FINAL DRAINAGE REPORT
for
Woodmen Vista Filing No. 1 & 2

&

Amendment to the
Master Development Drainage Report
for
Cumbre Vista Subdivision

Prepared for:
City of Colorado Springs
Subdivision Review Team
30 North Nevada Avenue, Suite 702
Colorado Springs, CO 80903

On Behalf of:
Infinity Holding Company, LLC

Prepared by:

Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

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November 2007

05.206.001

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.

Gerrit Slatter
Registered Professional Engineer
State of Colorado
No. 34907

SEAL

Developer's Statement:

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

Rocky Mountain Community Land Trust
Business Name

By: _____
Mr. Richard White

Title: DIRECTOR OF HOUSING DEVELOPMENT
Address: 1212 W. Colorado Ave.
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.

_____ Nov 16, 2007
City Engineer — Date

Conditions:

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APPENDIX

I. INTRODUCTION

A. Background

Woodmen Vista Filing No. 1 & 2 is a proposed single-family development located within the City of Colorado Springs. This site was evaluated as part of the ***Master Development Drainage Report for Cumbre Vista Subdivision & Preliminary/Final Drainage Report for Cumbre Vista Filing No. 1***, prepared by Matrix Design Group, Inc., July 2005. The project will encompass approximately 9.68 acres with 67 lots and will utilize the storm water infrastructure planned out per the approved MDDP.

This drainage report is also serving as an amendment to the ***Master Development Drainage Report for Cumbre Vista Subdivision***, prepared by Matrix Design Group, Inc., July 2005. Major changes from the approved MDDP focus primarily on drainage from the upstream property adjacent to the southern property line of Woodmen Vista. In coordination with this development, which is referred to as Cedarwood, drainage from their site will no longer be tributary to Woodmen Vista once it is fully developed (see Appendix for copy of agreement letter). To adequately accommodate for this change in drainage patterns, this drainage report will evaluate both the interim and fully developed conditions for the Woodmen Vista site and surrounding areas.

B. Project Location

The site is located in the City of Colorado Springs south of Cowpoke Road and east of the proposed extension of Tutt Boulevard. See Vicinity Map, Appendix A. A more detailed location of the site is as follows.

1. General Location. Section 6, Township 13 South, Range 65 West of the 6th Principal Meridian in Colorado Springs, Colorado.

2. Surrounding Streets. Surrounding street locations are as follows.

   North: Sorpresa Lane is located adjacent to the site to the north. Sorpresa has an east-west alignment and is currently under construction.

   East: Ski Lane is located approximately 300 feet to the east of the site in a north-south alignment. Sorpresa will provide access to the site from Ski Lane.

   West: Powers Boulevard is located approximately ¼ mile to the west. Tutt Boulevard is approximately 800 feet west of the site and provides additional access from Woodmen Road.

   South: Woodmen Road is located approximately 1300 feet due south of the site.

3. Drainageway. The site is located within the Cottonwood Drainage Basin. Cottonwood Creek is located approximately 2200 feet northwest of the project. This development is located within the study reach of the ***Master Development Drainage Report for Cumbre***

Vista Subdivision & Preliminary/Final Drainage Report for Cumbre Vista Filing No. 1, prepared by Matrix Design Group, Inc., July 2005, and will be consistent with the findings of that report.

4. Surrounding Developments. Surrounding land uses around the proposed single-family development are as follows.

   North: Cumbre Vista Subdivision, which comprises 123 acres of single-family development. The subdivision is currently under construction and will provide paved access to the site.
   East: Large single family lots with existing homes, and vacant land zoned in the county zoned as RR3 single family parcels.
   West: Vacant unplatted land.
   South: Currently vacant and unplatted land. Referred to as the Cedarwood Development, this area will eventually be developed as a commercial site.

C. *Property Description*

1. Drainage Area/Drainageways. The site is located south of Cottonwood Creek. Per the Drainage Basin Planning Study (DBPS) completed for the area, Cottonwood Creek will remain in its natural state with development and other improvements protected from the channel by implementing a prudent line setback. This set back has been based upon calculations and mapping provided within the DBPS. The channel will convey 2,332 cfs of flow during the major storm event when upstream areas are fully developed with regional detention facilities in place.

2. Ground Cover. The area is covered with native grasses with some trees and bushes. Existing single-family residential developments at the site will be replaced with the proposed subdivision.

3. General Topography. General topography of the site declines to the northwest at slopes ranging from 2% to 12%.

4. General Soil Conditions. The *Soil Survey of El Paso County Area, Colorado*, published by the United States Department of Agriculture, dated November 1991, has been utilized to investigate the existing general soil types within and tributary to the area impacting the Tutt Boulevard. See Soils Map, Appendix A. Two different soil types can be found in and around the study reach per Map 9 of the Soil Survey:

Soil ID No.	***Soil***	***Hydrologic Classification***	***Permeability***	***Erosion Hazard***
9	Blakeland Complex (1%-9% slopes)	A (Blakeland Part) D (Fluv. Hap. Part)	Rapid	Moderate
85	Stapleton Bernal sandy loams (3%-20% slopes)	B (Stapleton Part) D (Bernal Part)	Moderately Rapid	Moderate

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group "A" is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group "D" typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential.

Stapleton Bernal sandy loams dominate the soil types within the study reach. For the purposes of the Final Drainage Report, it has been assumed that hydrologic group "C" characteristics exist in the upstream area.

5. Irrigation Facilities. No existing irrigation facilities can be found on or around the site that would impact drainage patterns.

6. Proposed Land Use. The plat will include the single-family lots, open space corridors, and the required right of way for roadway and utility improvements.

7. Existing Utilities. No water or sanitary sewer mains exist in the area. The existing single family residences are serviced by well and septic systems.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

Woodmen Vista Filing No. 1 & 2 lies within the Cottonwood Creek Drainage Basin per the ***Cottonwood Creek Drainage Basin Planning Study*** (DBPS) prepared by Ayres and Associates, dated June 2000. This DBPS has been adopted as the guiding document by the City of Colorado Springs to plan drainage infrastructure improvements. The upstream basin is largely undeveloped.

B. Floodplain Statement

Review of the ***Flood Insurance Rate Map Panel 529 (08041CO529 F)***, effective date March 17, 1997, published by the Federal Emergency Management Agency (FEMA), reveals that Woodmen Vista Filing No. 1 & 2 is not located within a regulatory 100-year floodplain or floodway. See Floodplain Map, Appendix A.

C. Sub-Basin Description

The project consists of approximately 9.68 acres with 67 lots of single-family development. The proposed project is located within the southern portion of the approved ***Master Development Drainage Report for Cumbre Vista Subdivision***, prepared by Matrix Design Group, Inc., July 2005.

This report will look at both the interim and fully developed conditions for this site. Existing conditions have been evaluated as part of the approved MDDP. Interim conditions will consider developed conditions for the Woodmen Vista Subdivision and existing conditions for the surrounding properties. Fully developed conditions will consider the property to the south as fully developed, which is referred to as the Cedarwood Development throughout this report.

Onsite, runoff will consist of surface flow within the proposed streets that will discharge onto Sorpresa Lane. Side-lot swales will be maintained to allow drainage from the backyards to the street. Offsite flows from the south will be directed to an 8 foot concrete pan via proposed 2 foot berm located within the Cedarwood property. A 50 foot CSU easement exists to the south (within Cedarwood) and is offset 18 feet from the property line of Cedarwood/Woodmen Vista. The proposed berm will be located within that 18 foot strip of land and will extend the existing berm along the CSU easement to direct flows from the south to the proposed concrete pan. The concrete pan will discharge these flows onto the proposed Crestone Peak Trail. Since the proposed grades in the southeast corner of the site are approximately 4 feet higher than existing, a "berm" exists along the eastern property line. In this area, runoff from the east will flow into the "berm" and travel north to a proposed FES. The remaining offsite flows from the east will collect into a proposed inlet that connects to the existing storm sewer within Sorpresa Lane. All surface flows will utilize the street capacity of Sorpresa Lane and be collected by existing D10R inlets adjacent to the site and an existing 10' D10R sump inlet located near the intersection of Sorpresa Lane and Tutt Boulevard.

At this time, there is no knowledge of the properties to the east planning to develop their lots; however, in the event development does occur, an onsite drainage system should be designed. This system(s) will then connect directly to the 30" RCP located within a public easement at the northeast corner of the Woodmen Vista development. Per the approved ***Master Development Drainage Report for Cumbre Vista Subdivision***, prepared by Matrix Design Group, Inc., July 2005, the 30" RCP is designed to accept flowrates of Q(5) = 6.1 cfs and Q(100) = 13.7 cfs.

III. DRAINAGE DESIGN CRITERIA

A. Regulations

This report has been prepared in accordance to the criteria set forth in the ***City of Colorado Springs Drainage Criteria Manual***, dated November 1991 and subsequent updates. In addition to the City Criteria Manual, the ***Urban Storm Drainage Criteria Manuals, Volumes 1-3***, published by the Urban Drainage and Flood Control District, latest update, have also been used to supplement the City Criteria Manual. The analysis and proposed improvements have also considered the recommendations as provided within the Cottonwood Creek DBPS.

B. Hydrologic Criteria

Hydrologic analyses of the project have been performed using the Rational Method in accordance with the Criteria Manual for Colorado Springs. The Rational Method is used for basin areas that are less than 100 acres in size to help design localized facilities such as inlets and trunk infrastructure required:

$$Q=C*I*A$$

Where:

Q = Maximum runoff rate in cubic feet per second
C = Runoff coefficient
I = Average rainfall intensity in inches per hour
A = Area of drainage sub-basin in acres

The design storm events are:

- Initial Storm = 5-Year Storm
- Major Storm = 100-Year Storm

Runoff coefficients are based upon field observations of the area for the historic and interim conditions and anticipated development for the future conditions. Type "C" hydrologic soil characteristics have been assumed throughout the area.

C. Hydraulic Criteria

Detailed hydraulic analyses of the proposed roadways were completed as part of this study to determine the capacities of the roadways, and place proposed drainage inlets. The following criteria have been utilized per the City of Colorado Springs Drainage Criteria Manual and based upon the general site constraints.

