

MASTER DEVELOPMENT  
DRAINAGE PLAN ADDENDUM  
FOR  
PATRIOT PARK F#5



J·R ENGINEERING

18467-14

**MASTER DEVELOPMENT  
DRAINAGE PLAN ADDENDUM  
FOR  
PATRIOT PARK F#5**

(Addendum for the “Amended Master Development Drainage Plan for Patriot Park”, by Matrix Design Group, September 2007.)

March 31, 2009

Prepared For:

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Prepared By:

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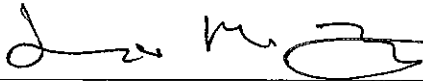
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**MASTER DEVELOPMENT DRAINAGE PLAN  
ADDENDUM FOR PATRIOT PARK**

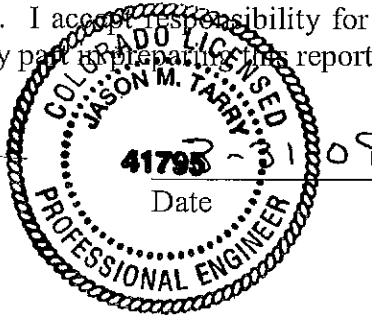
**DRAINAGE REPORT STATEMENT**

**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 caused by any negligent acts, errors, or omissions on my part in preparing this report.



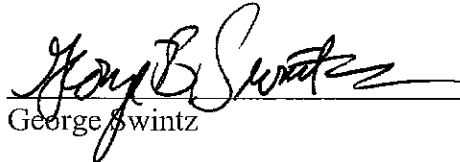
Jason M. Tarry, Colorado P.E. #41795  
For and On Behalf of JR Engineering, LLC



**DEVELOPER'S STATEMENT:**

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: COPT Development & Construction

By:   
George Swintz

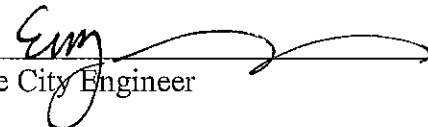
Title: VP Asset Management/Leasing

Address: 102 S. Tejon Street, Suite 720

Colorado Springs, CO 80903

City of Colorado Springs:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

  
For the City Engineer

4/28/09  
Date

w/ Conditions:

The determination of whether or not the proposed bridge will be reimbursable will need to be taken to the City Drainage Board. Any anticipated reimbursable cost over the estimates within the DBPS for creek improvements will also need to be approved by the City Drainage Board.

**MASTER DEVELOPMENT DRAINAGE PLAN ADDENDUM FOR  
PATRIOT PARK**

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**MASTER DEVELOPMENT DRAINAGE PLAN ADDENDUM  
FOR  
PATRIOT PARK**

**PURPOSE**

The purpose of this Addendum to the Master Development Drainage Plan (MDDP) for Patriot Park is to address changes from the “Amended MDDP for Patriot Park”, by Matrix Design Group dated September 2007. Significant changes include the addition of a PUD plan for the property on the west side of Sand Creek, revisions to the PUD plan for the southwest portion of the site, and the addition of the proposed bridge at Space Center Drive and Sand Creek as a reimbursable drainage structure.

**GENERAL DESCRIPTION**

The proposed Patriot Park development consists of approximately 99.68 acres located within the Southwest  $\frac{1}{4}$  of Section 12, Township 14 South, Range 66 West of the 6th Principle Meridian, County of El Paso, State of Colorado. The site lies within an area bound on the east by Powers Blvd., the south by Platte Ave., the west by Sand Creek and Babcock Road, and the north by Galley Road. The vicinity map in the Appendix of this report shows the location of the property near the intersection of Powers Blvd. and Platte Ave.

The proposed Patriot Park site consists primarily of sandy loam and loamy sand. The U.S. Department of Agriculture Soil Conservation Service (S.C.S.) identifies the portion of the site consisting of Sand Creek as Ellicot loamy coarse sand. This soil is described as Hydrologic Group A, which consists of soils with a high permeability. The remainder of the site consists of Hydrologic Group B soils identified as Blendon sandy loam, Bresser sandy loam, Truckton sandy loam, and Truckton loamy sand. Hydrologic Group B soils have high permeability but are less permeable than those of Group A. Based on recommendations from the El Paso County Drainage Criteria Manual (D.C.M.), Hydrologic Group B was used when determining runoff coefficients for the entire site. A soils map showing the location of the soil types within the site is included in the Appendix of this report.

## **HYDROLOGIC CALCULATIONS - RATIONAL METHOD**

The Rational Method was used to determine runoff values for basins with areas less than 100 acres in accordance with recommendations in the D.C.M. Runoff coefficients of  $C = 0.25$  and  $C = 0.35$  were used to represent native grassland conditions for the 5 and 100-year events, respectively. The proposed commercial subdivision land use was evaluated using  $C = 0.70$  and  $C = 0.80$  for the 5 and 100-year events, respectively. Runoff coefficients were determined based on the existing soil conditions for the site and recommendations in the D.C.M. and are consistent with those used in the previous MDDP. Hydrologic calculations for the site are included in the Appendix of this report.

## **EXISTING DRAINAGE CONDITIONS**

The existing condition drainage calculations for the portion of the site consisting of Space Center Drive and the land east of Space Center Drive have been accurately represented in the "Amended MDDP for Patriot Park" by Matrix, September 2007, and have not been recalculated for this Addendum. In addition to the existing basins presented in the previous MDDP, Basins E-1, E-2, E-3, E-4, E-5 and E-6 have been included in this Addendum to address the addition of land west of Sand Creek to the proposed site and the revised topography west of Space Center Drive.

Basin E-1 consists of 24.40 acres of mixed-use land west of Sand Creek. 17.9 acres of this basin are currently developed as commercial property and 6.5 acres is land that remains undeveloped or has been cleared of structures. Babcock Road is included in this basin along with some areas of native grass and scattered trees. The northern boundary of the Basin E-1 is a ridgeline located south of Geiger Blvd. FIMS data was used to delineate the basin and determine the flow paths. The basin generally slopes from north to south and west to east with flows traveling along the existing roadside ditches of Babcock Road and East Platte Ave. Runoff travels through existing culverts along the roadside ditches and under Babcock Rd. Flows exit the basin and enter Sand Creek via an existing channel in the southeast corner of the basin. Flow rates of  $Q_5 = 43.1$  cfs and  $Q_{100} = 83.4$  cfs have been calculated for Basin E-1. The Sand Creek DBPS identifies the outfall for this basin as Sand Creek just upstream of Platte Ave. The basin delineation, existing

land use for this basin, and the outfall channel for the basin are in conformance with the Sand Creek DBPS.

Basin E-2 consists of 6.75 acres of undeveloped land adjacent to the east side of Sand Creek in the central portion of Patriot Park. Runoff from this basin travels southwest and enters directly into Sand Creek. Flow rates of  $Q_5 = 4.3$  cfs and  $Q_{100} = 10.7$  cfs have been calculated for Basin E-2.

Basin E-3 consists of 4.80 acres of undeveloped land adjacent to the east side of Sand Creek in the central portion of Patriot Park. Runoff from this basin travels southwest through Basin E-2 and into Sand Creek. Flow rates of  $Q_5 = 3.2$  cfs and  $Q_{100} = 7.9$  cfs have been calculated for Basin E-3.

