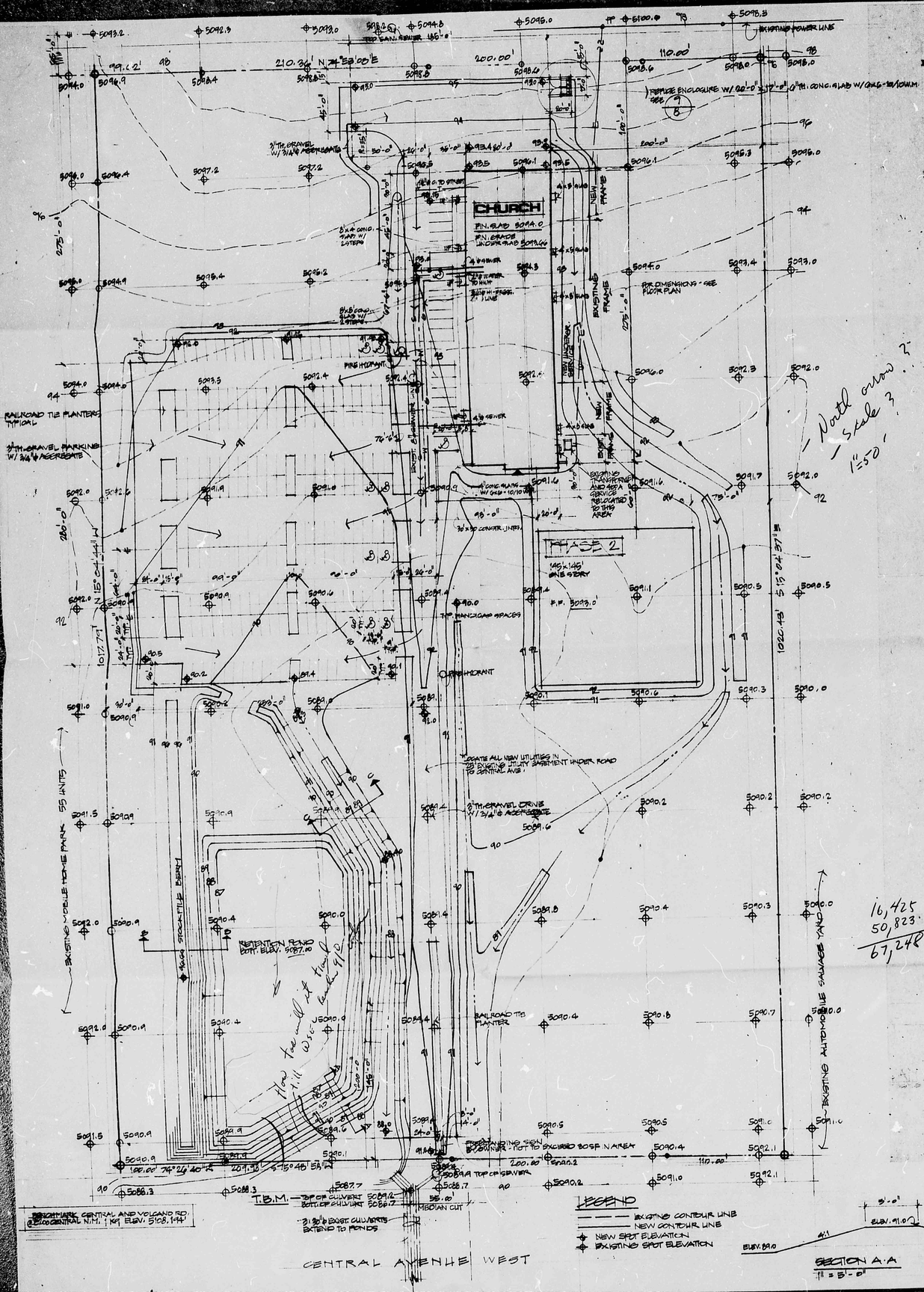
HYDROLOGY

K10/D15
2 PLANS

K10/D15

2 Plans



DRAINAGE CALCULATIONS

I. REFERENCES:

A. City of Albuquerque Development Process Manual (DPM) Volume 2, Design Criteria, Chapter 22, Drainage, Flood Control and Erosion Control.

B. Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico, United States Department of Agriculture, Soil Conservation Service.

C. Floodway Map, Panel 27 of 50, Federal Emergency Management Agency, October 14, 1983.

II. GENERAL INFORMATION:

A. Soil Type (Ref.B., Sheet No. 30) Soil type is MWA, Madurez-Wink association, gently sloping, Hydrologic Soil Group "B".

B. Imperviousness:

Type of Surface	Existing Area Sq.Ft.	Existing Area Acres	Proposed Area Sq.Ft.	Proposed Area Acres
Building Roof			22400	0.514
Concrete Surfaces			5237	0.120
Asphalt Surfaces			101388	2.328
Landscaping & Undeveloped surface	644700	14.8	515655	11.838
Site total	644700	14.8	644700	14.800
Percent impervious	0%		20%	

C. "C" Factor (See Ref. A., Plate 22.2 C-1)
1. Undeveloped "C" Factor = 0.34
2. Developed "C" Factor = 0.43

D. Rainfall, 100-year, 6-hour, R_6: (See Ref.A., Plate 22.2 D-1) R_6 = 2.2 inches.

E. Time of Concentration, T_c:
1. Undeveloped - overland flow length = 1017 ft. drop in elevation = 8.1 feet. Slope = 0.008 From Plate 22.2 B-1, Vel. = 0.5 fps use 1.0 fps as per conceptual plan. Tc = 1017/1.0 x 60 = 16.95 minutes.
2. Developed. V = 1.25 fps across pavement. Tc = 650/1.5x60 + 367/1.0x60 = 7.22 = 6.12 = 13.34 min.

F. Rainfall Intensity, I; (See Ref. A, Plate 22.2 D-2)

$$I = R_6 \times 6.84 \times T_c^{-0.51} = 2.2 \times 6.84 \times (16.95)^{-0.51}$$

I = 3.55 inches per hour, undeveloped. Use 3.55 in/hr as per conceptual plan.
I = 4.01 inches per hour developed. Use 4.75 inches per hour as per conceptual plan.

III. PEAK DISCHARGE:

A. Existing Conditions.
Q_{100} = 0.34 x 3.63 x 14.8 = 18.3 cfs
Q_{10} = 0.657 x 18.3 = 12.02 cfs

B. Developed Conditions:
Q_{100} = 0.43 x 4.75 x 14.8 = 30.2 cfs
Q_{10} = 0.657 x 30.2 = 19.8 cfs

IV. PEAK VOLUME:

A. Existing Conditions.
V_{100} = 0.34 x (2.2/12)14.8 x 43560 = 40186 cf.
V_{10} = 0.657 x 40186 = 26,402 cf

B. Developed Conditions:
V_{100} = 0.43 x (2.2/12)14.8 x 43560 = 50823 cf
V_{10} = 0.657 x 50823 = 33,391 cf

50,823
- 40,186
10,637
NO

V. RETENTION VOLUMES:

A. Volume displaced by improvements. Determined by cross-sections. This volume does not include the pad for Phase II building. 16,425 Total actual volume displaced (less volumes created by grading parking lot, roadside ditches, etc.)

B. Volume created by developing impervious surfaces. Developed volume less undeveloped volume = 10637 cf

16,425 NO!
50,823
67,248 CF

C. Required retention volume to compensate for improvements 16425 + 10637 = 27060 cf (does not include volumes displaced by pond dike or stockpile berm.

D. Retention pond dike. Average cross sectional area above existing ground elevation = 9 sf Length = 550 ft Volume 4950 cf

E. Stockpile Berm. Average ground elevation in area of berm is 90.63 Average area of berm cross section below flood level = 58.8 sf. Length = 440 ft. Volume = 58.8 x 440 = 25870 cf.