Roadway Capacity Criteria

Street Type	*Initial Storm Criteria*	*Major Storm Criteria*
Residential Street (ramp curb)	***Flow spread to crown; Maximum 20 cfs per side.***	***12" maximum depth at flowline; No adjacent flooding.***
Collector Street (vertical curb)	***6" allowable depth at flowline; Maximum 34 cfs per side; No overtopping of crown***	***12" maximum depth at flowline; No adjacent flooding.***
Arterial Street (8" Vertical Curb)	***8" allowable depth at flowline; Maximum 34 cfs per side; No overtopping crown of road***	***12" maximum depth at flowline; -or- 4" depth at crown (whichever is more restrictive)***

Sorpresa Lane, considered a collector street, and the internal residential roadways have been evaluated. Tutt Boulevard is considered a minor arterial street. Where roadway stormwater capacities are exceeded or at sump locations, inlets have been place to remain in compliance with City criteria. Additional physical constraints of the roadways have also been evaluated to determine areas where the minimum typical City criteria cannot be maintained.

D. Waivers from Criteria

No waivers from the drainage standards are being requested at this time.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

The surrounding area has been analyzed based upon existing conditions, interim conditions, and anticipated full build out of the site and surrounding areas. The interim conditions assume the properties to the south and east are not yet developed.

Much of the storm sewer infrastructure needed for this development, including water quality treatment, has been planned as part of the ***Master Development Drainage Report for Cumbre Vista Subdivision & Preliminary/Final Drainage Report for Cumbre Vista Filing No. 1.*** This analysis will use the MDDP as a basis for design to ensure compliance with its planned infrastructure; however, due to changes in the development plan for Cedarwood, this report will also amend the approved MDDP. These changes include a proposed concrete pan to route offsite flows to the proposed Crestone Peak Trail as opposed to the future 36" RCP proposed by the approved MDDP; and the diversion of offsite flows away from Woodmen Vista per the development plan for Cedarwood.

B. Existing Conditions

The existing conditions have been evaluated under the MDDP for Cumbre Vista Subdivision. Under the MDDP, Woodmen Vista is located within sub-basin E-21, which is 72.50 acres of undeveloped land and large single-family residential lots. Per the approved Final Drainage Report for Tutt Boulevard Filing 4, runoff travels northwest to a 48" FES located at the southeast corner of Tutt Boulevard and Sorpresa Lane and eventually flows into Cottonwood Creek.

C. Interim Developed Conditions

The interim conditions of this site assume Woodmen Vista Filing No. 1 and 2 is fully developed and the surrounding properties to the south (referred to as the Cedarwood development) and west (large single-family lots) have not been developed. Runoff from the Woodmen Vista site utilizes street surface capacity and existing storm drain infrastructure within Sorpresa Lane. Side-lot swales will be maintained to allow drainage from the backyards to the street. Surface flows within Sorpresa Lane and Tutt Boulevard meet roadway capacity criteria (see appendix for calculations). The storm sewer system within Sorpresa Lane has been designed to accommodate these flows per the approved ***Master Development Drainage Report for Cumbre Vista Subdivision***, prepared by Matrix Design Group, Inc., dated July 2005.

An onsite concrete pan is proposed to route offsite flows to the existing storm drain system within Sorpresa Lane. The proposed concrete pan is placed within an easement dedicated to the HOA or similar organization for maintenance between lots 15 and 16. A separate agreement to address the specifics of the maintenance of the drainage easements will be drafted and included with the closing of each of the properties within the easement. A cross section of the concrete pan is included on the drainage map.

Sub-basin CW-1 is 11.77 acres of offsite undeveloped land located entirely within the future development referred to as Cedarwood. Along the southern property line, rough grades have been established based upon an anticipated roadway design. A water line has been constructed along this alignment. A proposed 2 foot berm, located within the Cedarwood property between the existing CSU easement and the southern property line of Woodmen Vista, is placed to direct runoff into the proposed concrete pan within sub-basin IN-1. This berm is considered temporary and will be removed upon development within the Cedarwood property. Runoff rates for sub-basin CW-1 are Q(5) = 7.6 cfs and Q(100) = 16.3 cfs.

Sub-basin CW-2 comprises of 6.09 acres of offsite undeveloped land located south of the site, entirely within the Cedarwood property. Runoff sheet flows to the north and follows the southern property line due to the rough grades that were established per the Cedarwood development. A proposed 2 foot berm, located within the Cedarwood property between the existing 50 foot CSU easement and the southern property line of Woodmen Vista, is placed to direct runoff into the proposed concrete pan within sub-basin IN-1. This berm is considered temporary and will be removed upon development within the Cedarwood property. The flowrates from sub-basin CW-2 are Q(5) = 4.2 cfs and Q(100) = 9.0 cfs.

Design Point I1 is located near the southeast corner of the Woodmen Vista development and collects runoff from sub-basin CW-1 and CW-2. Runoff from this area, totaling 17.86 acres, is directed to an 8' by 8" concrete pan via proposed 2 foot berms that are placed between the property line and the existing 50 foot CSU easement within the Cedarwood property. The proposed concrete pan is placed between lots 15 and 16 of the eastern half of Woodmen Vista (see Appendix for calculations). Flows from the concrete pan are discharged onto Crestone Peak Trail via 8 foot wide curb chase. The berms, concrete pan, and curb chase are sized to accept runoff rates of Q(5) = 11.6 cfs and Q(100) = 24.7 cfs. Flows from the concrete pan are then routed to design point I3 at the intersection of the eastern fork of Crestone Peak Trail and Sorpresa Lane.

Sub-basin OS-1 consists of 7.17 acres of offsite undeveloped land and the southern half of Sorpresa Lane located east of the site. Runoff sheet flows to the north onto Sorpresa Lane at rates of Q(5) = 8.4 cfs and Q(100) = 18.7 cfs. Runoff is collected by a 15' D10R inlet (catch basin #1) located within Sorpresa Lane. Flows from this sub-basin are not tributary to Woodmen Vista; however, they are identified to properly analyze the capacity of the inlets within Sorpresa Lane.

Sub-basin OS-2 is comprised of 3.21 acres of offsite undeveloped land located east of the site. Runoff sheet flows to the west and will be directed to Crestone Peak Trail along proposed lot line swales. This sub-basin discharges runoff rates of Q(5) = 2.4 cfs and Q(100) = 5.1 cfs that are routed north along Crestone Peak Trail and then west along Sorpresa Lane to Inlet #2.

Sub-basin OS-3 encompasses 4.31 acres of offsite undeveloped land located east of the site. In this area, runoff from the east will flow along proposed lot lines toward Crestone Peak Trail. This sub-basin discharges runoff rates of Q(5) = 3.0 cfs and Q(100) = 6.3 cfs. These flows are routed north along Crestone Peak Trail and then west to Inlet#2 along Sorpresa Lane. Because

flow conveyed along the lot line between lot 10 and 11 coincides with an existing adjacent low point a City Standard D-21 curb opening is proposed to allow flow to enter the street unimpeded.

Sub-basin IN-1 consists of 4.12 acres of single-family development, Crestone Peak Trail, and the southern half of Sorpresa Lane. This area generates flowrates of Q(5) = 9.4 cfs and Q(100) = 19.1 cfs. Runoff from the lots drain to the proposed street, referred to as Crestone Peak Trail, and discharge onto Sorpresa Lane via a cross pan. The nearest catch basin is located approximately 150 feet downstream of the discharge point, which is referred to as catch basin #2.

Design Point I2 is located within sub-basin IN-1, near the intersection of the eastern fork of Crestone Peak Trail and Sorpresa Lane. Runoff from sub-basin IN-1 and design point I1 (sub-basins CW-1 and CW-2) is routed through this design point and discharged onto Sorpresa Lane via a cross pan. This design point routes runoff rates of Q(5) = 18.2 cfs and Q(100) = 38.1 cfs from an area totaling 21.98 acres. Crestone Peak Trail is a 36 foot residential street with ramp curb and 4 foot sidewalks. Runoff is contained within the roadway for both the 5-year and 100-year storms and meets the requirements of the City of Colorado Springs Drainage Criteria Manual (see Appendix for street capacity calculations). The nearest catch basin within Sorpresa Lane is approximately 150 feet downstream at design point I3 (catch basin #2).

Design point I3 is located at a 15' D10R inlet within Sorpresa Lane and collects flows from design point I2 and bypass flows from catch basin #1. Surface runoff rates of Q(5) = 23.4 cfs and Q(100) = 53.0 cfs travel within Sorpresa Lane before this design point. Catch basin #2 intercepts runoff rates of Q(5) = 10.0 cfs and Q(100) = 15.1 cfs and bypasses rates of Q(5) = 13.4 cfs and Q(100) = 37.9 cfs to design point I4 (catch basin #3). Sorpresa Lane has adequate capacity for both the 5-year and 100-year storms (see Appendix for calculations). Bypass and Overflow of inlets on Sorpresa Lane and Tutt Boulevard have been evaluated, and calculations have been provided in the appendix.

Sub-basin IN-2 encompasses 6.02 acres of single-family development, Crestone Peak Trail, and the southern half of Sorpresa Lane. As in the same manner as sub-basin IN-1, runoff from the lots drain to Crestone Peak Trail and discharge onto Sorpresa Lane via a cross pan. The nearest inlet is located at design point I4 (catch basin #3), the intersection of the western fork of Crestone Peak Trail and Sorpresa Lane. Flowrates from this sub-basin are Q(5) = 13.7 cfs and Q(100) = 27.8 cfs. Flows from sub-basin IN-2 comply with the City's roadway capacity criteria (see appendix for calculations).

Design point I4 is located at a 20' D10R inlet within Sorpresa Lane and collects flows from sub-basin IN-2 and bypass flows from catch basin #2. Surface runoff rates of Q(5) = 18.5 cfs and Q(100) = 47.5 cfs travel within Sorpresa Lane before this design point. Catch basin #3 intercepts runoff rates of Q(5) = 13.1 cfs and Q(100) = 21.8 cfs and bypasses rates of Q(5) = 5.5 cfs and Q(100) = 25.7 cfs to an existing 10' D10R sump inlet located at the intersection of Sopressa Lane and Tutt Boulevard. Sorpresa Lane has adequate capacity for both the 5-year and 100-year storms (see Appendix for calculations).