Basin E-4 consists of 7.61 acres of undeveloped land in the central portion of Patriot Park adjacent to the west side of Space Center Drive. This basin has been overlot graded and contains little vegetation. Runoff from Basin E-4 sheet flows south and is routed through Basins E-5 and E-6. Flow rates of  $Q_5 = 5.0$  cfs and  $Q_{100} = 12.4$  cfs have been calculated for Basin E-4.

Basin E-5 consists of 8.60 acres of undeveloped land in the central portion of Patriot Park adjacent to the west side of Space Center Drive. Land in this basin has been overlot graded and has little vegetation. Runoff from Basin E-5 sheet flows south and is routed through Basin E-6 at flow rates of  $Q_5 = 5.6$  cfs and  $Q_{100} = 13.9$  cfs.

Basin E-6 consists of 6.74 acres of undeveloped land in the central portion of Patriot Park adjacent to the west side of Space Center Drive. This basin has been overlot graded and is sparsely vegetated. Runoff from Basin E-5 sheet flows south and is routed through Basin E-6 at flow rates of  $Q_5 = 4.2$  cfs and  $Q_{100} = 10.5$  cfs.

## **PROPOSED DRAINAGE CHARACTERISTICS**

The proposed drainage characteristics for a large portion of the Patriot Park site remain consistent with those presented in the previous MDDP. This Addendum is intended to address

the basins that have experienced a change in area, land use, or other characteristic. The proposed drainage characteristics and flow rates for Basins OS-1 thru OS-3, PP-1, PP-2, PP-4, PP-5, PP-8 thru PP-10, PP-13 thru PP-16, and PP-19 remain unchanged from those presented in the previous MDDP. Corresponding design points for these basins are also unchanged from the previous MDDP. Basins A thru M presented in this Addendum are the only basins that have been affected by changes in the site layout.

Basin A consists of 15.35 acres of offsite land west of the proposed site. This basin consists of right-of-way for Platte Ave. and the proposed Space Center Drive along with a storage unit complex. Basin delineation is based on FIMS data for the offsite area. Runoff from Basin A will be routed south where it will be collected in a proposed storm sewer system. Runoff from this basin will not impact the adjacent Patriot Park development. The proposed storm sewer system shall consist of two curb inlets located in Space Center Drive and a flared end section to collect runoff from west of Space Center Drive. Preliminary sizing of this storm sewer system assuming a minimum pipe slope of 1% determined a 36" RCP would be sufficient to carry flows to Sand Creek. The Sand Creek DBPS outlines several culvert improvements in this basin. The proposed storm sewer improvements in this MDDP addendum are in conformance with the recommendations of the DBPS and provide additional collection systems to route flows from the proposed Space Center Drive to Sand Creek. Design of the curb inlets and pipe for this storm system shall occur with the final drainage report associated with the land in Basin C. Flow rates of  $Q_5 = 26.1$  cfs and  $Q_{100} = 53.1$  cfs will be collected by the proposed storm sewer system and routed to Sand Creek.

Basin B consists of 6.02 acres of existing and proposed commercial development west of Sand Creek along with Babcock Road. This basin generates flow rates of  $Q_5 = 16.3$  cfs and  $Q_{100} = 33.2$  cfs. Flows in Babcock Road shall be collected by two curb inlets near the proposed roundabout and routed to onsite water quality treatment. Sizing of this storm sewer system shall occur with the final drainage report for this area. Runoff from this basin will not be routed to the existing water quality pond and will therefore receive onsite water quality treatment. Design of water quality facilities shall be determined with a final drainage report for the area. The final



drainage report shall also include the streamside overlay zone to be identified under the development plan.

Basin C includes 2.61 acres of proposed commercial development west of Sand Creek. Flow rates of  $Q_5 = 7.3$  cfs and  $Q_{100} = 14.9$  cfs are generated from this basin. Runoff from this basin will be required to receive onsite water quality treatment prior to discharge into Sand Creek. The final drainage report for this area shall address water quality treatment for the site as well as the streamside overlay zone to be identified under the development plan.

Basin D consists of 1.02 acres of proposed bridge and roadway surface across Sand Creek and to the existing Space Center Drive. This basin consists primarily of impervious roadway surface. Onsite water quality treatment for Basins C shall be designed to include additional water quality volume to account for the western half of Basin D. The eastern half of Basin D shall receive water quality treatment in a proposed water quality pond north of Space Center Drive. Runoff from Basin D consists of  $Q_5 = 4.7$  cfs and  $Q_{100} = 8.8$  cfs to be divided in half for each side of Sand Creek.

Basin E has an area of 1.43 acres and consists of the existing water quality pond. Flow rates of  $Q_5 = 5.1$  cfs and  $Q_{100} = 10.4$  cfs are routed directly to the water quality pond from this basin.

Basin F consists of 12.45 acres of existing commercial development along the southern boundary of the site. Flow rates of  $Q_5 = 33.0$  cfs and  $Q_{100} = 67.1$  cfs are routed through porous landscape detention and into Sand Creek. Space Center Drive was previously planned to pass through the western edge of this basin. The area that was previously proposed to be roadway is now planned to be parking area for the proposed commercial development. The existing intersection of Space Center Drive and East Platte Ave. shall be removed and replaced with a roadside ditch. Runoff from Platte Ave. and Space Center Dr. that would have previously been intercepted by curb inlets in Space Center Drive shall be routed to an existing flared end section and storm sewer. The flows received in this storm sewer have not changed with the removal of Space Center Dr. access to Platte Ave. The existing inlets in Space Center Drive shall either be incorporated into the new parking area or removed from the system if the new parking area cannot accommodate

the existing layout. The flow rates calculated for this basin are within 10% above the flow rates in the previous MDDP, but do not have a negative impact on the existing porous landscape detention facilities that provide water quality treatment for the basin. Flows from this basin enter Sand Creek after receiving water quality treatment from the porous landscape detention facilities.

Basin G includes 4.02 acres of proposed commercial development adjacent to the east side of Sand Creek. This basin generates flow rates of  $Q_5 = 12.2$  cfs and  $Q_{100} = 24.9$  cfs. Onsite water quality treatment will be required for runoff from this site before entering Sand Creek. Porous landscape detention and extended sedimentation basins along the south and west sides of the basins are potential options for onsite treatment. Onsite water quality treatment will be designed with the final drainage report for this area along with the streamside overlay zone to be identified under the development plan.

Basin H consists of 2.38 acres of proposed commercial development. This basin is located along the east side of Sand Creek and generates flow rates of  $Q_5 = 7.2$  cfs and  $Q_{100} = 14.7$  cfs. Onsite water quality treatment will be required for this basin prior to release into Sand Creek and will be designed with the final drainage report for the area along with the streamside overlay zone to be identified under the development plan. Porous landscape detention and an extended detention along the west side of the basin are options for onsite water quality treatment.

Basin I includes 4.63 acres of proposed commercial development adjacent to the east side of Sand Creek. Flow rates from this basin are  $Q_5 = 13.2$  cfs and  $Q_{100} = 26.9$  cfs. Onsite water quality treatment will be required for this basin prior to release into Sand Creek. The proposed layout of parking in this basin provides a potential location for an extended detention basin adjacent to the southwest corner of the basin. This location should be evaluated with the final drainage report for the area to determine its suitability. The final drainage report for this area shall include the streamside overlay zone to be identified under the development plan.

