



**JR ENGINEERING, LTD.**  
6455 North Union Boulevard, Suite 202  
Colorado Springs, Colorado 80918  
593-2593

Colorado Springs  
Denver

Engineering  
Planning  
Surveying

MASTER DEVELOPMENT DRAINAGE PLAN  
FOR  
FALCON ESTATES REFILING NO. 2 WEST SIDE  
REVISED MARCH, 1992  
JOB NO. 8335.20

**RETURN WITHIN 2 WEEKS TO:  
CITY OF COLORADO SPRINGS  
STORM WATER & SUBDIVISION  
101 W. COSTILLA, SUITE 113  
COLORADO SPRINGS, CO 80903,  
(719) 578-6212**

Prepared For:

FALCON ESTATES REFILING NO. 2 TRUST  
& David Krall, Attorney at Law  
830 North Tejon, Suite 200  
Colorado Springs, Colorado 80903  
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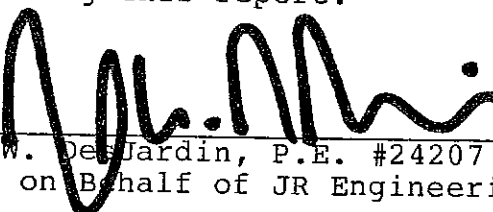
Prepared By:

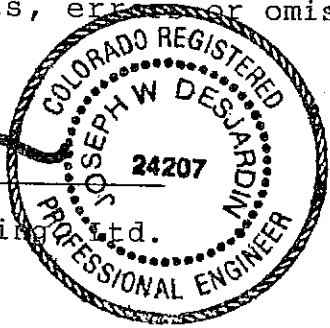
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(719) 593-2593

MASTER DEVELOPMENT DRAINAGE PLAN FOR FALCON  
ESTATES REFILEING NO. 2 WEST SIDE

Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability directly caused by the negligent acts, errors or omissions on my part in preparing this report.

  
\_\_\_\_\_  
Joseph W. Desjardin, P.E. #24207  
For and on Behalf of JR Engineering, Ltd.



3.19.92

Developer's Statement:

The developer has read and will comply with all the requirements specified in this drainage report.

FALCON ESTATES Refiling No 2 Trust  
Business Name

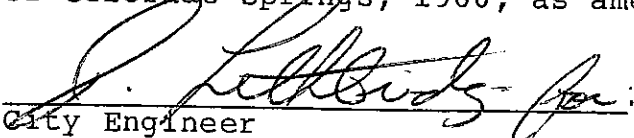
By: David H Kneel

Title: attorney

Address: 25 E. Cache la Poudre  
# 103  
C/S, CO 80903

City of Colorado Springs:

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

  
\_\_\_\_\_  
City Engineer

5/13/92  
\_\_\_\_\_  
Date

Conditions:

MASTER DEVELOPMENT DRAINAGE PLAN  
FALCON ESTATES REFILEING NO. 2 WEST SIDE  
REVISED MARCH, 1992

PURPOSE:

This report is the Master Development Drainage Plan (MDDP) for the Master Plan associated with annexation of a portion of Falcon Estates No. 2. The Master Development Drainage Plan, as required by the City/County Drainage Criteria Manual, identifies major drainageways, ponding (detention areas), locations of culverts, bridges, open channels and tributary drainage areas.

GENERAL DESCRIPTION:

The proposed Master Plan consists of a portion of Falcon Estates Refiling No. 2 West Side. The development is located in north-east Colorado Springs. The parcel is bound on the north by Chapel Hills Technological Center, on the east by Academy Boulevard, on the south by Falcon Estates Filing No. 1 and on the west by Pine Creek and Interstate 25; refer to Exhibit "A" in the appendix.

The proposed development consists of approximately 106 acres to be zoned Planned Business Center (PBC-2), Planned Industrial Park (PIP-1), Office Residential (OR) and Residential (RS and R).

EXISTING DRAINAGE CHARACTERISTICS:

Falcon Estates Refiling No. 2 West Side is within the Cottonwood Creek Drainage Basin. Cottonwood Creek was previously studied by Lincoln DeVore in 1979. An updated Cottonwood Creek Drainage Basin Planning Study (DBPS) is currently being prepared by URS Consultants. The site lies within Basins X-3 and X-4 with Basins U-1 thru U-4 being tributary; refer to Exhibit "B" in the appendix.