F. Total Retention Volume
27060 + 4950 + 25870 = ~~57880~~ cf
67,248 98,068 CF

VI. RETENTION POND VOLUME:

Average ground elevation in pond area = 90.2
Area of pond at elevation 90.2 = 47180 cf SF
Area of pond at elevation 88.5 = 45900 cf SF
Average area = 46500 cf
A small increase in the pond depth will result in enough additional volume to compensate for the displacement of additional volume to compensate for the displacement of Phase II building. This will provide a spoil area for excess excavation from the church building, if the material is suitable for fill and is placed in accordance with accepted engineering practice regarding compaction.
Required Volume. 57880 + 27060 (Phase II) = 85060 cf
Required depth = 86060/46500 = 1.83 Use 1.9 ft.
Elev. of Bottom = 90.2 - 1.9 = 88.3

VII. VOLUME OF STOCKPILE BERM:

85060 - 4950 = 80110 cf
45 ft. bottom with 2:1 side slopes 6 ft. high.
Area = 0.5 (45 + 20) 6 = 195 sf
length = 415 ft. Volume = 195 x 415 = 80,925 > 80110
The stockpile berm volume is adequate.

VIII. CHANNEL CAPACITY:

During peak conditions, the channel will be submerged under the flood plain. For this reason computation of velocities and flow depths is not particularly relevant.

DRAINAGE COMMENTS:

1. INTENT OF PLAN - THIS PLAN IS INTENDED TO REFINE THE CONCEPTS PRESENTED IN THE CONCEPTUAL GRADING AND DRAINAGE PLAN.

2. PRE-DESIGN FINDINGS -

A CONCEPTUAL DRAINAGE PLAN REQUIRED FOR SITE DEVELOPMENT SIGN-OFF.

B. DRAINAGE PLAN REQUIRED FOR BUILDING PERMIT SIGN-OFF.

C. CONCEPTUAL AND FINAL DRAINAGE PLAN PER DPM.

D. FINISHED FLOORS TO BE AT OR ABOVE ELEV. 5093.0

E. MUST ACCEPT OFF-SITE FLOWS AND PASS THEM THROUGH THE SITE.

F. DOWNSTREAM FLOODING DICTATES THE DISCHARGE RATE AND VOLUME FROM THE SUBJECT SITE.

3. THE PLAN CONFORMS TO 2.D. ABOVE BY SETTING FINISHED FLOOR AT ELEVATION 5094.0. FUTURE PHASE II FINISHED FLOOR WILL BE SET AT 5093.00.

4. COMPENSATION MUST BE MADE FOR THE VOLUME OF EXISTING FLOOD WATER DISPLACED BY BUILDING PAD AND ROAD AND FOR INCREASED RUNOFF DUE TO IMPERVIOUS SURFACES, BY EXCAVATING AN EQUIVALENT VOLUME BELOW ELEVATION 5092.0 (SEE CONCEPTUAL PLAN) WHICH IS THE ESTABLISHED FLOOD PLAIN ELEVATION. AT DEVELOPING RETENTION VOLUME, THE RATES AND VOLUMES OF STORM WATERS RELATIVE TO THIS SITE WILL REMAIN THE SAME AFTER DEVELOPMENT.

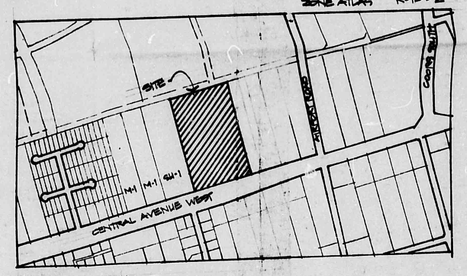
5. ONCE DOWNSTREAM DRAINAGE IMPROVEMENTS ARE IN PLACE (ANOLE DEL NORTE DIVERSION CHANNEL PHASE I) AND DRAINAGE WAYS FROM CENTRAL AVENUE TO THAT FACILITY ARE ESTABLISHED AS RIGHT-OF-WAY OR DRAINAGE EASEMENTS, ONLY THEN MAY THOSE TEMPORARY RETENTION PONDS BE ABANDONED AND THE SUBJECT SITE BE ALLOWED TO INCREASE THE VOLUME OF STORM WATERS TO THE SOUTH.

6. MINOR FLOWS WILL BE DISCHARGED DIRECTLY THROUGH THE EXISTING CULVERTS. WHEN THE CULVERTS REACH CAPACITY AND THE FLOOD WATERS BACK UP TO ELEVATION 5090.00, THE RETENTION POND WILL BE FILLED FROM THE NORTH END.