Basin J is comprised of 7.29 acres of proposed commercial development adjacent to the west side of Space Center Drive. This basin generates proposed flow rates of  $Q_5 = 21.3$  cfs and  $Q_{100} = 43.3$  cfs. Runoff from this basin shall be treated onsite with practices to promote infiltration or

routed to water quality facilities along the east side of Sand Creek. The design of the storm sewer system and water quality treatment facilities to accommodate runoff from Basin J shall be addressed with the final drainage report for this area.

Basin K consists of 6.34 acres of proposed commercial development adjacent to the west side of Space Center Drive. Flow rates of  $Q_5 = 17.5$  cfs and  $Q_{100} = 35.7$  cfs are generated by this basin. Water quality treatment for runoff from this basin shall be provided onsite or at a proposed water quality pond adjacent to Sand Creek. The design of water quality treatment facilities and storm sewer conveyance shall be determined with the final drainage report for this area.

Basin L includes 4.44 acres of proposed commercial development adjacent to the west side of Space Center Drive. Flow rates produced by this basin are  $Q_5 = 14.1$  cfs and  $Q_{100} = 28.7$  cfs. Runoff from this basin shall receive water quality treatment onsite or at a water quality pond along the east side of Sand Creek. The location of water quality treatment and design of the treatment and conveyance system shall be provided with the final drainage report for this area.

Basin M contains 4.48 acres of proposed commercial development adjacent to the north side of Space Center Drive. Flow rates of  $Q_5 = 14.0$  cfs and  $Q_{100} = 28.4$  cfs shall receive water quality treatment at a proposed water quality pond adjacent to the west edge of the basin. Runoff from this basin may also receive water quality treatment via onsite facilities such as porous landscape detention and other facilities that promote infiltration. The final design of water quality treatment and conveyance facilities shall be addressed with the final drainage report for this area.

The current PUD plan includes several changes from the plan used for the previous MDDP. The previous MDDP called for runoff from Basins G through M west of Space Center Drive to sheet flow southwest to be collected along an earth berm adjacent to the east side of Sand Creek. These flows were then routed into the existing water quality pond. This MDDP Addendum calls for runoff west of Space Center Drive to receive onsite treatment at a series of proposed water quality ponds along the west side of the basins. These water quality ponds shall be designed to discharge runoff directly into Sand Creek after treatment. A pedestrian trail and maintenance access shall also be provided along the east side of Sand Creek per this MDDP Addendum.

The total runoff from Basins G through M west of Space Center Drive is  $Q_5 = 99.5$  cfs and  $Q_{100} = 202.6$  cfs. These flow rates are approximately 10% above the flow rates of  $Q_5 = 90.2$  cfs and  $Q_{100} = 183.6$  cfs determined for the basins west of Space Center Drive in the previously approved MDDP. This difference is acceptable due to the concept level presented with the PUD plan. Runoff values for these basins will be determined in the final drainage report for each area based on the ultimate site layout in the development plan. The land use and outfall location for these basins is in conformance with the proposed basin characteristics presented in the Sand Creek DBPS. The DBPS identified the land use as industrial with an impervious area of 85-95%. The land use for the Patriot Park commercial development is proposed to have 75% imperviousness and will outfall to Sand Creek in conformance with the DBPS.

#### **PROPOSED CHANNEL IMPROVEMENTS**

Portions of the proposed channel improvements for Sand Creek were installed with the initial development of the site. These improvements include regrading of the channel to add two grouted boulder drop structures and riprap bank protection for approximately 700 linear feet of channel directly upstream of Platte Ave. The previous MDDP outlined similar proposed channel improvements continuing up Sand Creek to Galley Road. The proposed channel improvements for this reach shall be in conformance with the “Final Drainage Report for Sand Creek Channel Improvements at Platte Avenue, Patriot Park Concept Plan Area & Patriot Park Subdivision Filing No. 1” by Matrix Design Group. These proposed channel improvements include a 120-foot channel bottom width along the reach, four additional drop structures spaced approximately 440 feet apart between Platte Ave. and Galley Road, and riprap bank armoring. The improvements outlined in the Matrix report conform to the Sand Creek DBPS for this reach. The DBPS calls for a total of six check structures along Sand Creek between Platte Ave. and Galley Road. A riprap lined channel with a flow rate of  $Q_{100} = 5,000$  cfs is detailed in the Matrix report and is consistent with the proposed characteristics outlined in the DBPS.

The limits of the streamside overlay are shown on the proposed drainage map. The limits of proposed development shown in the PUD plan generally conform to the boundary of the streamside overlay with most areas falling outside the overlay boundary. The areas where the

PUD plan stops short of the overlay boundary are intended to compensate for the areas of the PUD plan that overlap with the streamside overlay. A proposed pedestrian trail/maintenance access road is to be located within the streamside overlay along the east side of the channel. The proposed trail shall be designed to accommodate maintenance vehicles and provide maintenance access to the channel at each of the proposed drop structures.

## **WATER QUALITY**

The existing water quality pond located at the south end of the site shall accommodate water quality for the portion of the site east of Space Center Drive that does not have onsite water quality treatment in the form of porous landscape detention. The required water quality treatment volume for these basins is calculated to be 0.698 ac-ft. The capacity of the existing water quality pond is 1.095 ac-ft according to the Amended MDDP by Matrix. The existing water quality capture volume was calculated to provide water quality treatment for 36.55 acres of development in the previously approved MDDP by Matrix and the proposed layout for the site includes 23.39 acres of development east of Space Center Dr. that does not have onsite water quality treatment. Therefore, the existing water quality pond has sufficient volume to accommodate water quality treatment for the portion of the site east of Space Center Dr. without modification. Water quality capture volume calculations for all the basins are included in the Appendix of this report.

Onsite water quality treatment shall be required for the additional drainage basins west of Sand Creek. Basin B shall provide 0.180 ac-ft of water quality capture volume. Basin C shall also include water quality treatment for the western half of Basin D and provide a total of 0.930 ac-ft of water quality capture volume. The final drainage report for each area shall address the design of water quality treatment structures.

The runoff from the eastern half of Basin D shall be treated in a proposed water quality pond north of Space Center Drive. Basins G, H, I, J, K, L, M and ½ Basin D shall require onsite water quality treatment. The total required water quality volume for Basins G through M and ½ Basin D is 1.021 ac-ft. Onsite water quality treatment may consist of porous landscape detention, extended detention basins, water quality ponds, or other features that promote infiltration and

deposition of sediments prior to discharge of flows into Sand Creek. Final water quality treatment locations and storm system layout shall be determined with the final drainage report for each area.

**FLOODPLAIN STATEMENT**

Portions of this site are located within the floodplain Zone A as determined by the Flood Insurance Rate Map (F.I.R.M.) Panels #08041C0751 F and #08041C0753 F dated March 17, 1997. Future improvements to the channel shall be permitted through F.E.M.A. and the Regional Floodplain Administrator. A portion of the F.E.M.A. floodplain map including the proposed site is included in the Appendix.