Portions of the site are within a designated F.E.M.A. floodplain as determined from Flood Insurance Rate Maps Community Panel No. 080060-0153-C revision dated March 2, 1989 and Community Panel No. 080060-0154-C revision dated March 2, 1989; refer to Exhibit "C" in appendix.

The general drainage pattern is from east to west along gently sloping grass slopes. There is an existing 48" RCP storm sewer, discharging runoff from Anderosa Estates, located along the rear property line between Turner and Cragin Roads east of Academy. The storm sewer jogs north along Academy and then continues west as a 54" RCP along the north side of Lots 1 and 2 of Block 6, eventually discharging into the recently improved Burns Road Channel. All other runoff from the east, sheet flows across Academy Boulevard onto the site. Within this portion of Falcon Estates Refiling No. 2 West Side, deep and broad natural drainageways exist to channel runoff to Pine Creek.

PROPOSED DRAINAGE CHARACTERISTICS:

The proposed development consists of commercial, industrial, office and residential uses. The proposed drainage patterns will remain similar to historic, utilizing as much of the natural drainageways as possible.

The "Draft" Cottonwood Creek Drainage Basin Planning Study estimates the detained 100-year flow from Anderosa Estates at Academy Boulevard (design point 28-B) to be 440 CFS. An additional 48" RCP is recommended to parallel the existing 54" RCP along the north side of Block 6 discharging into the Burns Road Channel. Subsequent "Preliminary/Final" Drainage Reports will determine final sizing and/or alternative improvement selections.

The "Draft" Cottonwood Creek Drainage Basin Planning Study estimates the fully developed 100-year runoff from Basin U-4 at Academy Boulevard to be 318 CFS using HEC-1 and 373 CFS using the Rational Method. The combined runoff from U-4 and X-4 is estimated to be 628 CFS or 671 CFS, depending on which chart in the report is used. The recommended improvement for this quantity of runoff is an Alternate B Open Channel with an 83' bottom width.

Channel Alternate B (stabilized, hand-lined bank floodway with wetlands bottom) is described in the Draft Cottonwood Creek Drainage Basin Planning Study as follows:

This channel type is a modification of existing drainageways with emergent vegetation. Some type of bank protection will be provided along with grade control/drop structures. The type of bank protection and placement of grade control structures needs to be designed to fit into the natural environment and habitats. The low flow channel in this type would typically be undefined. The wetland bottom in this type will contain increased runoff and support wetland vegetation similar to that existing in the drainageway, but at higher densities and diversity. Mitigation of disturbed areas due to bank protection will be done along the area where the disturbance occurs. Drop structures will be used to reduce velocities, help prevent erosion and allow establishment and enhancement of the existing vegetation upstream of the drops. Wildlife corridors can be maintained with this channel alternative. This channel configuration can also be used to replace existing Agricultural/Cultivated channels and Modified channels.

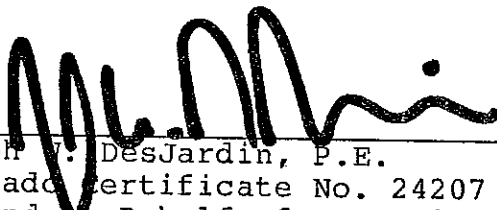
Final dimensions and improvements and/or alternative drainage improvements will be selected and analyzed in subsequent Preliminary/Final Drainage Reports.

The proposed Cragin Road and Turner Road extensions to the north to connect with Kelly Johnson Boulevard will cross an existing concrete-lined open channel adjacent to the north property line of Falcon Estates Refiling No. 2. These proposed roadway crossings of the existing drainage facility will require bridge type structures in order to not obstruct storm water runoff capacity.

SUMMARY:

Approximately 400 acres of drainage basins are tributary to this site. Portions of the site are within a F.E.M.A. floodplain. Final selection and sizing of drainage facilities must occur with future Preliminary/Final Drainage Reports once more development information is available via a Concept or Development Plan.

Respectfully submitted,



\_\_\_\_\_  
Joseph V. DesJardin, P.E.  
Colorado Certificate No. 24207  
For and on Behalf of JR Engineering, Ltd.