The bypass rates of Q(5) = 5.5 cfs and Q(100) = 25.7 cfs from catch basin #3 are contained within Sopressa Lane in accordance with City requirements (see Seciton III, part C of this

report). The 10' D10R sump inlet at the intersection of Sorpresa Lane and Tutt Boulevard does not allow ponding over the crown of Sorpress for the 5-year storm and does not allow ponding above 12" for the 100-year storm (see Appendix for calculations). Flows for the 100-year storm are contained within the right-of-way for Sorpresa Lane. Since the 10' sump inlet at the corner of Sorpresa Lane and Tutt Boulevard cannot intercept the 5-year or 100-year runoff rates, a comprehensive analysis of flows within Sorpresa Lane and Tutt Boulevard to Cottonwood Creek was completed and provided in the Appendix of this report. Surface flows for both storm events are in accordance with City Street Capacity Requirements.

The runoff rates under this final drainage report are in compliance with the runoff rates established under the approved MDDP for Cumbre Vista Subdivision. By comparing CA values between the MDDP and this FDR and assuming Tc values are the same for each report, the development under this FDR is acceptable (see Appendix for calculations).

D. Future Developed Conditions

In anticipation of the future development of Cedarwood and the adjacent properties to the east, this study evaluates the impact these properties will have on Woodmen Vista from a drainage standpoint. The approved MDDP for Cumbre Vista Subdivision anticipated a 36" RCP storm sewer to extend through the site to carry drainage from Cedarwood; however, Cedarwood will be diverting its drainage away from Woodmen Vista once it is fully developed, eliminating the need for the 36" RCP. When this area is fully developed, flows from Cedarwood shall not exceed the rates established under the interim conditions of this drainage report.

As stated within the interim conditions of this report, the development of Cedarwood is limited to runoff rates established under the interim conditions. Flows generated from sub-basins CW-1 and CW-2 in excess of the runoff rates established under the interim developed conditions will either be detained onsite or comply with the ***Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4***, by Engineering and Surveying, Inc., dated February 2006, and the ***Master Development Drainage Plan for Woodmen Heights Master Plan***, by Classic Consulting Engineers & Surveyors, dated June 2004.. The discharge point for Cedarwood within Sand Creek is an existing 48" RCP located within Black Forest Road.

Sub-basin FU-1 encompasses 10.19 acres of offsite undeveloped and large-single family lots. This sub-basin is consistent with sub-basin D10 of the approved MDDP for Cumbre Vista Subdivision. At this time, there is no knowledge of plans to develop the properties within this sub-basin. In the event that they do, flows and drainage patterns must comply with the approved MDDP for Cumbre Vista Subdivision. The 30" RCP constructed per the Sorpresa Lane Storm Sewer Plans is designed to accommodate the developed flows from this sub-basin. Per the approved MDDP, this area generates runoff rates of Q(5) = 12.0 cfs and Q(100) = 26.6 cfs in its current undeveloped state.

Sub-basin FU-2 contains 5.01 acres of offsite undeveloped and large-single family lots. This sub-basin is consistent with sub-basin D12 of the approved MDDP for Cumbre Vista Subdivision. At this time, there is no knowledge of plans to develop the properties within this

sub-basin. The 30" RCP constructed per the Sorpresa Lane Storm Sewer Plans is designed to accommodate the developed flows from this sub-basin. Per the approved MDDP, this area generates runoff rates of Q(5) = 6.1 cfs and Q(100) = 13.7 cfs in its current undeveloped state.

Since runoff rates under future developed conditions are less than those under the interim developed conditions, design points I1 through I4 remain unchanged and assume the worst condition that adjacent developments decide to discharge flows onto Woodmen Vista.

E. Water Quality

Water quality issues for this site have been addressed as part of the MDDP for Cumbre Vista Subdivision. A water quality pond has been constructed in the northwest corner of Cumbre Vista and was sized to accommodate flows from Woodmen Vista.

F. Erosion Control Plan

The City of Colorado Springs/El Paso County Drainage Criteria Manual specifies that an Erosion Control Plan and associated cost estimate be submitted in conjunction with the Final Drainage Report. Matrix Design Group, Inc., respectfully requests the Erosion Control Plan be submitted in conjunction with the Overlot Grading Plan and construction assurances posted prior to obtaining a grading permit.

G. Cost Estimate

All proposed drainage devices per this report are privately owned and maintained by the HOA. The developer is responsible for constructing the proposed improvements. The construction costs for the proposed improvements are not eligible for reimbursement. The storm sewer system within Woodmen Vista is proposed per the Sorpresa Lane Storm Sewer construction plans, dated May 2006 and revised July 2007. A summary of the cost estimate is as follows:

Private (non-refundable)

Item	Unit	Quantity	Unit Cost	Extension
Concrete Pan	LF	125	$45.00	$5,625.00
Sidewalk Chase	LF	15	$65.00	$975.00
			Sub-Total	$6,600.00
			15% Contingencies & Engineering	$660.00
			Grand Total	***$7,260.00***

Since the engineer has no control over the cost of labor, materials, equipment or services furnished by others; over the contactor's method of determining prices; or over the competitive bidding or market conditions, the opinion of probable construction costs provided herein are made on the basis of the engineer's experience and qualifications and represents the best judgment as an experienced and qualified professional familiar with the construction industry. The engineer cannot, and does not, guarantee that proposals, bid, or actual construction costs will not vary from the opinion of probable costs.

H. Drainage and Bridge Fees

Woodmen Vista Filing No. 1 & 2 has not been previously platted. The 2007 drainage and bridge fees as published by the City of Colorado Springs has been assessed to the site. There are no pond fees for Cottonwood Creek Drainage Basin. Woodmen Vista Filing No. 1 & 2 is located entirely within the Cottonwood Creek Drainage Fee Basin. The fees are based upon the platted acreage and have been calculated as follows.

	Area (ac.)	Fee/Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Drainage Fee	9.68	$10,247.00	$99,190.96	$0.00	$99,190.96	$0.00
Bridge Fee	9.68	$836.00	$8,092.48	$0.00	$8,092.48	$0.00
Pond Fee	9.68	$0.00	$0.00	$0.00	$0.00	$0.00
			Total Fee Due at Platting		***$107,283.44***	

There are no proposed drainage infrastructure improvements to be completed with this project that have been specified within the DBPS for Cottonwood Creek. Therefore the construction of the drainage infrastructure is not reimbursable against the Drainage Fees. The Drainage and Bridge fees in the amount of ***$107,283.44*** will be due at the time of plat recording.

VI. CONCLUSIONS

The proposed Woodmen Vista Filing No. 1 & 2 is in compliance with the *City of Colorado Springs & El Paso County Drainage Criteria Manual*, dated November 1991 and the current Drainage Basin Planning Study for Cottonwood Creek. Per the changes discussed earlier, this report amends the approved ***Master Development Drainage Report for Cumbre Vista Subdivision & Preliminary/Final Drainage Report for Cumbre Vista Filing No. 1***, prepared by Matrix Design Group, Inc., dated July 2005. This report changes drainage patterns within the approved MDDP, but does not negatively impact the storm sewer infrastructure planned as part of the approved MDDP. As stated under developed conditions, offsite areas will be restricted to peak discharge rates established under the interim conditions for all flows routed through Woodmen Vista Filing No. 1 & 2.

Prepared By:

For and on behalf of **Matrix Design Group, Inc.**

Gerrit L. Slatter, P.E.
Project Manager

VII. REFERENCES

1. ***City of Colorado Springs & El Paso County Drainage Criteria Manual***, dated November 1991.

2. ***Cottonwood Creek Drainage Basin Planning Study***, Ayres and Associated, June 2000.

3. ***Cottonwood Creek Drainage Basin Planning Study***, URS Consultants, June 9, 1994.

4. ***FEMA Flood Insurance Rate Map***, El Paso County Colorado and Incorporated Areas, Panel 529 of 1300. March 17, 1997.

5. ***Master Development Drainage Report for Cumbre Vista Subdivision & Preliminary/Final Drainage Report for Cumbre Vista Filing No. 1***, Matrix Design Group, Inc., July 2005.

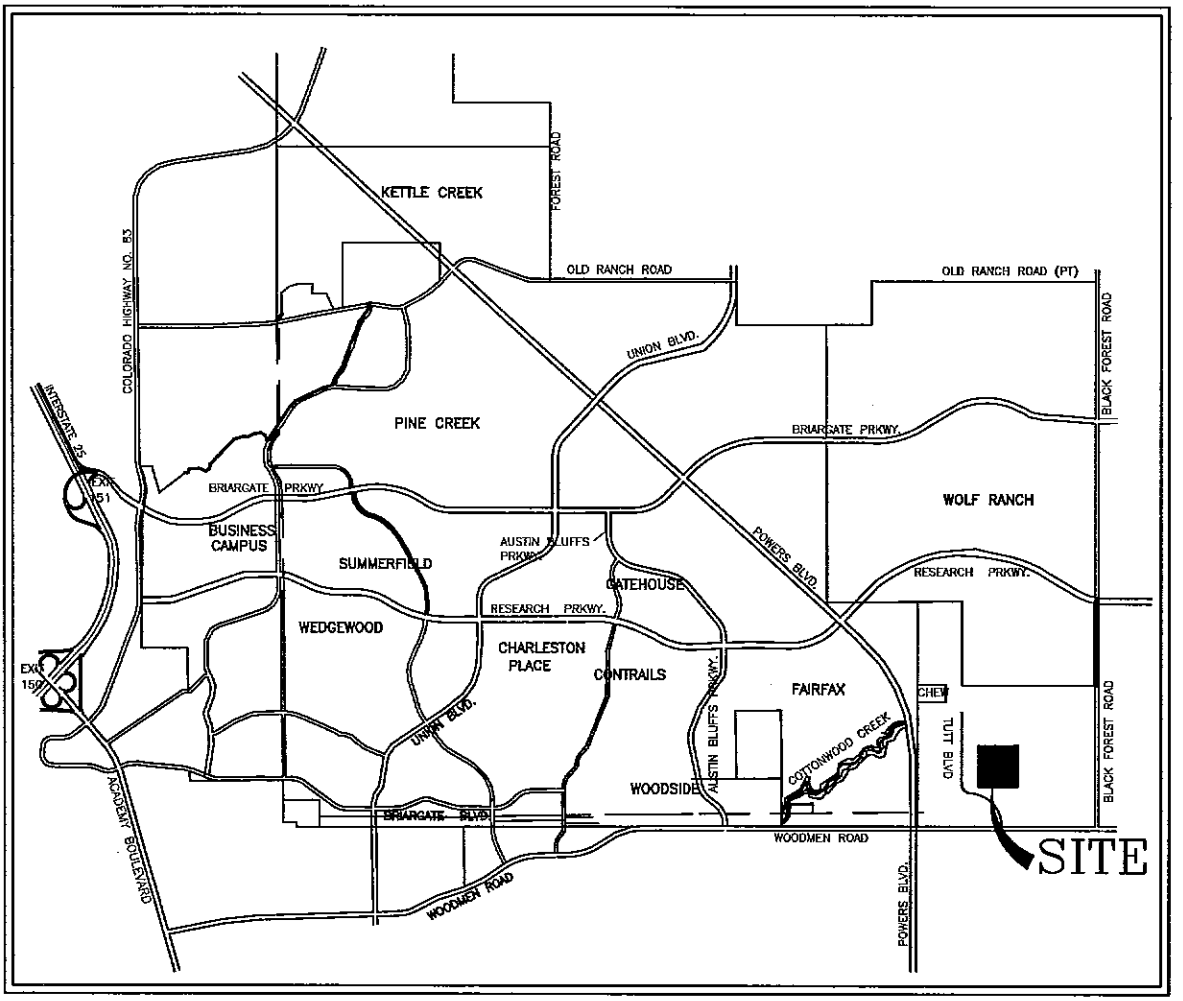
6. ***Soil Survey of El Paso County Area, Colorado***. United States Department of Agriculture Soil Conservation Service. Issued June 1981.