7. OFF-SITE FLOW - THERE APPEARS TO BE NO SIGNIFICANT OFF-SITE FLOW AFFECTING THE SITE. WEST OF THE SITE IS MOBILE HOME PARK WHICH DRAINS TO CENTRAL AVENUE. SPOT ELEVATIONS SHOW THAT SOME OFF-SITE FLOW MAY EXIST HERE. NORTH OF THE SITE IS A LARGE EXCAVATION FOR FLOOD CONTROL WHICH IS LOWER THAN THE SITE. SHOULD AN UNUSUALLY RAINY SEASON OCCUR THAT WOULD FILL THIS EXCAVATION, OFF-SITE WOULD OCCUR AND FLOODING WOULD BE INCREASED ON THE SITE. ELEVATIONS SHOW THAT THE AREA EAST OF THE SITE IS LOWER THAN THE SITE. THE PROPOSED GRADING WILL CHANNEL ALL ON-SITE DEVELOPED FLOW AWAY FROM THIS AREA. ANY OFF-SITE FLOWS THAT MAY EXIST ARE ACCEPTED AND WILL BE CHANNELED TO CENTRAL AVENUE.

DRAINAGE PLAN

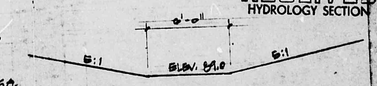
SCALE : 1" = 20'-0"



LOCATION MAP

LEGAL DESCRIPTION

TRACTS A, C-32 AND A PORTION OF C-31, SIEGLITZ INDUSTRIAL PARK/ LUVARN ADDITION, LOCATED ON THE NORTH SIDE OF CENTRAL AVENUE BETWEEN AIRPORT DRIVE NW AND 79TH ST. NW CONTAINING APPROX. 14.6A.