\_\_\_\_\_  
Date 3.19.92

/cdr

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EXHIBIT "B" - COTTONWOOD CREEK DRAINAGE BASIN PLANNING STUDY

EXHIBIT "C" - F.E.M.A. FLOODPLAIN MAPS

FALCON ESTATES REFILE NO. 2 WEST SIDE MASTER PLAN  
PREPARED BY YERGENSEN, OBERING & WHITTAKER

APPENDIX



EXHIBIT "A"  
ZONING (VICINITY) MAP



EXHIBIT "B"

COTTONWOOD CREEK  
DRAINAGE BASIN PLANNING STUDY

COTTONWOOD CREEK DBPS - TABLE 6  
 BASIN HYDROLOGY - SUMMARY OF PEAK FLOWS  
 100-YEAR STORM

SHEET 3

DESIGN POINT	TRIBUTARY AREA (ACRES)	* DETAINED RUNOFF Q(CFS)	* FLOW THRU RUNOFF Q(CFS)
8B	448	552	552
8A	205	179	179
6A	186	417	417
5A	179	101	101
32	6,362	5,274	11,505
31	6,182	4,933	11,267
30	5,760	4,217	10,669
29	5,645	4,019	10,422
OFF-29	3,194	2,583	5,634
28	2,323	2,069	5,600
27	1,472	518	3,213
26	1,344	253	2,970
25	1,024	118	2,201
24	915	1,999	1,999
23	819	1,807	1,807
22	282	578	578
U4X4	262	628	628
28H	2,067	1,631	4,980
28G	1,581	794	3,487
28F	493	850	1,563
28E	365	404	1,120
28D	128	356	356
28C	237	77	775
28B	250	440	651
28A	186	267	426
26B	320	138	797
26A	154	454	454
23A	269	511	511
22A	147	300	300

\* INCLUDES PRECIPITATION AREA REDUCTION FACTOR FOR COTTONWOOD CREEK BASIN

Three basic channel types have been conceptually developed as alternatives for current drainageways in response to future runoff conditions. These were presented previously in Figures 29 through 32. Although there were four channel alternatives shown, alternatives C and D are variations of the same concept with alternative D being recommended over alternative C. Therefore, we essentially have a consideration of using alternatives A, B, or D. These channel types are modifications that are consistent with future land use, wetlands and wildlife habitat. Each channel type also meets the objective of controlling stream velocity and erosion. A combination of vegetation and structural elements will be used as controls. These channel types can be further described as follows:

a. Channel Alternative A  
(Natural Channel With Shrub and Emergent Wetlands)

This channel type is occupied by native wetland and riparian vegetation. The channel may be slightly modified by bank armoring. This will need to be done in the areas where a significant erosion problem already exists or is anticipated and it threatens existing structures. Any type of bank treatment needs to closely consider how it fits into the natural setting. The channel bottom is natural and sinuous. Grade control structures will be necessary to halt the vertical degradation that is currently occurring. Drop structures will cause changes to the channels at the location of construction. This type of channel is intended to minimize the impact on the natural environment. In cases where construction would do a significant amount of damage or disruption to the environment and habitat, it is recommended that additional Right-of-Way or easement areas be provided in conjunction with minimizing improvements to allow for future channel horizontal movements. The actual width of Right-of-Way or easement needs to be determined at the subdivision report level.

b. Channel Alternative B  
(Stabilized, Hard-lined Bank Floodway With Wetland Bottom)

This channel type is a modification of existing drainageways with emergent vegetation. Some type of bank protection will be provided along with grade control/drop structures. The type of bank protection and placement of grade control structures needs to be designed to fit into the natural environment and habitats. The low flow channel in this type would typically be undefined. The wetland bottom in this type will contain increased runoff

and support wetland vegetation similar to that existing in the drainageway, but at higher densities and diversity. Mitigation of disturbed areas due to bank protection will be done along the area where the disturbance occurs. Drop structures will be used to reduce velocities, help prevent erosion and allow establishment and enhancement of the existing vegetation upstream of the drops. Wildlife corridors can be maintained with this channel alternative. This channel configuration can also be used to replace existing Agricultural/Cultivated channels and Modified channels.

c. Channel Alternative C  
(Hard-lined Floodway)

This channel alternative is a hard-lined drainageway. Lining types need to fit the adjacent improvements. This alternative is to be used predominantly in areas that are already urbanized. A variety of structural components are suitable. The bottom can be grass-lined or planted with emergent wetland species. The use of woody vegetation in this alternative is not recommended. Concrete or riprap may be required in some cases due to existing Right-of-Way constraints and/or erosion considerations. Use of this alternative has been limited to areas where jurisdictional wetlands are not anticipated. Minimal wildlife habitat characteristics can be maintained with this alternative. If jurisdictional wetlands are present, their loss will be mitigated.