7. ***Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4***, Engineering and Surveying, Inc., February 2006.

8. ***Sorpresa Lane Storm Sewer***, Matrix Design Group, Inc., May 2006, revised July 2007.

APPENDIX A

MAPS



VICINITY MAP

NORTH
N.T.S.

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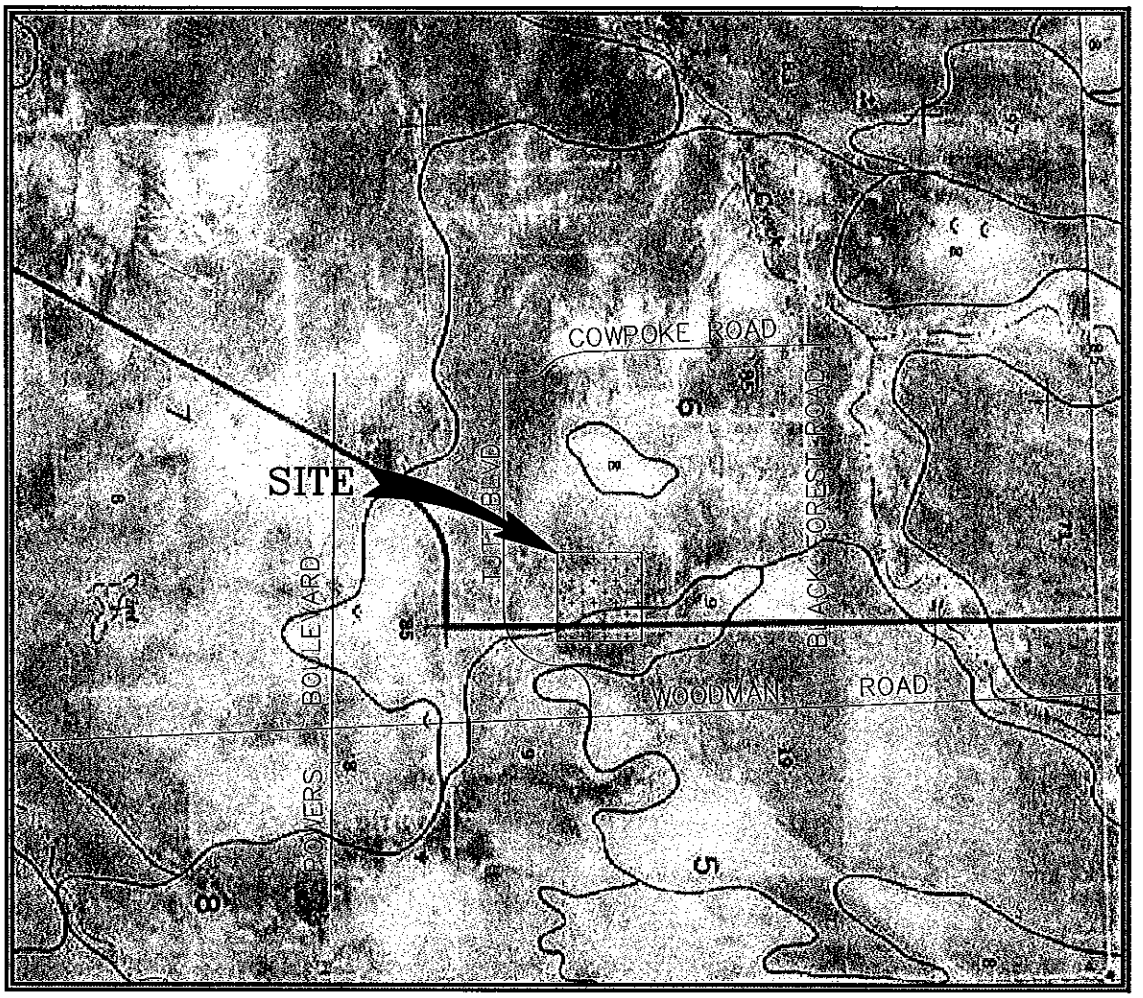
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208



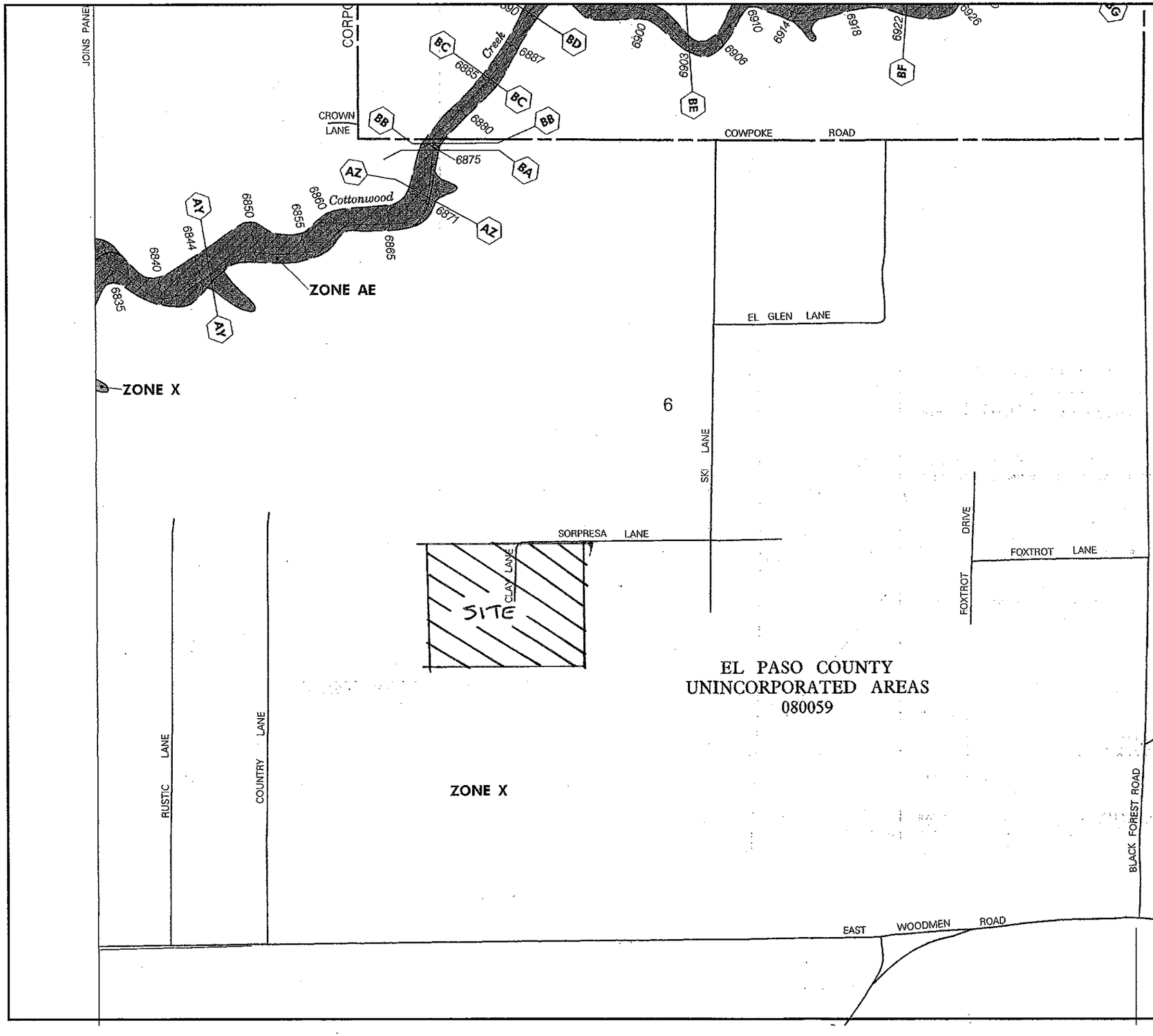
NORTH
N.T.S.