**DRAINAGE, BRIDGE, AND POND FEES**

Drainage, bridge, and pond fees for the site will be assessed using the City of Colorado Springs published fees for 2009. The Patriot Park site consists of 99.68 acres and lies entirely within the Sand Creek drainage basin. Currently, four filings have been platted for the site. Patriot Park Filing 1 includes 4.962 acres, Patriot Park Filing 2 includes 9.21 acres (4.94 acres for replat of Filing 1 and 4.27 acres of new public right-of-way), Patriot Park Filing 3 includes 5.728 acres, and Patriot Park Filing 4 includes 5.60 acres. Patriot Park includes 73.86 acres of unplatted land. The following is a breakdown of the total fees to be assessed for this unplatted acreage.

**Fee Summary**

Drainage Fees	\$9,493/ac	73.86 ac	\$701,152.98
Bridge Fees	\$596/ac	73.86 ac	\$44,020.56
<u>Pond Fees</u>	<u>\$3,951/ac</u>	<u>73.86 ac</u>	<u>\$291,820.86</u>
<b>Total</b>			<b>\$1,036,994.40</b>

The proposed channel improvements for Sand Creek adjacent to the Patriot Park development are estimated to cost \$1,021,200.00. These improvements consist of channel grading, riprap protection, grouted boulder drop structures, and establishment of vegetation for both sides of the channel for approximately 2,200 linear feet. The estimated cost for the improvements was based

on the cost of existing improvements for approximately 700 linear feet of Sand Creek upstream of Platte Ave.

**Channel Improvements Cost Estimate (Public Reimbursable):**

<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total</u>
Earthwork	CY	28,000	\$4.00	\$112,000.00
Riprap bank protection	CY	9,400	\$50	\$470,000.00
Grouted Boulder Drop Structures (4)	CY	3,750	\$80	\$300,000.00
Native seeding	AC	4	\$1500	<u>\$6,000.00</u>
			<i>Sub-Total</i>	\$888,000.00
			<i>10% Engineering and 5% Contingencies</i>	<u>\$133,200.00</u>
			<b>Grand Total</b>	<b>\$1,021,200.00</b>

A preliminary cost estimate has been developed for the bridge on Space Center Drive over Sand Creek and is provided in the following table.

**Bridge Cost Estimate:**

<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total</u>
Bridge Cost	SF	8,500	\$100	\$850,000.00
			<i>Sub-Total</i>	\$850,000.00
			<i>10% Engineering and 5% Contingencies</i>	<u>\$127,500.00</u>
			<b>Grand Total</b>	<b>\$977,500.00</b>

The proposed bridge on Space Center Drive across Sand Creek is estimated to cost \$977,500.00. Therefore, the total cost of drainage improvements is estimated to be \$1,998,700. Included in this amount is the portion of the channel improvements that will be the responsibility of the future developer for the land adjacent to the northwest side of Sand Creek. Approximately 1600 linear feet of channel is shared with the adjacent development along with two drop structures (\$361,000.00). It is anticipated that Patriot Park will be developed prior to the development of the west side of the channel. The developer of Patriot Park (COPT) shall be responsible for the installation of bank armoring along the east side of Sand Creek adjacent to the Patriot Park

development. COPT will also be responsible for constructing two of the four remaining sloping boulder drop structures as described in the previously approved Amended MDDP by Matrix, September 2007. A hydraulic analysis shall accompany the design of these proposed channel improvements to ensure that unimproved portions of the reach are not adversely affected by the improvements.

It is estimated that \$961,705.60 in drainage credits will remain at the completion of Patriot Park and associated drainage improvements. The final determination of credits available to the developer shall be determined by the Drainage Board upon completion of all Final Drainage reports and identification of construction costs for drainage facilities.

#### **SUMMARY**

The Patriot Park site has been expanded to include land on the west side of Sand Creek. The updated PUD Plan for Patriot Park reflects this additional land as well as changes in the proposed layout for portions of the Patriot Park site. This MDDP Addendum addresses that addition of land to the site as well as any changes to the drainage characteristics of the proposed site. Only areas that changed from the previous MDDP are addressed in this Addendum.