2. Alternative Lining Types

There are a variety of channel lining types available for use in the various channel alternatives. Figures 34 through 40 show some of the types available and where they may be appropriately applied. It is recommended that the type of channel lining be selected according to how well it fits into the current setting. These linings need to be designed to withstand the anticipated channel velocities, minimize the environmental impacts, and provide an aesthetically pleasing drainageway.

3. Multiple Use Opportunities

The drainageways within this study area create an opportunity to provide multiple use of these corridors. The location of the proposed major trail systems are shown on Figure 3. A maintenance road/trail link is required to be provided for the channels unless conditions dictate otherwise. Approval of eliminating road/trail requires approval from the appropriate City/County agencies. In

**COTTONWOOD CREEK DBPS - TABLE 9  
CHANNEL RECOMMENDATIONS**

REACH	HEC-1 FLOW w/det. (CFS)	CHANNEL LENGTH(FT)	EXISTING IMPROVEMENT	RECOMMENDED IMPROVEMENT	TOTAL BOTTOM WIDTH (FT)	TOTAL DEPTH (FT)
G2 TO DESIGN POINT 12B	947/430	2,800	48" PIPE	PARALLEL	72" RCP	N/A
G1 TO DESIGN POINT 12A	541	2,400	CONCRETE	NO IMPROVEMENT REQ	10.0	4.0
C16 TO DESIGN POINT 11G	263	5,500	NATURAL	STORM SEWER	54" RCP	N/A
11F TO DESIGN POINT 11	218/1726	3,500	NATURAL	ALTERNATIVE B	10.0	9.6
E6 TO DESIGN POINT 11E	265	4,000	NATURAL	STORM SEWER	54" RCP	N/A
11D TO DESIGN POINT 11F	1,341	2,000	NATURAL	ALTERNATIVE B	10.0	8.7
E2 TO DESIGN POINT 11C	361	3,300	NATURAL	ALTERNATIVE B	10.0	4.4
11A TO DESIGN POINT 11B	539	3,300	NATURAL	ALTERNATIVE B	10.0	4.5
E1 TO DESIGN POINT 11A	335	3,000	NATURAL	ALTERNATIVE B	20.0	3.7
9A TO DESIGN POINT 9B	577	6,800	NATURAL	ALTERNATIVE B	50.0	3.4
C14 TO DESIGN POINT 9A	255	2,500	NATURAL	STORM SEWER	48" RCP	N/A
B5 TO DESIGN POINT 8H	592	4,800	NATURAL	STORM SEWER	72" RCP	N/A
B6 TO DESIGN POINT 8	1,612	4,000	NATURAL	ALTERNATIVE B	80.0	4.5
C5 TO DESIGN POINT 8F	594	6,300	NATURAL	ALTERNATIVE B	30.0	4.3
B8 TO DESIGN POINT 8G	973	3,000	NATURAL	ALTERNATIVE B	80.0	3.6
B0 TO DESIGN POINT 8D	330	4,500	NATURAL	STORM SEWER	60" RCP	N/A
8A TO DESIGN POINT 8B	552	4,000	NATURAL	ALTERNATIVE B	40.0	3.8
C2 TO DESIGN POINT 8A	179	3,000	NATURAL	STORM SEWER	42" RCP	N/A
B2 TO DESIGN POINT 6A	417	3,000	NATURAL	ALTERNATIVE B	20.0	4.4
5A TO DESIGN POINT 5	138	3,900	NATURAL	ALTERNATIVE A	20.0	2.8
31 TO DESIGN POINT 32	5,274	1,500	NATURAL	ALTERNATIVE A	20.0	13.2
30 TO DESIGN POINT 31	4,933	1,600	NATURAL	ALTERNATIVE B	20.0	12.8
U4 TO DESIGN POINT 31	671	4,500	NATURAL	ALTERNATIVE B	83.0	3.0
SUM13 TO DESIGN POINT 29	2,949	3,300	NATURAL	ALTERNATIVE B	10.0	11.9
28 TO DESIGN POINT 29	2,042	1,900	CONCRETE	INCREASE BOTTOM WIDTH	19.0	6.0
28B TO DESIGN POINT 28	438	1,600	54" PIPE	PARALLEL	48" RCP	N/A
28A TO DESIGN POINT 28B	440	1,900	48" PIPE	PARALLEL	48" RCP	N/A
U1 TO DESIGN POINT 28A	267	2,800	42" PIPE	NO IMPROVEMENT REQ	N/A	N/A