SOILS MAP

LEGEND

ID	SOIL NAME	HYD. GROUP
9	BLAKELAND COMPLEX	A/D
85	STAPLETON BERNAL SANDY LOAMS	B/D

Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 529 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0529	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0529	F

MAP NUMBER
08041C0529 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

APPENDIX B

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Woodmen Vistas Filing 1 and 2
Cottonwood Creek Drainage Basin

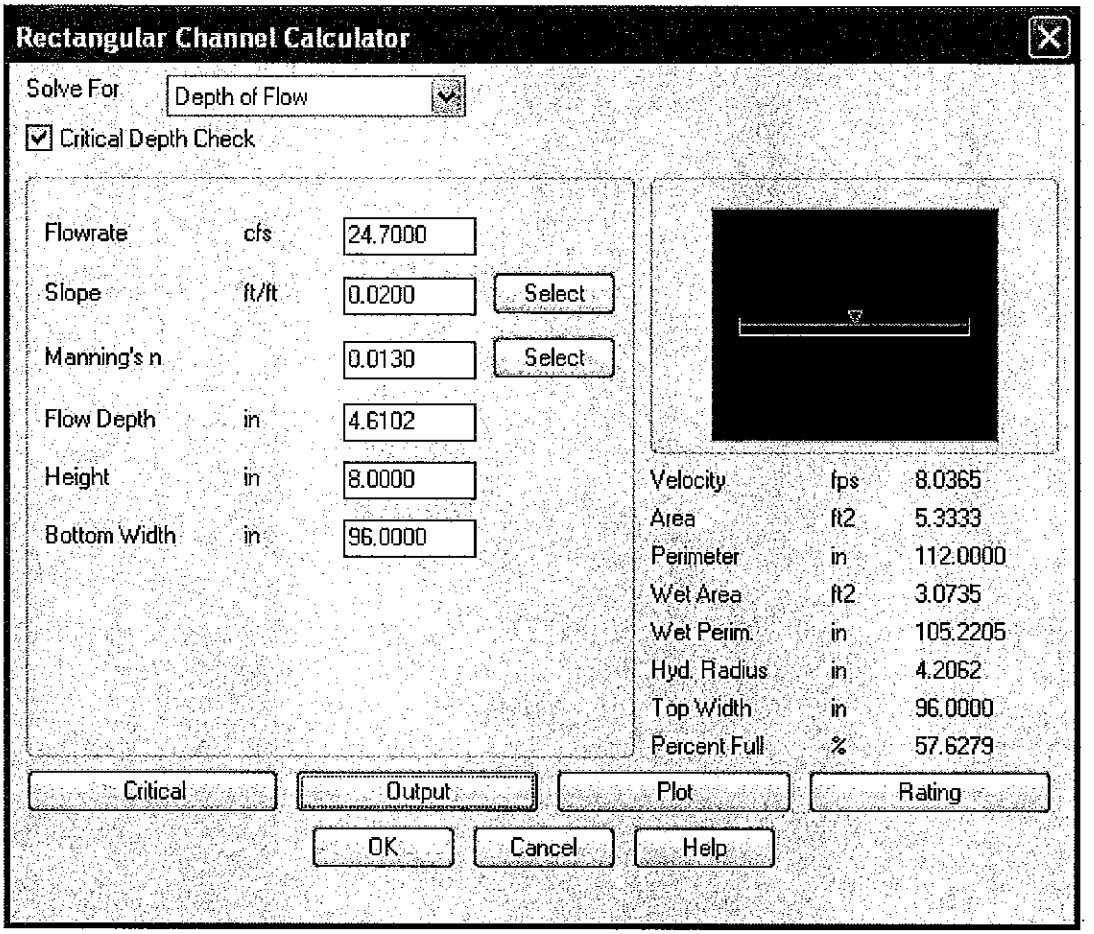
Rational Method Hydrologic Analysis
Interim/Future Developed Conditions

Sub-Basin Designation	Design Point	Tributary Basins	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time					Intensity		Peak Runoff	
				C(5)	C(100)	CA(5)	CA(100)	Overland Length (ft)	Overland Slope (%)	T(initial) (min.)	Travel Length (ft)	Weighted Slope (%)	Velocity (fps)	T(travel) (min.)	Final T(c)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
Interim/Fully Developed Conditions																			
CW-1			11.77	0.25	0.30	2.94	3.53	300	2.7%	19.9	800	4.0%	2.0	6.7	26.6	2.59	4.61	7.6	16.3
CW-2			6.09	0.25	0.30	1.52	1.83	300	3.0%	19.2	600	4.7%	2.2	4.5	23.7	2.76	4.91	4.2	9.0
OS-1			7.17	0.40	0.50	2.87	3.59	150	2.0%	15.5	1000	3.0%	3.0	5.6	21.0	2.94	5.23	8.4	18.7
OS-2			3.21	0.25	0.30	0.80	0.96	300	4.7%	16.5	310	2.2%	1.4	3.7	20.2	3.00	5.34	2.4	5.1
OS-3			4.31	0.25	0.30	1.08	1.29	300	4.7%	16.5	615	2.2%	1.4	7.3	23.8	2.75	4.90	3.0	6.3
IN-1			4.12	0.70	0.80	2.88	3.30	100	2.0%	12.6	750	2.1%	2.5	5.0	17.6	3.21	5.71	9.3	18.8
IN-2			6.02	0.70	0.80	4.21	4.82	100	2.0%	12.6	750	3.2%	2.7	4.6	17.3	3.24	5.77	13.7	27.8

Routed Surface Flows

Interim Developed Conditions				CA(5)fb	CA(100)fb														
Inlet #1		OS1	7.17			2.87	3.59			15.5	0			5.6	21.0	2.94	5.23	8.4	18.7
Concrete Pan	I1	CW1, CW2	17.86			4.47	5.36			26.6	0		5.0	0.0	26.6	2.59	4.61	11.6	24.7
Street	I2	DP I1,IN1	21.98			7.35	8.65			26.6	700		5.0	2.3	28.9	2.47	4.40	18.2	38.1
Inlet #2	I3	OS1(fb), OS2, OS3, DP I2	29.15	0.68	1.67	9.91	12.58			28.9	700		5.0	2.3	31.3	2.37	4.21	23.4	53.0
Inlet #3	I4	DP I2(fb), IN2	35.17	3.80	6.74	8.02	11.56			31.3	400		5.0	1.3	32.6	2.31	4.11	18.5	47.5
Future Developed Conditions				CA(5)fb	CA(100)fb														
Inlet #1		OS1	7.17			2.87	3.59			15.5	0			5.6	21.0	2.94	5.23	8.4	18.7
Concrete Pan	I1	CW1, CW2	17.86			4.47	5.36			26.6	0		5.0	0.0	26.6	2.59	4.61	11.6	24.7
Street	I2	DP I1,IN1	21.98			7.35	8.65			26.6	700		5.0	2.3	28.9	2.47	4.40	18.2	38.1
Inlet #2	I3	OS1(fb), DP I2	29.15	0.68	1.67	8.03	10.33			28.9	700		5.0	2.3	31.3	2.37	4.21	19.0	43.5
Inlet #3	I4	DP I2(fb), IN2	35.17	3.80	6.74	8.02	11.56			31.3	400		5.0	1.3	32.6	2.31	4.11	18.5	47.5

CONCRETE PAN BETWEEN LOTS 15 AND 16, BASIN IN-4



Channel Calculator

Given Input Data:
- Shape ..... Rectangular
- Solving for ..... Depth of Flow
- Flowrate ..... 24.7000 cfs
- Slope ..... 0.0200 ft/ft
- Manning's n 0.0130
- Height ..... 8.0000 in
- Bottom width ..... 96.0000 in

Computed Results:
- Depth ..... 4.6102 in
- Velocity ..... 8.0365 fps
- Full Flowrate ..... 59.3696 cfs
- Flow area 3.0735 ft2
- Flow perimeter ..... 105.2205 in
- Hydraulic radius ..... 4.2062 in
- Top width ..... 96.0000 in
- Area 5.3333 ft2
- Perimeter ..... 112.0000 in
- Percent full ..... 57.6279 %

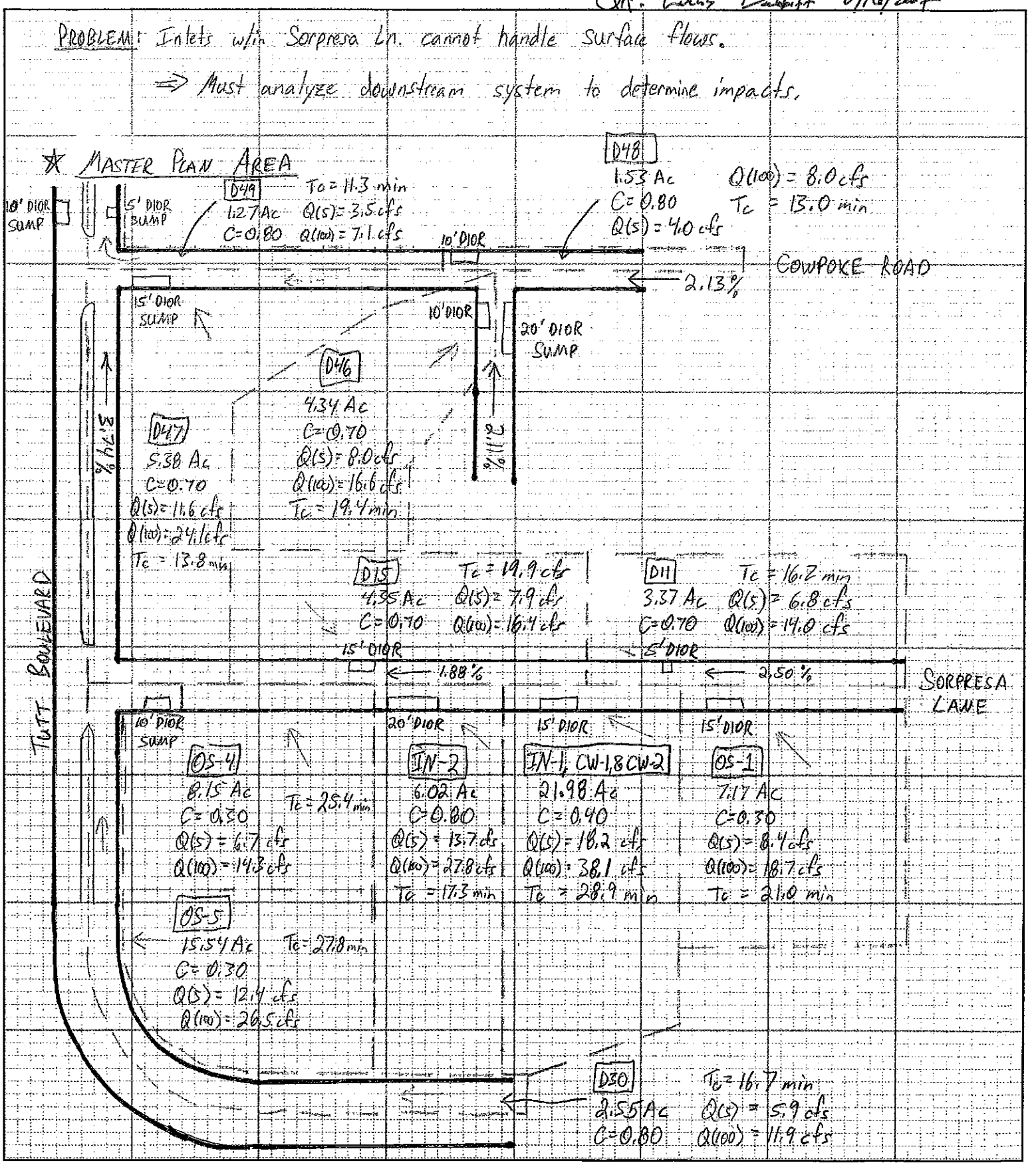
Critical Information
- Critical depth ..... 7.9999 in
- Critical slope ..... 0.0035 ft/ft
- Critical velocity ..... 4.6313 fps
- Critical area 5.3333 ft2
- Critical perimeter ..... 111.9998 in
- Critical hydraulic radius ..... 6.8571 in
- Critical top width ..... 96.0000 in
- Specific energy ..... 1.3879 ft
- Minimum energy ..... 1.0000 ft
- Froude number 2.2858
- Flow condition ..... Supercritical

Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

Job. No. 05.206.001
Date 8 / 9 / 07
Sheet 1 of 4
By ZACH
QA: Laura Bullitt 8/16/2007

Project WOODMEN VISTAS
Subject FLOWS W/in SORPRESA LN. & TUTT BLVD.

PROBLEM: Inlets w/in Sorpresa Ln. cannot handle surface flows.
⇒ Must analyze downstream system to determine impacts.



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Program Management

Job. No. 05.206.001
Date 8 / 9 / 07
Sheet 2 of 4
By ZACH

Project WOODMEN VISTAS
Subject FLOWS W/in SORPRESA LN. & TUTT BLVD.

There are two scenarios that must be addressed:

1) Interim Conditions

Woodmen Vistas (WV-1 & WV-2) and Cumbre Vista (D11, D45, D46, & D47) are fully developed. OS-1, OS-4, OS-5, and the bridge w/in Tutt are not developed. This bridge will cross Cottonwood Creek, but its construction will not take place for many years down the road.

At this time, Tutt Blvd. ends before Cottonwood Creek & surface runoff from Tutt sheet flows to the creek.

2) Fully Developed Conditions

All areas, except for sub-basin OS-1, will be developed (incl. the bridge). Sub-basins OS-4 & OS-5 will connect directly to the existing storm sewer resulting in zero surface discharge to Tutt Blvd. & Sorpresa Ln.

APPROACH FOR SCENARIO #1

STREET CAPACITY REQUIREMENTS

	MINOR STORM	MAJOR STORM	
Sorpresa	6" @ FL 34 cfs max per side No overtopping the Crown	12" @ FL ✓	* SORPRESA is a Collector St.
TUTT	6" @ FL ✓ 34 cfs max per side One 10 Ft Lane free	8" @ FL ✓ No curb overtopping 4" max @ Crown	* TUTT is a Minor Arterial St.

Since the bridge over Cottonwood Creek is not built and flows may overtop the crown for the 100-YR storm, verify surface flows are within street capacity requirements for 5-yr & 100-yr. Flow in excess of the capacity of the inlets will spill over into Cottonwood Creek.

½ STREET CAPACITY (using Flowmaster)

* Sorpresa Ln: 5-YR S=1.75% Q_{cap} = 22.42 cfs — 100-YR Q_{cap} = 205.20 cfs
(40 ft road, 20 ft to ℄) S=2.50% Q_{cap} = 26.80 cfs

* Tutt Blvd: 5-YR S=3.74% Q_{cap} = 25.01 cfs — 100-YR Q_{cap} = 108.12 cfs
(One-way, 28 Ft wide FL to FL ⇒ 18 Ft spread for 5-YR capacity) (100-YR capacity ⇒ 8" max @ FL)

Worksheet for Sorpressa - 1/2 Capacity, 5yr_1.75%

Project Description

Solve For	Discharge

Input Data

Channel Slope	0.01750	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Spread	20.00	ft
Roughness Coefficient	0.015	

Results

Discharge	22.42	ft³/s
Flow Area	4.08	ft²
Depth	0.48	ft
Gutter Depression	0.08	ft
Velocity	5.50	ft/s

Worksheet for Sorpressa - 1/2 Capacity, 5yr_2.5%

Project Description

Solve For	Discharge

Input Data

Channel Slope	0.02500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Spread	20.00	ft
Roughness Coefficient	0.015	

Results

Discharge	26.80	ft^3/s
Flow Area	4.08	ft^2
Depth	0.48	ft
Gutter Depression	0.08	ft
Velocity	6.57	ft/s

Cross Section for Sorpressa - 1/2 Capacity, 100yr

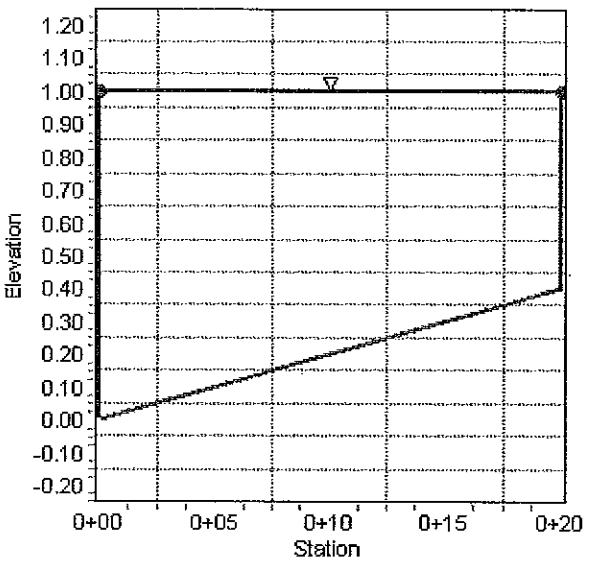
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	1.00	ft
Discharge	205.20	ft³/s

Cross Section Image



Worksheet for Sorpressa - 1/2 Capacity, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.02500	ft/ft
Normal Depth	1.00	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	1.00
0+00	0.00
0+20	0.40
0+20	1.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 1.00)	(0+20, 1.00)	0.013

Results

Discharge		205.20	ft³/s
Elevation Range	0.00 to 1.00 ft		
Flow Area		16.00	ft²
Wetted Perimeter		21.59	ft
Top Width		20.01	ft
Normal Depth		1.00	ft
Critical Depth		1.68	ft
Critical Slope		0.00345	ft/ft
Velocity		12.83	ft/s
Velocity Head		2.56	ft
Specific Energy		3.56	ft
Froude Number		2.53	
Flow Type	Supercritical		

Worksheet for Sorpressa - 1/2 Capacity, 100yr

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	1.68	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.00345	ft/ft

Worksheet for Tutt - 1/2 Capacity, 5yr

Project Description

Solve For	Discharge

Input Data

Channel Slope	0.03740	ft/ft ✓
Gutter Width	2.00	ft ✓
Gutter Cross Slope	0.06	ft/ft ✓
Road Cross Slope	0.02	ft/ft ✓
Spread	18.00	ft ✓
Roughness Coefficient	0.015	✓

Results

Discharge	25.01	ft^3/s
Flow Area	3.32	ft^2
Depth	0.44	ft < 6" ✓
Gutter Depression	0.08	ft
Velocity	7.53	ft/s

Cross Section for Tutt - 1/2 Capacity, 100yr

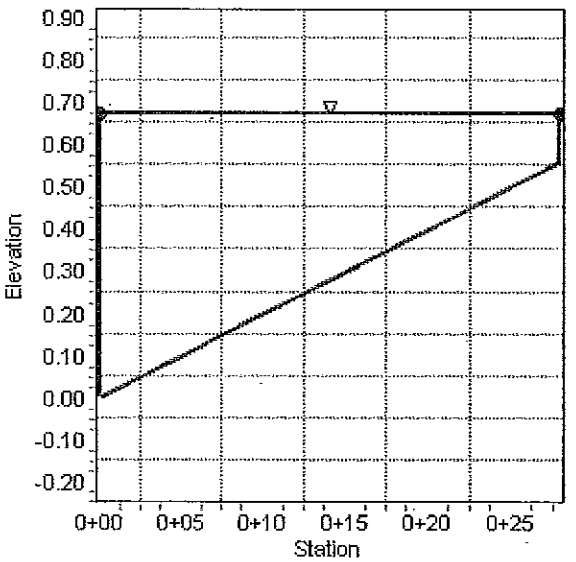
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.03740	ft/ft
Normal Depth	0.67	ft
Discharge	108.12	ft³/s

Cross Section Image



Worksheet for Tutt - 1/2 Capacity, 100yr

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.03740	ft/ft
Normal Depth	0.67	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+28	0.56
0+28	0.67

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+28, 0.67)	0.015

Results

Discharge	108.12	ft³/s
Elevation Range	0.00 to 0.67 ft	
Flow Area	10.83	ft²
Wetted Perimeter	28.77	ft
Top Width	28.00	ft
Normal Depth	0.67	ft
Critical Depth	1.05	ft
Critical Slope	0.00384	ft/ft
Velocity	9.99	ft/s
Velocity Head	1.55	ft
Specific Energy	2.22	ft
Froude Number	2.83	
Flow Type	Supercritical	

Worksheet for Tutt - 1/2 Capacity, 100yr

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	1.05	ft
Channel Slope	0.03740	ft/ft
Critical Slope	0.00384	ft/ft

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Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