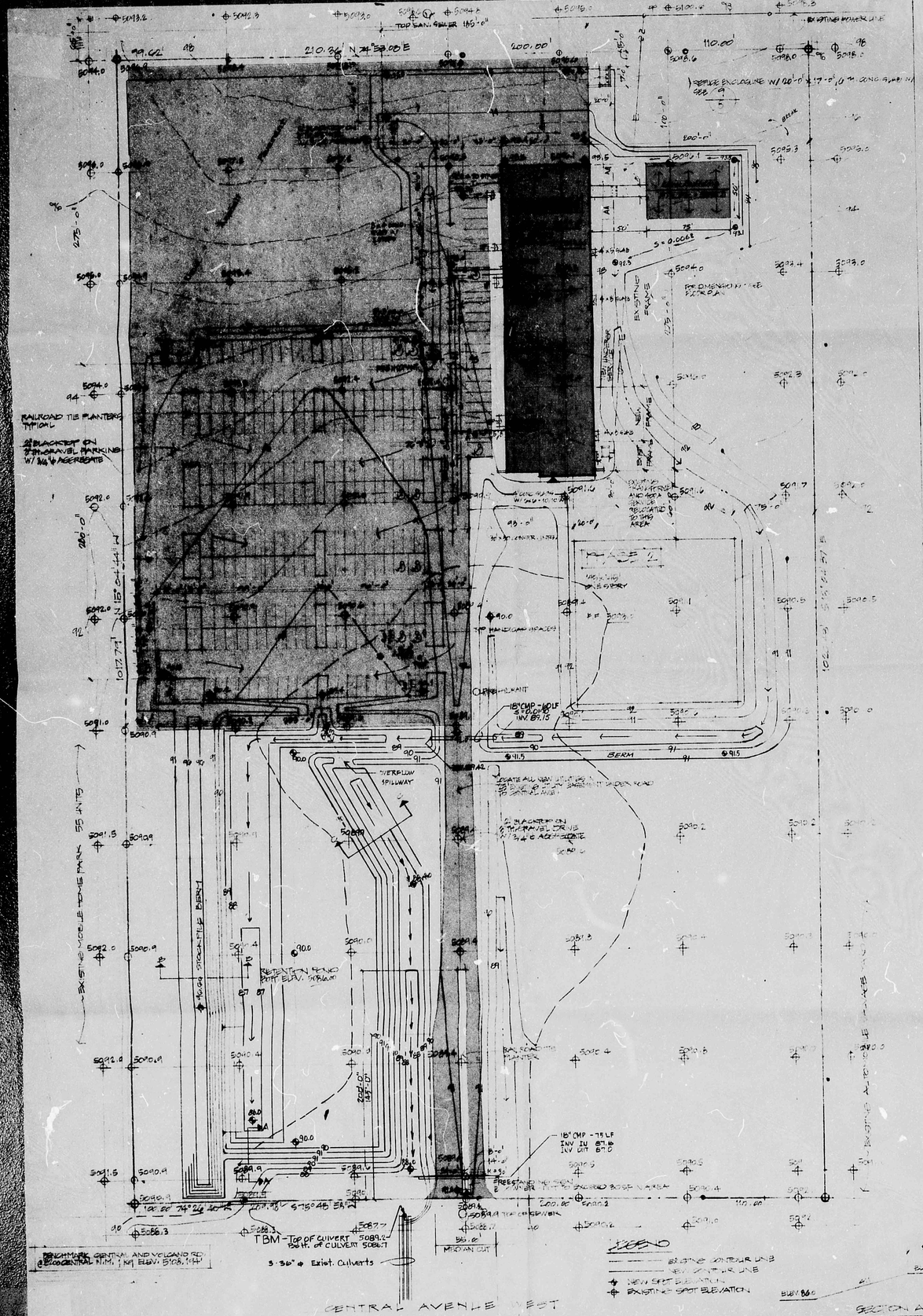
FRANK D. LOVEJOY
NEW MEXICO
6512
10/30/85
REGISTERED PROFESSIONAL ENGINEER

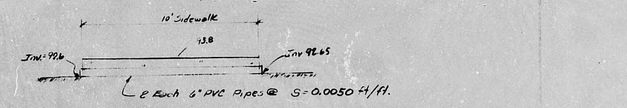
RECEIVED
OCT 30 1985
HYDROLOGY SECTION

VICTORY LOVE FELLOWSHIP CHURCH

SITE PLAN / DRAINAGE PLAN 1" = 50'-0"

1 of 1





SECTION A-A
1/4" = 1'-0"

DRAINAGE CALCULATIONS

I. REFERENCES:

A. CITY OF ALBUQUERQUE DEVELOPMENT PROCESS MANUAL (DPM) VOLUME 2, DESIGN CRITERIA, CHAPTER 22.

B. FLOODWAY MAP, PANEL 27 OF 50, (FEMA), OCTOBER 14, 1983.

C. SOIL SURVEY OF BERNALILLO COUNTY, NEW MEXICO, U.S. SOIL CONSERVATION SERVICE, JUNE, 1977.

II. ON-SITE RUNOFF CHARACTERISTICS:

A. UNDEVELOPED RUNOFF COEFFICIENT:

TYPE OF SURFACE	AREA	"C" VALUE	AREA("C")
STREETS, DRIVES, WALKS			
ROOFS			
LAWNS & LANDSCAPING			
UNDEVELOPED	644700	= 14.8	
TOTAL AREA	644700		

WEIGHTED "C" VALUE = 0.40

PERCENT IMPERVIOUS = 0%

B. DEVELOPED RUNOFF COEFFICIENT:

TYPE OF SURFACE	AREA	"C" VALUE	AREA("C")
STREETS, DRIVES, WALKS	206026	0.95	195725
ROOFS	22400	0.90	20160
LAWNS & LANDSCAPING			
UNDEVELOPED	416274	0.40	166510
TOTAL AREA	644700		382395

WEIGHTED "C" VALUE = 382395 / 644700 = 0.59

PERCENT IMPERVIOUS = 35%

C. RAINFALL, 100-YR.,6-HR.:(REF. A., PLATE 22.2 D-1)
R_6 = 2.2 INCHES

D. TIME OF CONCENTRATION: FROM NE CORNER TO SE CORNER, AVERAGE SLOPE IS 0.0067. FOR PAVED AREAS, VELOCITY IS ABOUT 1 FPS. Tc = 1270/1360 = 21.17 MIN.