EXHIBIT "B"

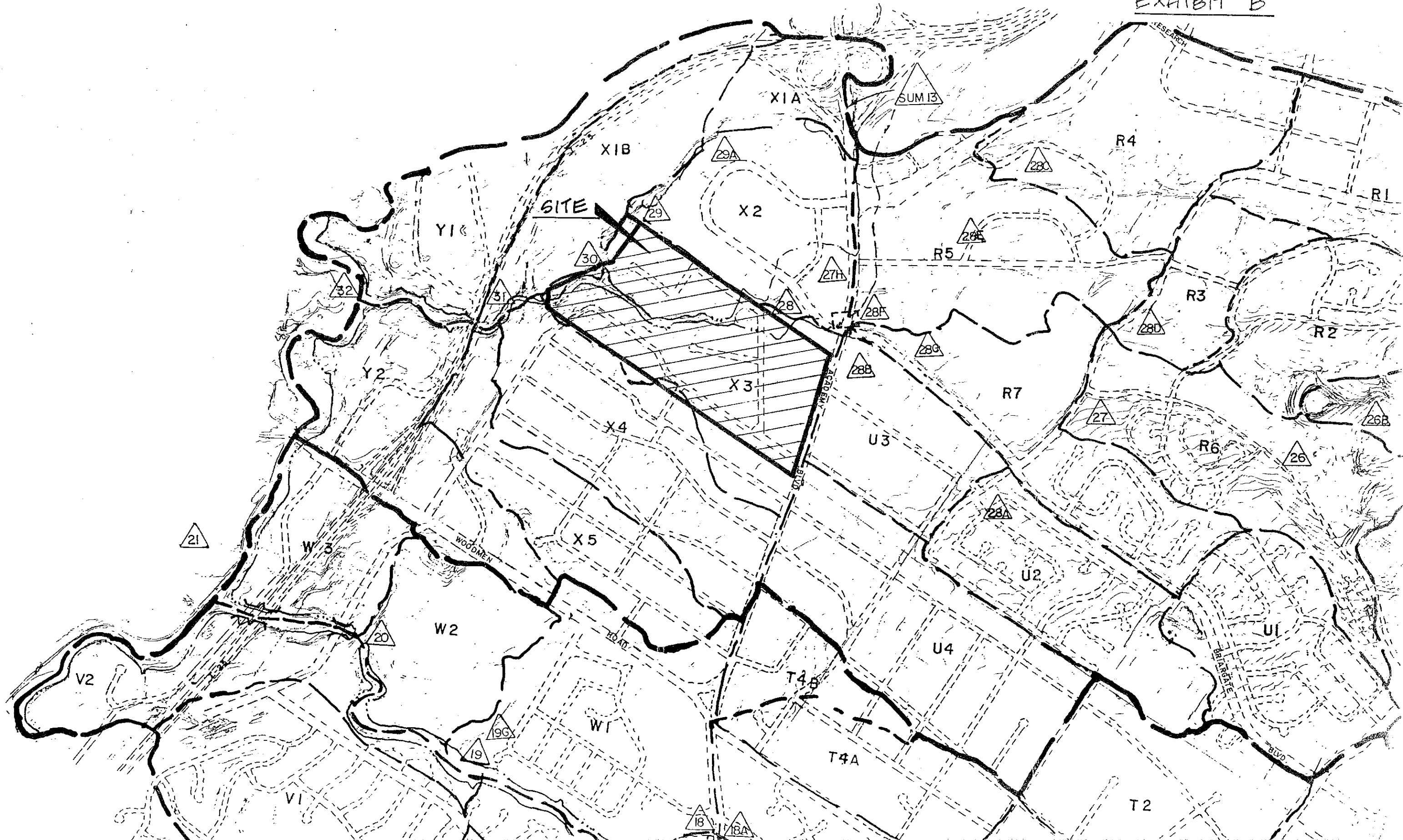