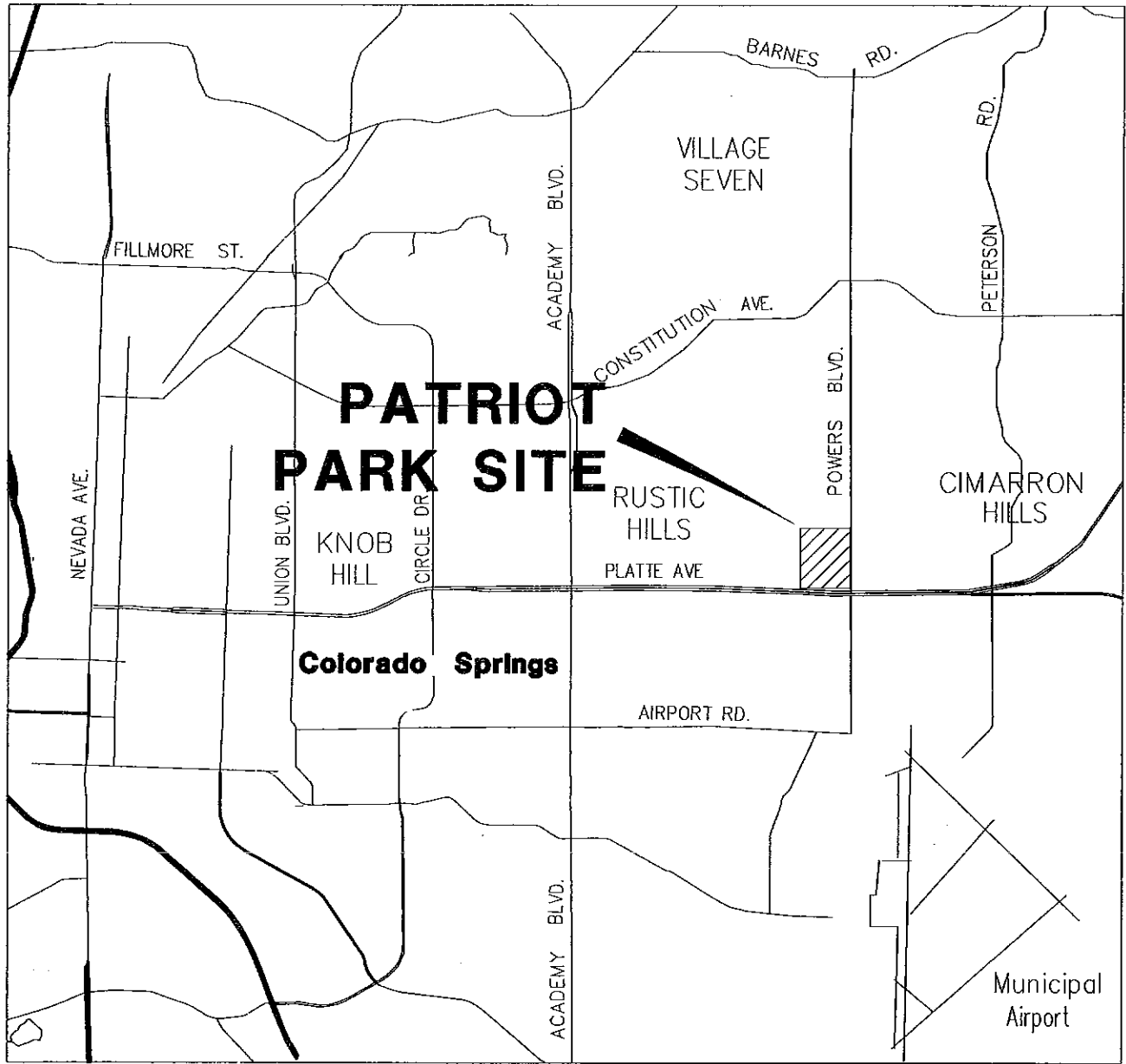


## REFERENCES

1. "Amended MDDP for Patriot Park", Matrix Design Group, September 2007.
2. "City of Colorado Springs/County of El Paso Drainage Criteria Manual" dated November 1991.
3. "Drainage Letter Patriot Park Filing 2", Nolte Associates, September 2006.
4. FEMA Flood Insurance Rate Map, El Paso County and Incorporated Areas, Panels 751 and 753 of 1300 dated March 17, 1997.
5. "Final Drainage Report for Sand Creek Channel Improvements at Platte Avenue, Patriot Park Concept Plan Area & Patriot Park Subdivision Filing No. 1", Matrix Design Group, August 2005.
6. "Final Drainage Report Patriot Park Filing No. 3 for Patriot Park Building #6", Matrix Design Group, February 2007.
7. "Final Drainage Report Patriot Park Filing No. 4 for Patriot Park Building #7", CTR Engineering, December 2007.
8. "Sand Creek Drainage Basin Planning Study", Kiowa Engineering Corporation, revised March 1996.
9. "Soils Survey of El Paso County Area", Colorado Soil Conservation Service dated June 1981.

**APPENDIX**

**VICINITY MAP**



\*Base map from "Amended MDDP for Patriot Park" by Matrix Design Group, September 2007.

VICINITY MAP  
 PATRIOT PARK  
 JOB NO. 28842.31  
 SEPTEMBER 2008  
 SHEET 1 OF 1



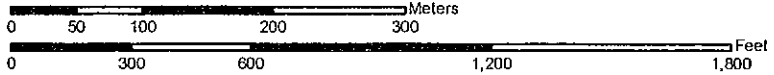
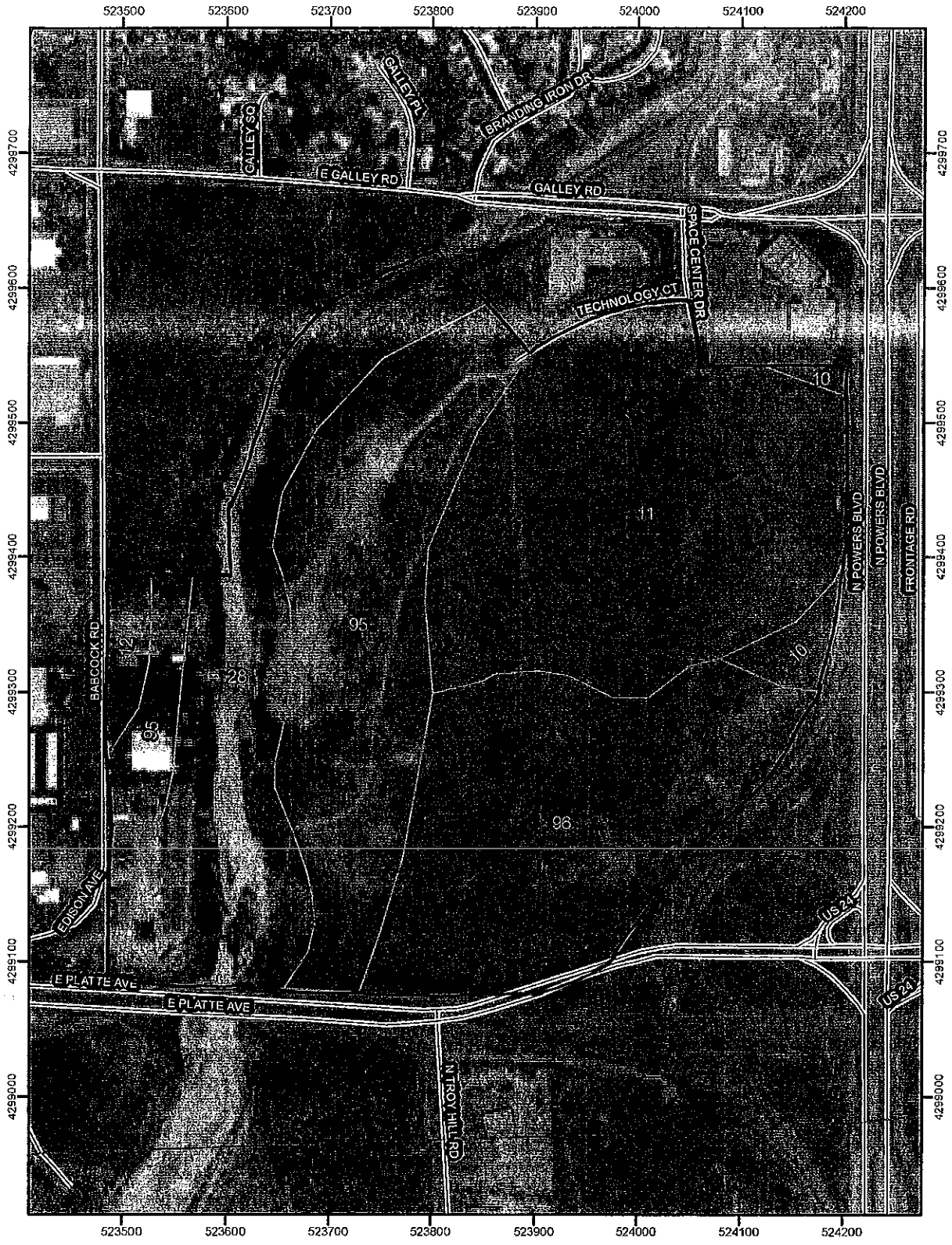
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 719-593-2593 • Fax: 719-528-6613 • www.jrengineering.com





































**SCS SOILS MAP**

Soil Map—El Paso County Area, Colorado  
(Patriot Park Soils Map)



Soil Map—El Paso County Area, Colorado  
(Patriot Park Soils Map)

**MAP LEGEND**

<b>Area of Interest (AOI)</b>		Very Stony Spot	
Area of Interest (AOI)		Wet Spot	
<b>Soils</b>		Other	
		<b>Special Line Features</b>	
<b>Special Point Features</b>			Gully
	Blowout		Short Steep Slope
	Borrow Pit		Other
	Clay Spot	<b>Political Features</b>	
	Closed Depression	<b>Municipalities</b>	
	Gravel Pit		Cities
	Gravelly Spot		Urban Areas
	Landfill	<b>Transportation</b>	
	Lava Flow		Rails
	Marsh	<b>Roads</b>	
	Mine or Quarry		Interstate Highways
	Miscellaneous Water		US Routes
	Perennial Water		State Highways
	Rock Outcrop		Local Roads
	Saline Spot		Other Roads
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		
	Spoil Area		
	Stony Spot		