E. RAINFALL INTENSITY,I (REF. A., PLATE 22.2 D-2)
$I = R_6 X 6.84 X (T_c)^{-0.51} = (2.2)6.84(21.17)^{-0.51} = 3.17 IN/HR$

F. SOIL TYPE (REF. I.C., SHEET NO. 30)SOIL IS MWA, MADUREZ WINK ASSOCIATION, HYDROLOGIC SOIL GROUP "B".

G. RUNOFF CURVE NUMBER (CN)-(REF.I.A., PLATE 22.2 C-2)

UNDEVELOPED LAND USE: PASTURE OR RANGE LAND, POOR.

UNDEVELOPED CN =79

DEVELOPED LAND USE:PAVEMENT, BLDG., 98; OTHER, 79.

DEVELOPED CN = WEIGHTED = $\frac{(416274 \times 79 + 228426 \times 98)}{644700}$ = 86

H. DIRECT RUNOFF, Q_D, INCHES (REF. I.A., PL. 22.2 C-4)

UNDEVELOPED Q_D = 0.60 IN. DEVELOPED Q_D = 1.1 IN.

III. ON-SITE PEAK DISCHARGE BY RATIONAL EQUATION:

A. EXISTING CONDITIONS:
Q_{100} = 0.40 X 3.17 X 14.8 = 13.77 CFS
Q_{10} = 0.657 X 18.77 = 12.33 CFS

B. DEVELOPED CONDITIONS:
Q_{100} = 0.59 X 3.17 X 14.8 = 27.68 CFS
Q_{10} = 0.657 X 27.68 = 18.19 CFS

IV. ON-SITE VOLUME BY S.C.S. METHOD:

A. EXISTING CONDITIONS:
V_{100} = AREA (Q_D/12) = 644700 (0.6/12) = 32235 CF
V_{10} = 0.657 X 32235 = 21136 CF

B. DEVELOPED CONDITIONS:
V_{100} = AREA (Q_D/12) = 644700(1.1/12) =59098 CF
V_{10} = 0.657 X 59098 = 38827 CF

V. REQUIRED POND VOLUME:

PER HYDROLOGY COMMENTS, THE POND VOLUME SHOULD BE LARGE ENOUGH TO RETTHE 100-YEAR DEVELOPED VOLUME. NO ALLOWANCE FOR DISPLACEMENT IS REQUIRED.

VI. ACTUAL POND VOLUME:

THE EXISTING AVERAGE GROUND ELEVATION IN THE AREA WHERE THE POND IS TO BE CONSTRUCTED IS 90.2. VOLUME IS DETERMINED BY AVERAGING CONTOUR AREAS.

CONTOUR LINE	AREA(SF)	AVE. AREA (SF)	DEPTH (FT)	VOLUME (CF)
90.27	30537			
		30537	.27	8245
90.00	30537			
		25263	1.00	25263
66.00	19989			
		16379	1.00	16379
88.00	12768			
		7909	1.00	7909
87.00	3050			
		1525	1.00	1525
86.00	0			
TOTAL				59321

59321 CF > 59098 CF POND VOLUME IS ADEQUATE

CALCULATIONS FOR NEW BUILDING
Sidewalk Culvert Calculations: Area = 27645 SF = 0.63AC
Impervious 75x85 + 4C x 95 = 5675 SF C = $\frac{5675 \times 0.95 + 21970 \times 0.40}{27645}$ = 0.51
Tc = 10 Min. I = 4.65 Q = CIA = 0.51 x 4.65 x 0.63 = 1.49 CFS
Pipe Capacity - Use Orifice Equation Q = CA√2gh
C = 0.6 A = 0.1963 SF H = (93.8 - 92.65) 0.25 = 0.90
Q = 0.6 x 0.1963 / 5.3222 x 0.90 = 0.89 CFS 12" PIPE
2 Pipes Required

CERTIFICATION:

I HEREBY CERTIFY THAT I HAVE INSPECTED THE SITE AND HAVE FOUND IT TO BE IN REASONABLE CONFORMANCE WITH THIS REVISED DRAINAGE PLAN. I FURTHER CERTIFY THAT I HAVE PERFORMED A SURVEY TO CONFIRM THE ELEVATION OF THE FINISHED FLOOR OF THE BUILDING WHICH IS 5094.03. (THIS ELEVATION IS BASED ON AN ELEVATION OF 5093.70 ON TOP OF CONCRETE AT THE FRONT DOOR WHICH IS 0.33 FEET BELOW FINISHED FLOOR.)