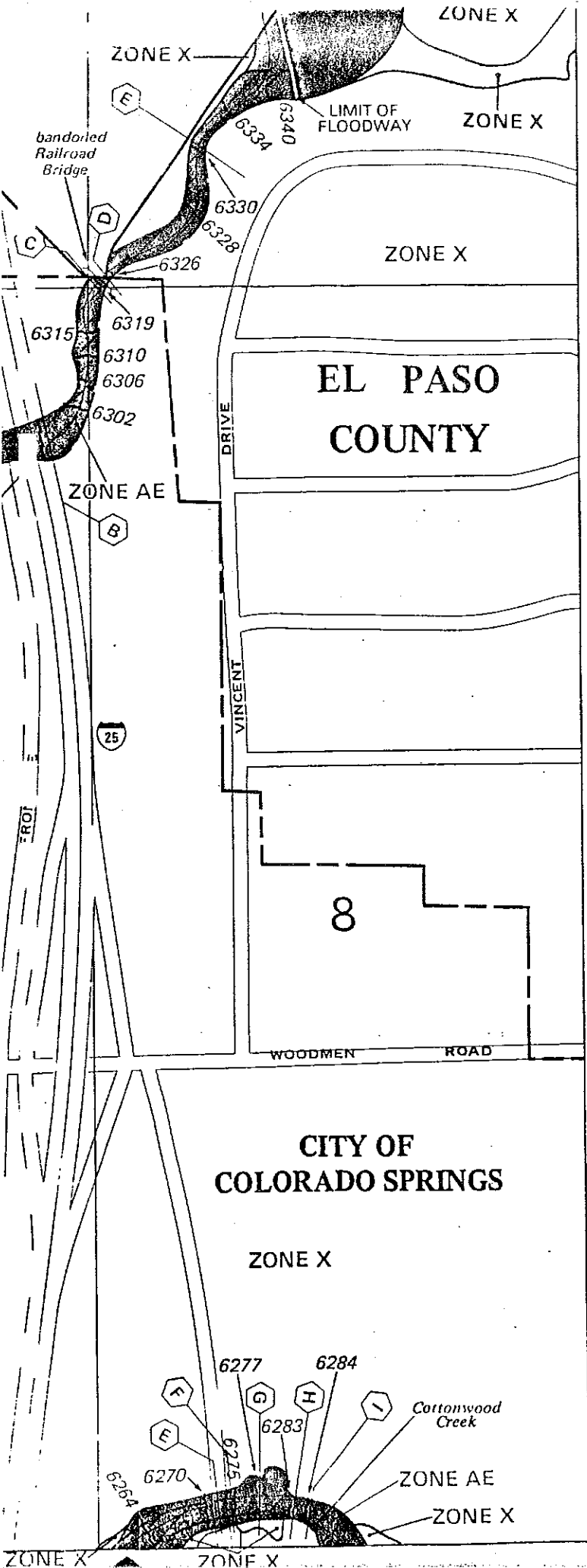