**MAP INFORMATION**

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 13N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 6, Aug 21, 2008

Date(s) aerial images were photographed: 1999

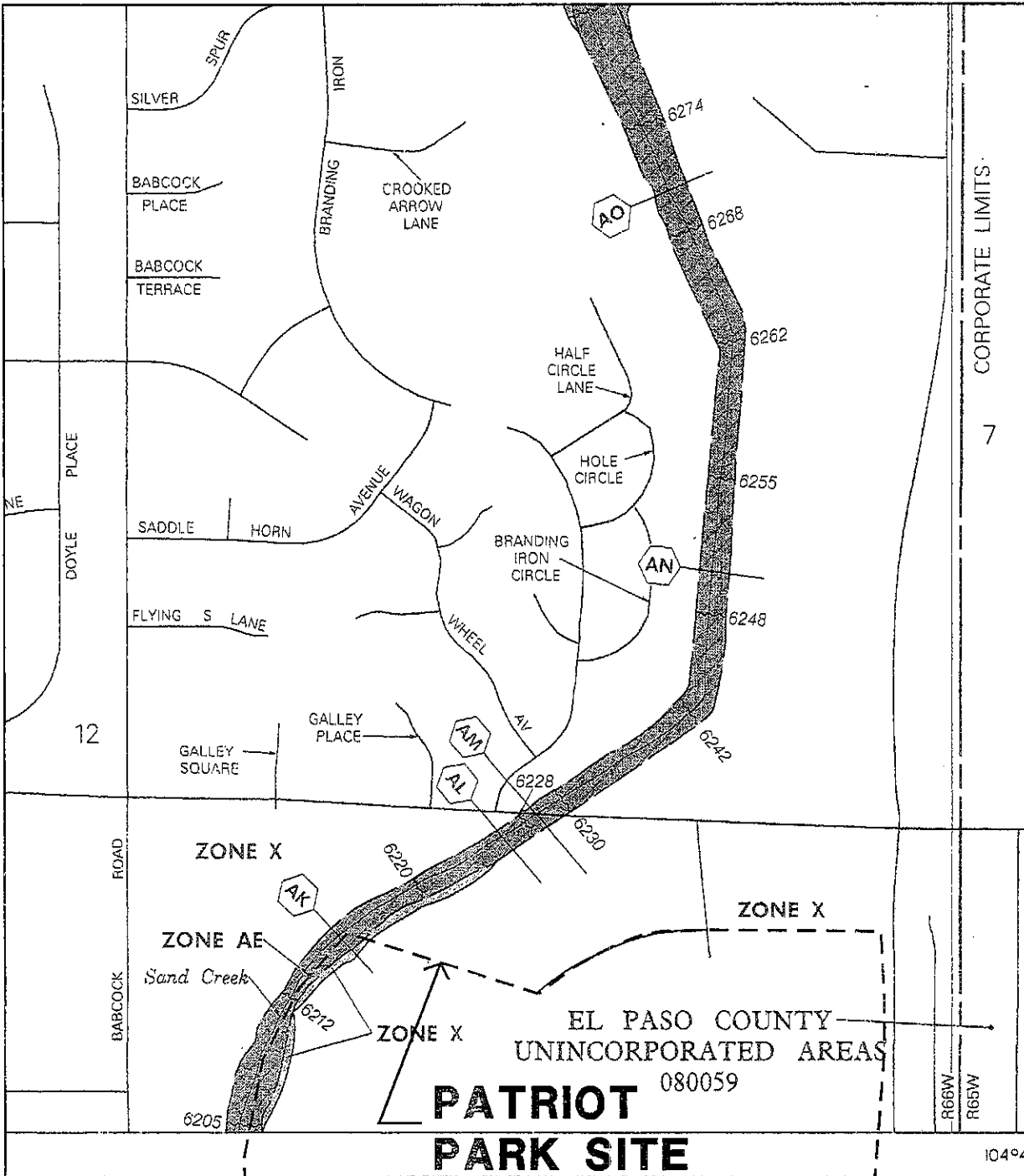
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.


## Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	1.7	1.7%
11	Bresser sandy loam, 0 to 3 percent slopes	29.2	29.8%
12	Bresser sandy loam, 3 to 5 percent slopes	1.5	1.5%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	18.5	18.9%
95	Truckton loamy sand, 1 to 9 percent slopes	24.5	24.9%
96	Truckton sandy loam, 0 to 3 percent slopes	22.6	23.1%
Totals for Area of Interest (AOI)		98.1	100.0%

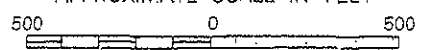


**FEMA FIRM MAP**





APPROXIMATE SCALE IN FEET



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM**  
**FLOOD INSURANCE RATE MAP**


EL PASO COUNTY,  
COLORADO AND  
INCORPORATED AREAS

**PANEL 751 OF 1300**  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS CITY OF	080090	0751	F
EL PASO COUNTY, UNINCORPORATED AREAS	080050	0751	F

**MAP NUMBER**  
08041CC751 F

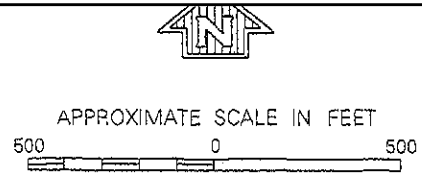
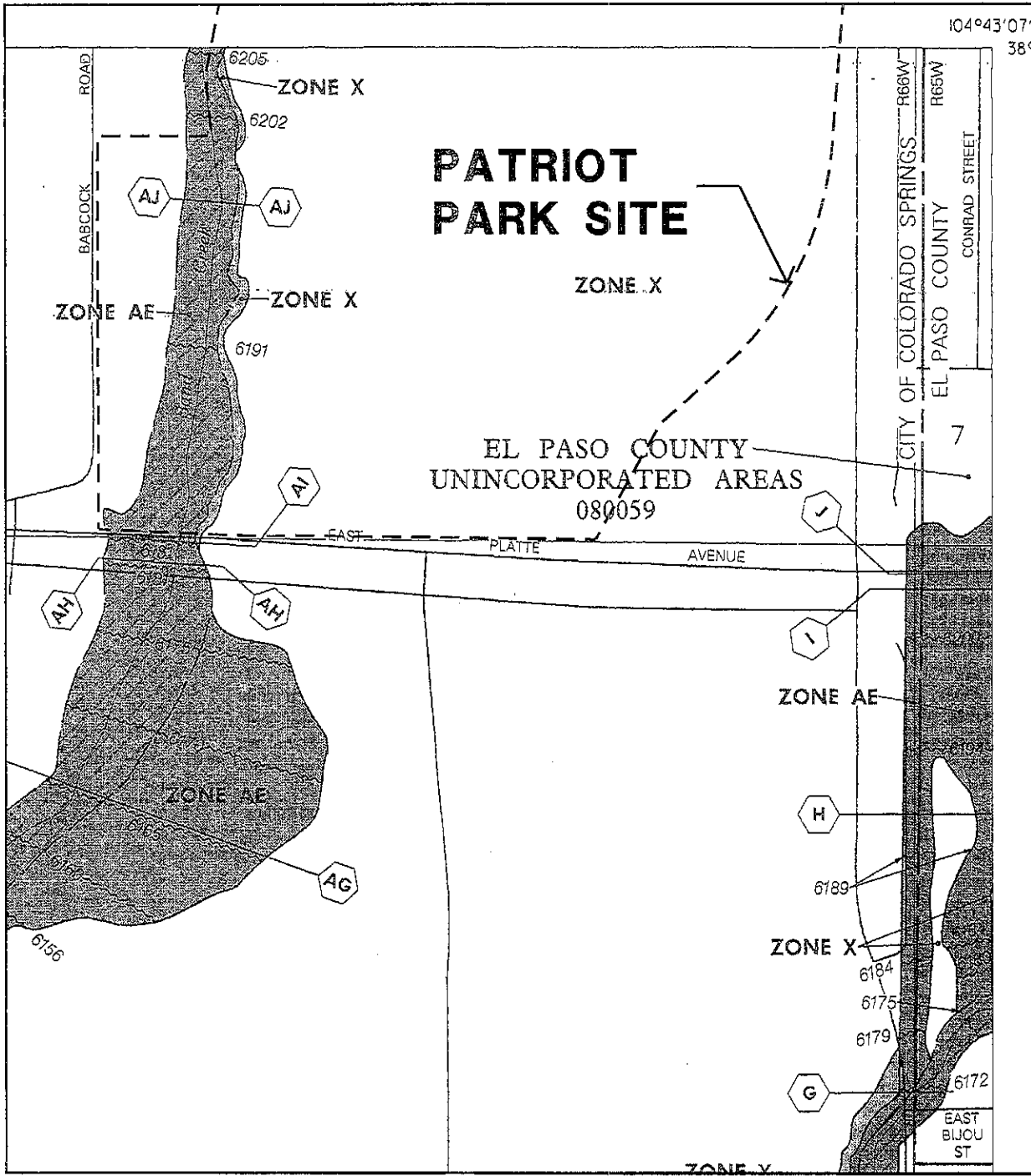
**EFFECTIVE DATE:**  
MARCH 17, 1997



