 10

$Q = CIA$ (undeveloped) $= 0.45(5.4)(0.129) = 0.313$ cfs

$Q_o = \frac{0.313}{0.129(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.235$ min

$V_o = \frac{11340(26.235)}{26.235 + 25} - 40(2.7)(26.235) = 2973.27$ ft³

$V_T = 2973.27(0.129)(0.90) = 345.20$ ft³

by design:

$A_{req} = \frac{V_T}{2} = \frac{345.2}{2} = 172.6$ sq. ft

$A_{actual} = 16 \times 16 = 256 > 172.6$ sq. ft ok

SECTION 11:

$Q = CIA = 0.45(5.4)(0.198) = 0.481$ cfs

$Q_o = \frac{0.481}{0.198(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.235$ min

$V_o = \frac{11340(26.235)}{26.235 + 25} - 40(2.7)(26.235) = 2973.29$ ft³

$V_T = 2973.29(0.198)(0.90) = 529.64$ ft³

RETENTION BASIN DESIGN - SECTION 11

by design:

$$A_{req} = \frac{529.84}{2} = 264.92 \text{ sq ft}$$

$$A_{actual} = 26 \times 12 = 312.0 > 264.92 \text{ sq.ft} \quad ok$$

SECTION 12

$$Q = CIA \text{ (undeveloped)} = 0.45(5.4)(0.351) = 0.853$$

$$Q_o = \frac{0.853}{0.351(0.90)} = 2.7$$

$$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.235$$

$$V_s = \frac{11340(26.235)}{26.235 + 25} - 40(2.7)(26.235) = 2973.29 \text{ ft}^3$$

$$V_T = 2973.29(0.351)(0.90) = 939.26 \text{ ft}^3$$

by design:

$$A_{req} = \frac{939.26}{2} = 469.63 \text{ sq.ft}$$

$$A_{actual} = 33.5 \times 21 = 703.5 \text{ sq.ft} > 469.63 \text{ sq.ft} \quad ok$$

RETENTION BASIN DESIGN
SECTION 13

$Q = CIA$ (undeveloped) $= 0.45(5.4)(0.144)$
$= 0.350$ cfs

$Q_o = \frac{0.350}{0.144(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{Q_o}} = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.23$ min

$V_s = \frac{11340T}{T+25} - 40Q_oT = \frac{11340(26.23)}{26.23+25} - 40(2.7)(26.23)$

$= 2973.83$ ft^3

$V_T = 2973.83(0.144)(0.90) = 385.41$ ft^3

by design: assume depth to be 2'

$A_{req} = \frac{V_T}{} = \frac{385.41}{2} = 192.7$ sq. ft

SECTION 14

$Q = CIA$ (undeveloped) $= 0.45(5.4)(0.167) = 0.406$ cfs

$Q_o = \frac{0.406}{0.167(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.23$ min

$V_s = \frac{11340(26.23)}{26.23+25} - 40(2.7)(26.23) = 2973.83$ ft^3

RETENTION BASIN DESIGN
SECTION 14 (cont)

$V_T = 2973.83(0.167)(0.90) = 447 \text{ ft}^3$

by design: assume 2' depth

$A_{req} = \frac{447}{2} = 223.5 \text{ sq. ft}$

SECTION 15

$Q = CIA$ (undeveloped) $= 0.45(5.4)(0.145) = 0.352$ cfs

$Q_0 = \frac{0.352}{0.145(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.23$

$V_S = \frac{11340(26.23)}{26.23 + 25} - 40(2.7)(26.23) = 2973.83 \text{ ft}^3$

$V_T = 2973.83(0.145)(0.90) = 388.08 \text{ ft}^3$

by design: assume 2' depth

$A_{req} = \frac{388.08}{2} = 194.0 \text{ sq. ft}$

BERNICE MADRID
JANUARY 7, 1979

RETENTION BASIN DESIGN
SECTION 16

$Q = CIA$ (undeveloped) $= 0.45(5.1)(0.165) = 0.401$ cfs

$Q_0 = \frac{0.401}{0.165(0.90)} = 2.7$ cfs/acre imperviousness

$T = -25 + \sqrt{\frac{7087.5}{2.7}} = 26.23$

$V_S = \frac{11340(26.23)}{26.23 + 25} - 40(2.7)(26.23) = 2973.29$ ft^3

$V_T = 2973.29(0.165)(0.90) = 441.53$ ft^3

by design: assume 2 ft depth

$A_{req} = \frac{441.53}{2} = 220.8$ sq. ft