EXHIBIT "C"

F.E.M.A. FLOODPLAIN MAPS

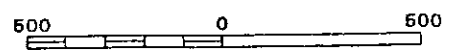


Flood Insurance Rate (FIRM) panel numbers correspond to EL PASO COUNTY COLORADO FIRM maps. For more information, refer to the EL PASO COUNTY FIRM published separately.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.



APPROXIMATE SCALE IN FEET

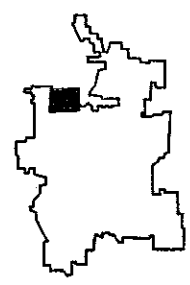


**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM  
FLOOD INSURANCE RATE MAP**

CITY OF  
**COLORADO  
SPRINGS,  
COLORADO**  
EL PASO COUNTY

**PANEL 153 OF 625**  
(SEE MAP INDEX FOR PANELS NOT PRINTED)



PANEL LOCATION

**COMMUNITY-PANEL NUMBER  
080060 0153 C**

**MAP REVISED:  
MARCH 2, 1989**



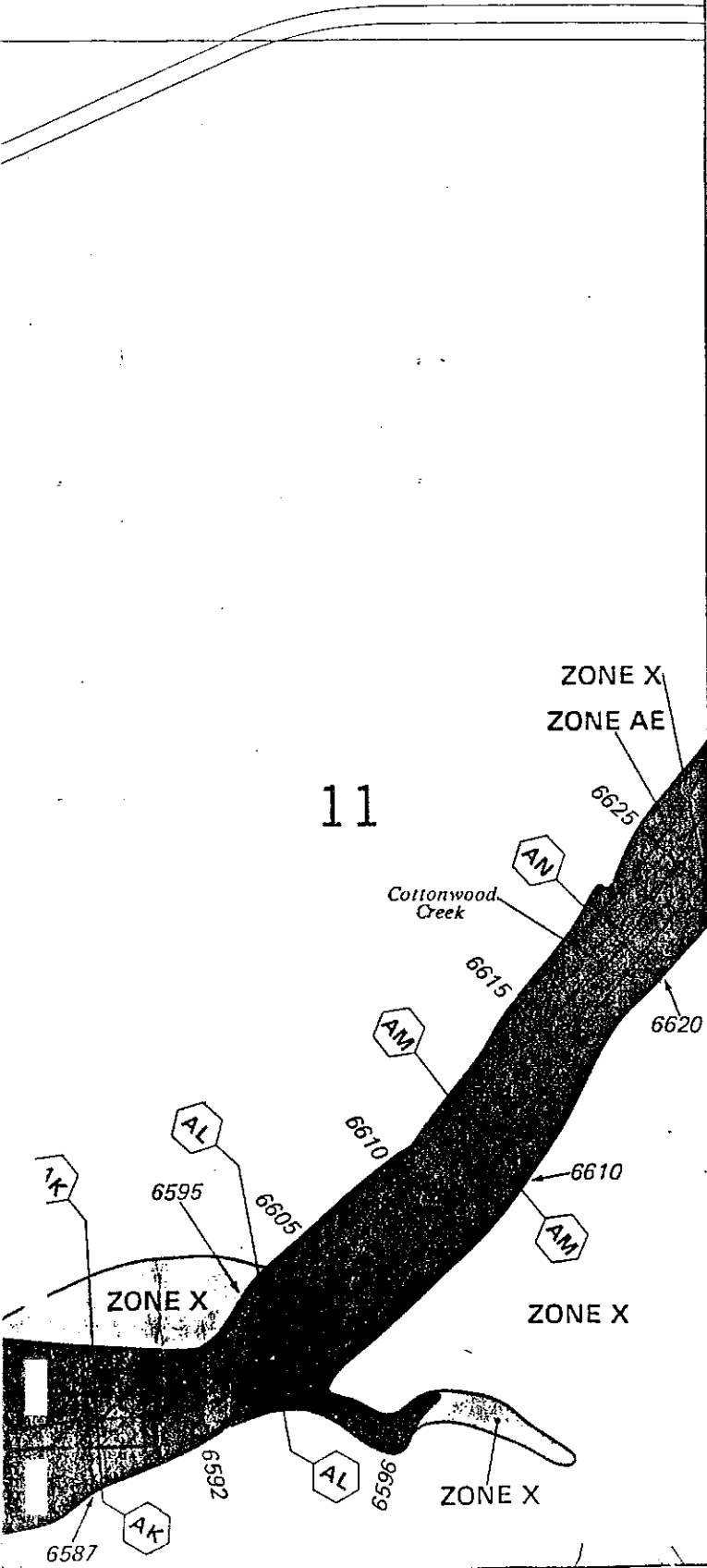
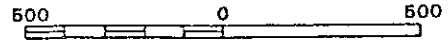
Federal Emergency Management Agency

to the EL PASO COUNTY FIRM published separately

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APPROXIMATE SCALE IN FEET



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM  
FLOOD INSURANCE RATE MAP**