Job. No. 05.206.001

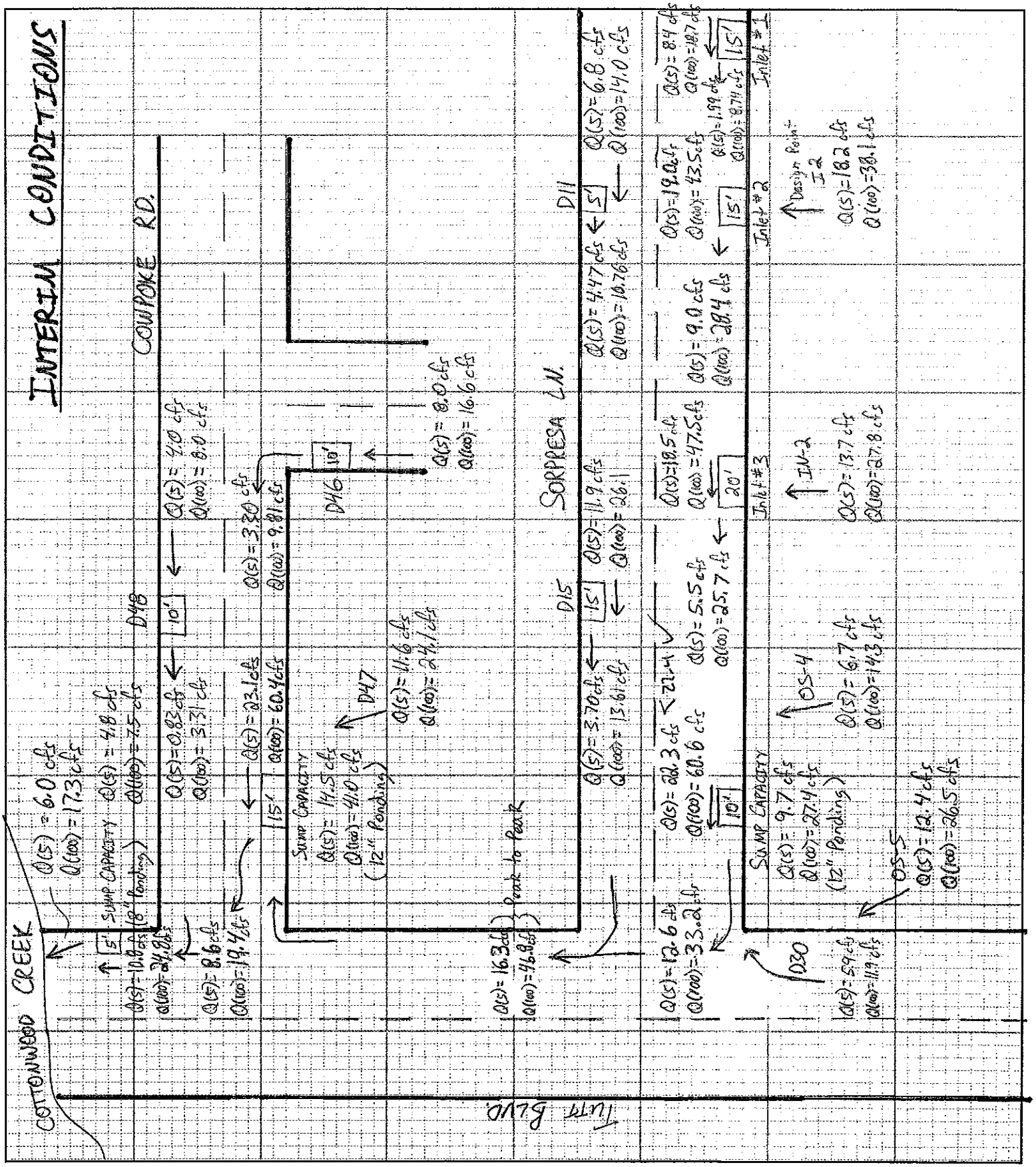
Date 8 / 9 / 07

Sheet 3 of 4

Project WOODMEN VISTAS

Subject Flows w/in Sorpresa Ln & Tutt Blvd.

By ZACH



Worksheet for Inlet #1 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	8.40	ft³/s
Slope	0.02500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	15.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	76.36	%
Intercepted Flow	6.41	ft³/s
Bypass Flow	1.99	ft³/s
Spread	12.62	ft
Depth	0.34	ft
Flow Area	1.68	ft²
Gutter Depression	0.09	ft
Total Depression	0.42	ft
Velocity	5.01	ft/s
Equivalent Cross Slope	0.08107	ft/ft
Length Factor	0.55	
Total Interception Length	27.21	ft

Worksheet for Inlet #1 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	18.70	ft³/s ✓
Slope	0.02500	ft/ft ✓
Gutter Width	2.00	ft ✓
Gutter Cross Slope	0.06	ft/ft ✓
Road Cross Slope	0.02	ft/ft ✓
Roughness Coefficient	0.015	✓
Curb Opening Length	15.00	ft ✓
Local Depression	4.00	in ✓
Local Depression Width	3.00	ft ✓

Results

Efficiency	53.25	%
Intercepted Flow	9.96	ft³/s
Bypass Flow	8.74	ft³/s
Spread	17.38	ft < 20' ✓
Depth	0.43	ft < 1' ✓
Flow Area	3.11	ft²
Gutter Depression	0.09	ft
Total Depression	0.42	ft
Velocity	6.02	ft/s
Equivalent Cross Slope	0.06487	ft/ft
Length Factor	0.34	
Total Interception Length	43.53	ft

Worksheet for Inlet #2 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	19.00	ft^3/s
Slope	0.02500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	15.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	52.46	%
Intercepted Flow	9.97	ft^3/s
Bypass Flow	9.03	ft^3/s
Spread	17.51	ft
Depth	0.43	ft
Flow Area	3.15	ft^2
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	6.04	ft/s
Equivalent Cross Slope	0.06366	ft/ft
Length Factor	0.34	
Total Interception Length	44.33	ft

Worksheet for Inlet #2 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	43.50	ft³/s
Slope	0.02500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	15.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	34.71	%
Intercepted Flow	15.10	ft³/s
Bypass Flow	28.40	ft³/s
Spread	24.13	ft
Depth	0.56	ft
Flow Area	5.90	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	7.37	ft/s
Equivalent Cross Slope	0.05169	ft/ft
Length Factor	0.21	
Total Interception Length	71.12	ft

Worksheet for Inlet #3 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	18.50	ft³/s
Slope	0.01800	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	20.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	70.53	%
Intercepted Flow	13.05	ft³/s
Bypass Flow	5.45	ft³/s
Spread	18.48	ft
Depth	0.45	ft
Flow Area	3.50	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	5.29	ft/s
Equivalent Cross Slope	0.06140	ft/ft
Length Factor	0.49	
Total Interception Length	40.59	ft

Worksheet for Inlet #3 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	47.50	ft^3/s
Slope	0.01800	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	20.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	45.84	%
Intercepted Flow	21.77	ft^3/s
Bypass Flow	25.73	ft^3/s
Spread	26.57	ft
Depth	0.61	ft
Flow Area	7.14	ft^2
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	6.65	ft/s
Equivalent Cross Slope	0.04874	ft/ft
Length Factor	0.29	
Total Interception Length	69.27	ft

Worksheet for D11 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	6.80	ft³/s
Slope	0.02500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	5.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	34.32	%
Intercepted Flow	2.33	ft³/s
Bypass Flow	4.47	ft³/s
Spread	11.57	ft
Depth	0.32	ft
Flow Area	1.42	ft²
Gutter Depression	0.09	ft
Total Depression	0.42	ft
Velocity	4.78	ft/s
Equivalent Cross Slope	0.08616	ft/ft
Length Factor	0.21	
Total Interception Length	24.01	ft

Worksheet for D11 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	14.00	ft³/s
Slope	0.02500	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	5.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	23.13	%
Intercepted Flow	3.24	ft³/s
Bypass Flow	10.76	ft³/s
Spread	15.50	ft
Depth	0.40	ft
Flow Area	2.49	ft²
Gutter Depression	0.09	ft
Total Depression	0.42	ft
Velocity	5.63	ft/s
Equivalent Cross Slope	0.07020	ft/ft
Length Factor	0.14	
Total Interception Length	36.77	ft

Worksheet for D15 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	11.90	ft³/s
Slope	0.01800	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	15.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	68.90	%
Intercepted Flow	8.20	ft³/s
Bypass Flow	3.70	ft³/s
Spread	15.54	ft
Depth	0.39	ft
Flow Area	2.50	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	4.77	ft/s
Equivalent Cross Slope	0.06907	ft/ft
Length Factor	0.48	
Total Interception Length	31.42	ft

Worksheet for D15 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	26.10	ft³/s
Slope	0.01800	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	15.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	47.84	%
Intercepted Flow	12.49	ft³/s
Bypass Flow	13.61	ft³/s
Spread	21.12	ft
Depth	0.50	ft
Flow Area	4.54	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	5.75	ft/s
Equivalent Cross Slope	0.05624	ft/ft
Length Factor	0.30	
Total Interception Length	49.44	ft

Worksheet for D46 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	8.00	ft³/s
Slope	0.02110	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	58.70	%
Intercepted Flow	4.70	ft³/s
Bypass Flow	3.30	ft³/s
Spread	12.84	ft
Depth	0.34	ft
Flow Area	1.73	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	4.63	ft/s
Equivalent Cross Slope	0.07884	ft/ft
Length Factor	0.39	
Total Interception Length	25.76	ft

Worksheet for D46 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	16.60	ft³/s
Slope	0.02110	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	40.88	%
Intercepted Flow	6.79	ft³/s
Bypass Flow	9.81	ft³/s
Spread	17.17	ft
Depth	0.42	ft
Flow Area	3.03	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	5.48	ft/s
Equivalent Cross Slope	0.06451	ft/ft
Length Factor	0.25	
Total Interception Length	39.49	ft

Worksheet for D48 - 5yr

Project Description

Solve For	Efficiency

Input Data

Discharge	4.00	ft³/s
Slope	0.02130	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	79.34	%
Intercepted Flow	3.17	ft³/s
Bypass Flow	0.83	ft³/s
Spread	9.60	ft
Depth	0.27	ft
Flow Area	1.00	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	3.99	ft/s
Equivalent Cross Slope	0.09624	ft/ft
Length Factor	0.58	
Total Interception Length	17.13	ft

Worksheet for D48 - 100yr

Project Description

Solve For	Efficiency

Input Data

Discharge	8.00	ft³/s
Slope	0.02130	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.06	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	10.00	ft
Local Depression	4.00	in
Local Depression Width	3.00	ft

Results

Efficiency	58.60	%
Intercepted Flow	4.69	ft³/s
Bypass Flow	3.31	ft³/s
Spread	12.82	ft
Depth	0.34	ft
Flow Area	1.72	ft²
Gutter Depression	0.08	ft
Total Depression	0.41	ft
Velocity	4.64	ft/s
Equivalent Cross Slope	0.07895	ft/ft
Length Factor	0.39	
Total Interception Length	25.82	ft

Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

Job. No. 05.206.001
Date 8 / 9 / 07
Sheet 4 of 4
By ZACH

Project WOODMEN VISTAS
Subject Flows w/in Sorpresa Ln & Tutt Blvd

INTERIM CONDITIONS (Cont.)