Federal Emergency Management Agency

104°43

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)



**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM**  
**FLOOD INSURANCE RATE MAP**

EL PASO COUNTY,  
COLORADO AND  
INCORPORATED AREAS

PANEL 753 OF 1300  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080000	0753	F
EL PASO COUNTY, UNINCORPORATED AREAS	030059	0753	F

**MAP NUMBER**  
08041G0753 F

**EFFECTIVE DATE:**  
MARCH 17, 1997

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

## HYDROLOGIC CALCULATIONS

***PATRIOT PARK MDDP ADDENDUM***  
***EXISTING CONDITIONS***  
***(Area Runoff Coefficient Summary)***

BASIN	TOTAL AREA (Acres)	STREETS / DEVELOPED			OVERLAND / UNDEVELOPED			WEIGHTED	
		AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>
<i>E-1</i>	24.40	17.90	0.90	0.95	6.50	0.25	0.35	<i>0.73</i>	<i>0.79</i>
<i>E-2</i>	6.75	0.00	0.90	0.95	6.75	0.25	0.35	<i>0.25</i>	<i>0.35</i>
<i>E-3</i>	4.80	0.00	0.90	0.95	4.80	0.25	0.35	<i>0.25</i>	<i>0.35</i>
<i>E-4</i>	7.61	0.00	0.90	0.95	7.61	0.25	0.35	<i>0.25</i>	<i>0.35</i>
<i>E-5</i>	8.60	0.00	0.90	0.95	8.60	0.25	0.35	<i>0.25</i>	<i>0.35</i>
<i>E-6</i>	6.74	0.00	0.90	0.95	6.74	0.25	0.35	<i>0.25</i>	<i>0.35</i>

Calculated by: CMW

Date: 11/24/2008

Checked by: JCH

**PATRIOT PARK MDDP ADDENDUM**  
**EXISTING CONDITIONS**  
**(Area Drainage Summary)**

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	Location	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		From DCM Table 5-1															
E-1	24.40	0.73	0.79	0.25	300	5	23.3	1180 500	1.2% 2.8%	3.8 5.9	5.1 1.4	29.8		2.4	4.3	43.1	83.4
E-2	6.75	0.25	0.35	0.25	500	13	25.9	500	2.0%	4.9	1.7	27.6		2.5	4.5	4.3	10.7
E-3	4.80	0.25	0.35	0.25	500	15	24.7	285	2.0%	4.9	1.0	25.7		2.6	4.7	3.2	7.9
E-4	7.61	0.25	0.35	0.25	500	14	25.3	285	2.5%	5.5	0.9	26.2		2.6	4.7	5.0	12.4
E-5	8.60	0.25	0.35	0.25	500	14	25.3	350	2.0%	4.9	1.2	26.5		2.6	4.6	5.6	13.9
E-6	6.74	0.25	0.35	0.25	470	9	27.8	175	3.0%	6.1	0.5	28.3		2.5	4.5	4.2	10.5

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: CMW

Date: 11/24/2008

Checked by: JCH

**PATRIOT PARK MDDP ADDENDUM**  
**PROPOSED CONDITIONS**  
*(Area Runoff Coefficient Summary)*

BASIN	TOTAL AREA (Acres)	STREETS / DEVELOPED			OVERLAND / UNDEVELOPED			WEIGHTED	
		AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>
<i>A</i>	15.35	15.35	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>B</i>	6.02	6.02	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>C</i>	2.61	2.61	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>D</i>	1.02	1.02	0.90	0.95	0.00	0.25	0.35	<i>0.90</i>	<i>0.95</i>
<i>E</i>	1.43	1.43	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>F</i>	12.45	12.45	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>G</i>	4.02	4.02	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>H</i>	2.38	2.38	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>I</i>	4.63	4.63	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>J</i>	7.29	7.29	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>K</i>	6.34	6.34	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>L</i>	4.44	4.44	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>
<i>M</i>	4.48	4.48	0.70	0.80	0.00	0.25	0.35	<i>0.70</i>	<i>0.80</i>

Calculated by: CMW

Date: 11/24/2008

Checked by: JCH

**PATRIOT PARK MDDP ADDENDUM**  
**PROPOSED CONDITIONS**  
**(Area Drainage Summary)**

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C <sub>s</sub>	C <sub>100</sub>	C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	Location	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		From DCM Table S-1															
A	15.35	0.70	0.80	0.25	300	5	23.3	1180 500	1.2% 2.8%	3.8 5.9	5.1 1.4	29.8		2.4	4.3	26.1	53.1
B	6.02	0.70	0.80	0.70	130	1	9.3	700	2.2%	5.2	2.2	11.5		3.9	6.9	16.3	33.2
C	2.61	0.70	0.80	0.70	120	1	8.7	600	2.2%	5.2	1.9	10.6		4.0	7.1	7.3	14.9
D	1.02	0.90	0.95	0.90	20	0.5	1.2	320	2.2%	5.2	1.0	5.0		5.1	9.1	4.7	8.8
E	1.43	0.70	0.80	0.70	20	0.5	2.5	150	1.5%	4.3	0.6	5.0		5.1	9.1	5.1	10.4
F	12.45	0.70	0.80	0.70	80	1	6.2	1550	1.5%	4.3	6.0	12.2		3.8	6.7	33.0	67.1
G	4.02	0.70	0.80	0.70	100	1.5	6.5	575	1.9%	4.8	2.0	8.5		4.3	7.7	12.2	24.9