CITY OF  
**COLORADO  
SPRINGS,  
COLORADO**  
EL PASO COUNTY

**PANEL 154 OF 625**  
(SEE MAP INDEX FOR PANELS NOT PRINTED)



PANEL LOCATION

**COMMUNITY-PANEL NUMBER  
080060 0154 C**

**MAP REVISED:  
MARCH 2, 1989**



Federal Emergency Management Agency

S Air Force Academy  
NOT INCLUDED

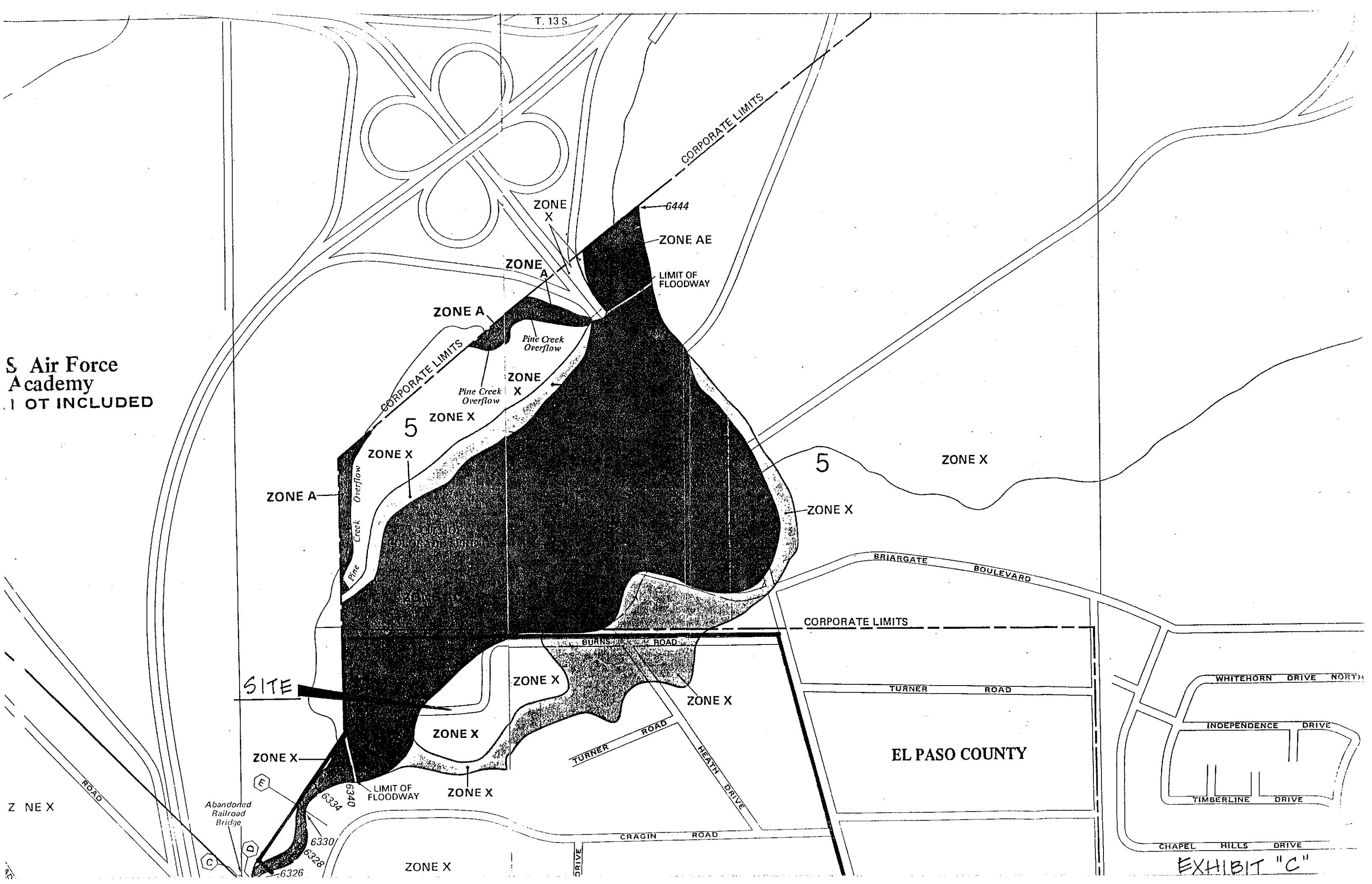


EXHIBIT "C"

FALCON ESTATES REFILE NO. 2 WEST SIDE MASTER PLAN  
PREPARED BY YERGENSEN, OBERING AND WHITTAKER