Frank D. Lovelady — May 7, 1987
SIGNATURE — DATE

DRAINAGE COMMENTS:

1. INTENT OF PLAN - THIS PLAN IS INTENDED TO REFINE THE CONCEPTS PRESENTED IN THE CONCEPTUAL GRADING AND DRAINAGE PLAN.

2. PRE-DESIGN CONFERENCE FINDINGS:

   A. CONCEPTUAL DRAINAGE PLAN REQUIRED FOR SITE DEVELOPMENT SIGN-OFF.

   B. DRAINAGE PLAN REQUIRED FOR BUILDING PERMIT SIGN-OFF.

   C. CONCEPTUAL AND FINAL DRAINAGE PLAN PER DPM.

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   E. MUST ACCEPT OFF-SITE FLOWS AND PASS THEM THROUGH THE SITE.

   F. DOWNSTREAM FLOODING DICTATES THE DISCHARGE RATE AND VOLUME FROM THE SUBJECT SITE.

3. THE PLAN CONFORMS TO 2.D. ABOVE BY SETTING FINISHED FLOOR AT ELEVATION 5094.0. FUTURE PHASE II FINISHED FLOOR WILL BE SET AT 5093.00.

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5. ONCE DOWNSTREAM DRAINAGE IMPROVEMENTS ARE IN PLACE (ARDLE DEL NORTE DIVERSION CHANNEL PHASE I) AND DRAINAGE WAYS TO CENTRAL AVENUE TO THAT FACILITY ARE ESTABLISHED AS RIGHTS-OF-WAY OR DRAINAGE EASEMENTS, ONLY THEN MAY THOSE TEMPORARY RETENTION PONDS BE ABANDONED AND THE SUBJECT SITE BE ALLOWED TO INCREASE THE VOLUME OF STORM WATERS TO THE SOUTH.

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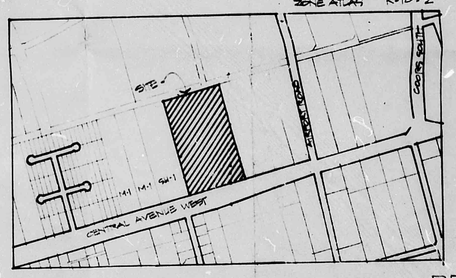
DRAINAGE PLAN

SCALE: 1" = 50'-0"

ZONE ATLAS K-10-Z



LOCATION MAP

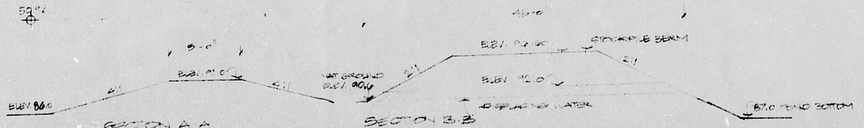
LEGAL DESCRIPTION

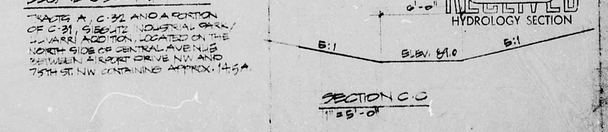
TRACTS A, C-32 AND A PORTION OF C-31, SUBDIVISION OF GREEN ACRES ADDITION, LOCATED ON THE NORTH SIDE OF CENTRAL AVENUE BETWEEN ROBERT DRIVE NW AND 75TH ST. NW CONTAINING APPROX. 14.5 A

FRANK D. LOVELADY N.M. REG. NO. 6512 REGISTERED PROFESSIONAL ENGINEER 10/30/85

REVISED DEC. 2, 1985
Revised May 7, 1987
Revised August 31, 1987

RECEIVED SEP 03 1987 HYDROLOGY SECTION





VICTORY LOVE FELLOWSHIP CHURCH

SITE PLAN / DRAINAGE PLAN 1" = 50'-0"

1 / 1