From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel ( $T_t$ )		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	$C_5$	$C_{100}$	$C_5$	Length (ft)	Height (ft)	$T_c$ (min)	Length (ft)	Slope (%)	Velocity (fps)	$T_t$ (min)	TOTAL (min)	Location	$I_5$	$I_{100}$	$Q_5$ (c.f.s.)	$Q_{100}$ (c.f.s.)
		From DCM Table 3-1												(in/hr)	(in/hr)		
<i>H</i>	2.38	0.70	0.80	0.70	100	1	7.5	260	1.1%	3.7	1.2	8.7		4.3	7.7	7.2	14.7
<i>I</i>	4.63	0.70	0.80	0.70	100	1	7.5	650	1.4%	4.1	2.6	10.1		4.1	7.3	13.2	26.9
<i>J</i>	7.29	0.70	0.80	0.70	100	1.5	6.5	780	1.5%	4.3	3.0	9.6		4.2	7.4	21.3	43.3
<i>K</i>	6.34	0.70	0.80	0.70	100	1	7.5	662	0.8%	3.1	3.5	11.0		4.0	7.0	17.5	35.7
<i>L</i>	4.44	0.70	0.80	0.70	100	1.5	6.5	270	1.7%	4.6	1.0	7.5		4.5	8.1	14.1	28.7
<i>M</i>	4.48	0.70	0.80	0.70	100	1.5	6.5	320 180	2.0% 7.5%	4.9 9.6	1.1 0.3	7.9		4.5	7.9	14.0	28.4

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: CMW

Date: 11/24/2008

Checked by: JCH

## **WATER QUALITY**

Designer: Jeff Holste  
 Company: JR Engineering  
 Date: November 20, 2008  
 Project: Patriot Park  
 Location: Colorado Springs (Existing WQ Pond)

<p>1. Basin Storage Volume</p> <p>A) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>B) Contributing Watershed Area (Area)</p> <p>C) Water Quality Capture Volume (WQCV)              (WQCV = <math>1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)</math>)</p> <p>D) Design Volume: Vol = (WQCV / 12) * Area * 1.2</p>	<p><math>I_a =</math> <u>75.00</u> %</p> <p><math>i =</math> <u>0.75</u></p> <p>Area = <u>23.29</u> acres</p> <p>WQCV = <u>0.30</u> watershed inches</p> <p>Vol = <u>0.698</u> acre-feet</p>
<p>2. Outlet Works</p> <p>A) Outlet Type (Check One)</p> <p>B) Depth at Outlet Above Lowest Perforation (H)</p> <p>C) Required Maximum Outlet Area per Row, (<math>A_o</math>)</p> <p>D) Perforation Dimensions (<b>enter one only</b>):              i) Circular Perforation Diameter <b>OR</b>              ii) 2" Height Rectangular Perforation Width</p> <p>E) Number of Columns (<math>n_c</math>, See Table 6a-1 For Maximum)</p> <p>F) Actual Design Outlet Area per Row (<math>A_o</math>)</p> <p>G) Number of Rows (<math>n_r</math>)</p> <p>H) Total Outlet Area (<math>A_{ot}</math>)</p>	<p><input checked="" type="checkbox"/> Orifice Plate</p> <p><input type="checkbox"/> Perforated Riser Pipe</p> <p><input type="checkbox"/> Other: _____</p> <hr/> <p>H = _____ feet</p> <p><math>A_o =</math> _____ square inches</p> <p>D = _____ inches, <b>OR</b></p> <p>W = _____ inches</p> <p><math>n_c =</math> _____ number</p> <p><math>A_o =</math> _____ square inches</p> <p><math>n_r =</math> _____ number</p> <p><math>A_{ot} =</math> _____ square inches</p>
<p>3. Trash Rack</p> <p>A) Needed Open Area: <math>A_l = 0.5 * (\text{Figure 7 Value}) * A_{ot}</math></p> <p>B) Type of Outlet Opening (Check One)</p> <p>C) For 2", or Smaller, <b>Round Opening</b> (Ref.: Figure 6a):</p> <p>i) Width of Trash Rack and Concrete Opening (<math>W_{conc}</math>)              from Table 6a-1</p> <p>ii) Height of Trash Rack Screen (<math>H_{TR}</math>)</p>	<p><math>A_l =</math> _____ square inches</p> <p><input type="checkbox"/> <math>\leq 2"</math> Diameter <b>Round</b></p> <p><input type="checkbox"/> 2" High <b>Rectangular</b></p> <p><input type="checkbox"/> Other: _____</p> <hr/> <p><math>W_{conc} =</math> _____ inches</p> <p><math>H_{TR} =</math> _____ inches</p>

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: Jeff Holste  
 Company: JR Engineering  
 Date: November 20, 2008  
 Project: Patriot Park  
 Location: Colorado Springs (Basin B)

<p>1. Basin Storage Volume</p> <p>A) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>B) Contributing Watershed Area (Area)</p> <p>C) Water Quality Capture Volume (WQCV)              (WQCV = <math>1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I)</math>)</p> <p>D) Design Volume: Vol = (WQCV / 12) * Area * 1.2</p>	<p><math>I_a = \frac{75.00}{\%}</math></p> <p><math>i = \frac{0.75}{}</math></p> <p>Area = <math>\frac{6.02}{}</math> acres</p> <p>WQCV = <math>\frac{0.30}{}</math> watershed inches</p> <p>Vol = <math>\frac{0.180}{}</math> acre-feet</p>
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Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: Jeff Holste  
 Company: JR Engineering  
 Date: November 20, 2008  
 Project: Patriot Park  
 Location: Colorado Springs (Basin C and 1/2 Basin D)

<p>1. Basin Storage Volume</p> <p>A) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>B) Contributing Watershed Area (Area)</p> <p>C) Water Quality Capture Volume (WQCV)              (WQCV = <math>1.0 * I^3 - 1.19 * I^2 + 0.78 * I</math>)</p> <p>D) Design Volume: Vol = (WQCV / 12) * Area * 1.2</p>	<p><math>I_a =</math> <u>75.00</u> %</p> <p><math>i =</math> <u>0.75</u></p> <p>Area = <u>3.12</u> acres</p> <p>WQCV = <u>0.30</u> watershed inches</p> <p>Vol = <u>0.093</u> acre-feet</p>
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# Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: Jeff Holste  
 Company: JR Engineering  
 Date: November 20, 2008  
 Project: Patriot Park  
 Location: Colorado Springs (Basins G through M and 1/2 Basin D)

<p>1. Basin Storage Volume</p> <p>A) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>B) Contributing Watershed Area (Area)</p> <p>C) Water Quality Capture Volume (WQCV)  <math>(WQCV = 1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))</math></p> <p>D) Design Volume: <math>Vol = (WQCV / 12) * Area * 1.2</math></p>	<p><math>I_a = \frac{75.00}{100} \%</math></p> <p><math>i = \frac{0.75}{100}</math></p> <p>Area = <u>34.09</u> acres</p> <p>WQCV = <u>0.30</u> watershed inches</p> <p>Vol = <u>1.021</u> acre-feet</p>
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## **DRAINAGE MAPS**