Flows within Sorpresa Ln and Tutt Blvd. do not exceed allowable capacity for both 5-year and 100-year storms. As mentioned earlier, flows in excess of the sump inlet near Cottonwood Creek spill into the Creek since the bridge will not be constructed for a number of years. Therefore, the proposed flows from Woodmen Vistas under interim developed conditions will not exceed the capacity of the downstream storm system.

APPROACH FOR SCENARIO #2 (FULLY DEVELOPED CONDITIONS)

There are four key differences between interim and fully developed conditions:

1) The bridge across Cottonwood Creek will be constructed.

2) Sub-basins OS-4 and OS-5 will be developed. These sub-basins will incorporate a drainage system to collect onsite runoff and connect to the existing storm sewer via an existing stub out (i.e. no surface discharge onto Tutt or Sorpresa).

3) Sub-basins CW-1 and CW-2 will be developed. Though a drainage plan has not been developed at this time, their plan is to divert runoff away from Woodmen Vistas. However, they will be allowed to discharge to Woodmen Vistas at historic rates. I have modeled the fully developed conditions with the assumption that these sub-basins will discharge at historic rates.

4) At this time, it is unknown if sub-basin OS-1 will be developed. If it ever is, a stub out has been provided for the site to connect; however, the sub-basin may discharge onto Sorpresa @ historic rates. For the Fully Developed Conditions, I have assumed this area to be undeveloped.

Key Design Issue:

Determine where downstream the storm system can handle street flows before reaching the future Cottonwood Creek bridge.

Answer = 15 ft sump inlet @ Coppoke & Tutt Blvd.

15' Sump Capacity		Flowrates Tributary to the Inlet
Q(5) = 14.5 cfs	>	Q(5) = 11.9 cfs
Q(100) = 41.0 cfs	>	Q(100) = 37.5 cfs

Woodmen Vistas Filing 1 and 2
Cottonwood Creek Drainage Basin

Rational Method Hydologic Analysis
Interim/Fully Developed Conditions

Sub-Basin Designation	Design Point	Tributary Basins	Total Area (ac.)	Weighted Coefficients		CA		Overland Time			Travel Time					Intensity		Peak Runoff	
				C(5)	C(100)	CA(5)	CA(100)	Overland Length (ft)	Overland Slope (%)	T(initial) (min.)	Travel Length (ft)	Weighted Slope (%)	Velocity (fps)	T(travel) (min.)	Final T(c)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
Interim/Fully Developed Conditions																			
CW-1			11.77	0.25	0.30	2.94	3.53	300	2.7%	19.9	800	4.0%	2.0	6.7	26.6	2.59	4.61	7.6	16.3
CW-2			6.09	0.25	0.30	1.52	1.83	300	3.0%	19.2	600	4.7%	2.2	4.5	23.7	2.76	4.91	4.2	9.0
OS-1			7.17	0.40	0.50	2.87	3.59	150	2.0%	15.5	1000	3.0%	3.0	5.6	21.0	2.94	5.23	8.4	18.7
OS-2			3.21	0.25	0.30	0.80	0.96	300	4.7%	16.5	310	2.2%	1.4	3.7	20.2	3.00	5.34	2.4	5.1
OS-3			4.31	0.25	0.30	1.08	1.29	300	4.7%	16.5	615	2.2%	1.4	7.3	23.8	2.75	4.90	3.0	6.3
IN-1			4.12	0.70	0.80	2.88	3.30	100	2.0%	12.6	750	2.1%	2.5	5.0	17.6	3.21	5.71	9.3	18.8
IN-2			6.02	0.70	0.80	4.21	4.82	100	2.0%	12.6	750	3.2%	2.7	4.6	17.3	3.24	5.77	13.7	27.8
OS-4		Offsite to Sorpressa	8.15	0.25	0.30	2.04	2.45	200	4.7%	13.5	1000	2.2%	1.4	11.9	25.4	3.30	5.87	6.7	14.3
OS-5		Offsite to Tutt	15.54	0.25	0.30	3.89	4.66	200	4.7%	13.5	1200	2.2%	1.4	14.3	27.8	3.20	5.69	12.4	26.5
D30		Tutt Blvd (From Tutt Blvd FDR)	2.55	0.70	0.80	1.79	2.04	40	2.0%	8.0	2100	3.7%	4.0	8.8	16.7	3.29	5.85	5.9	11.9
D11		From Cumbre Vista MDDP	3.37	0.60	0.70	2.02	2.36	65	2.0%	10.2	900	2.0%	2.5	6.0	16.2	3.34	5.95	6.8	14.0
D15		From Cumbre Vista MDDP	4.35	0.60	0.70	2.61	3.05	100	2.0%	12.6	1300	3.0%	3.0	7.2	19.9	3.02	5.38	7.9	16.4
D46		From Cumbre Vista MDDP	4.34	0.60	0.70	2.60	3.04	50	2.0%	8.9	2000	2.5%	3.2	10.4	19.4	3.06	5.45	8.0	16.6
D47		From Cumbre Vista MDDP	5.38	0.60	0.70	3.23	3.77	40	2.0%	8.0	1400	3.7%	4.0	5.8	13.8	3.59	6.39	11.6	24.1
D48		From Cumbre Vista MDDP	1.53	0.70	0.80	1.07	1.22	40	2.0%	8.0	1200	3.0%	4.0	5.0	13.0	3.69	6.57	4.0	8.0
D49		From Cumbre Vista MDDP	1.27	0.70	0.80	0.89	1.02	40	2.0%	8.0	800	3.0%	4.0	3.3	11.3	3.91	6.95	3.5	7.1

Routed Surface Flows

				CA(5)fb	CA(100)fb														
Interim Developed Conditions																			
Inlet #1		OS1	7.17			2.87	3.59			15.5	0			5.6	21.0	2.94	5.23	8.4	18.7
Concrete Pan	I1	CW1, CW2	17.86			4.47	5.36			26.6	0		5.0	0.0	26.6	2.59	4.61	11.6	24.7
Street	I2	DP I1,IN1	21.98			7.35	8.65			26.6	700		5.0	2.3	28.9	2.47	4.40	18.2	38.1
Inlet #2	I3	OS1(fb), DP I2	29.15	0.68	1.67	8.03	10.33			28.9	700		5.0	2.3	31.3	2.37	4.21	19.0	43.5
Inlet #3	I4	DP I2(fb), IN2	35.17	3.80	6.74	8.02	11.56			31.3	400		5.0	1.3	32.6	2.31	4.11	18.5	47.5
10' Sump	I5	DP I4(fb), OS4, OS5, D30	61.41	2.38	6.25	10.09	15.40			32.6	770		5.0	2.6	35.2	2.21	3.93	22.3	60.6
D15	I6	D11(fb), D15	7.72	1.34	1.81	3.95	4.85			19.9	0		5.0	0.0	19.9	3.02	5.38	11.9	26.1
15' Sump	I7	DP I5(fb), DP I6(fb), D46(fb), D47	78.85	8.00	12.76	11.23	16.52			35.2	1350		5.0	4.5	39.7	2.06	3.66	23.1	60.4
5' Sump	I8	DP I7(fb), D48(fb), D49	81.65	4.40	5.82	5.29	6.84			39.7	150		5.0	0.5	40.2	2.04	3.63	10.8	24.8
Fully Developed Conditions				CA(5)fb	CA(100)fb														
Inlet #1		OS1	7.17			2.87	3.59			15.5	0			5.6	21.0	2.94	5.23	8.4	18.7
Concrete Pan	I1	CW1, CW2	17.86			4.47	5.36			26.6	0		5.0	0.0	26.6	2.59	4.61	11.6	24.7
Street	I2	DP I1,IN1	21.98			7.35	8.65			26.6	700		5.0	2.3	28.9	2.47	4.40	18.2	38.1
Inlet #2	I3	OS1(fb), DP I2	29.15	0.68	1.67	8.03	10.33			28.9	700		5.0	2.3	31.3	2.37	4.21	19.0	43.5
Inlet #3	I4	DP I2(fb), IN2	35.17	3.80	6.74	8.02	11.56			31.3	400		5.0	1.3	32.6	2.31	4.11	18.5	47.5
10' Sump	I5	DP I4(fb), D30	37.72	2.38	6.25	4.17	8.29			32.6	770		5.0	2.6	35.2	2.21	3.93	9.2	32.6
D15	I6	D11(fb), D15	7.72	1.34	1.81	3.95	4.85			19.9	0		5.0	0.0	19.9	3.02	5.38	11.9	26.1
15' Sump	I7	DP I5(fb), DP I6(fb), D46(fb), D47	55.16	2.08	5.65	5.30	9.42			35.2	1350		5.0	4.5	39.7	2.06	3.66	10.9	34.4

Sump Inlets

Sump Inlet Location	Storm Event	Q (cfs)	Inlet Size (ft)	Clogging Factor	Calculated Depth (ft)	D(max) (ft)	Meets Criteria?
Sump Inlet Capacity - 12" Ponding for Sorpresa & Cowpoke, 8" Ponding for Tutt							
Tutt Blvd	5-year	4.8	5	1.20	0.50	0.50	yes
	100-year	7.5	5	1.20	0.67	0.67	yes
Sorpresa Ln	5-year	9.7	10	1.20	0.50	0.50	yes
	100-year	27.4	10	1.20	1.00	1.00	yes
Cowpoke Rd	5-year	14.5	15	1.20	0.50	0.50	yes
	100-year	41.0	15	1.20	1.00	1.00	yes

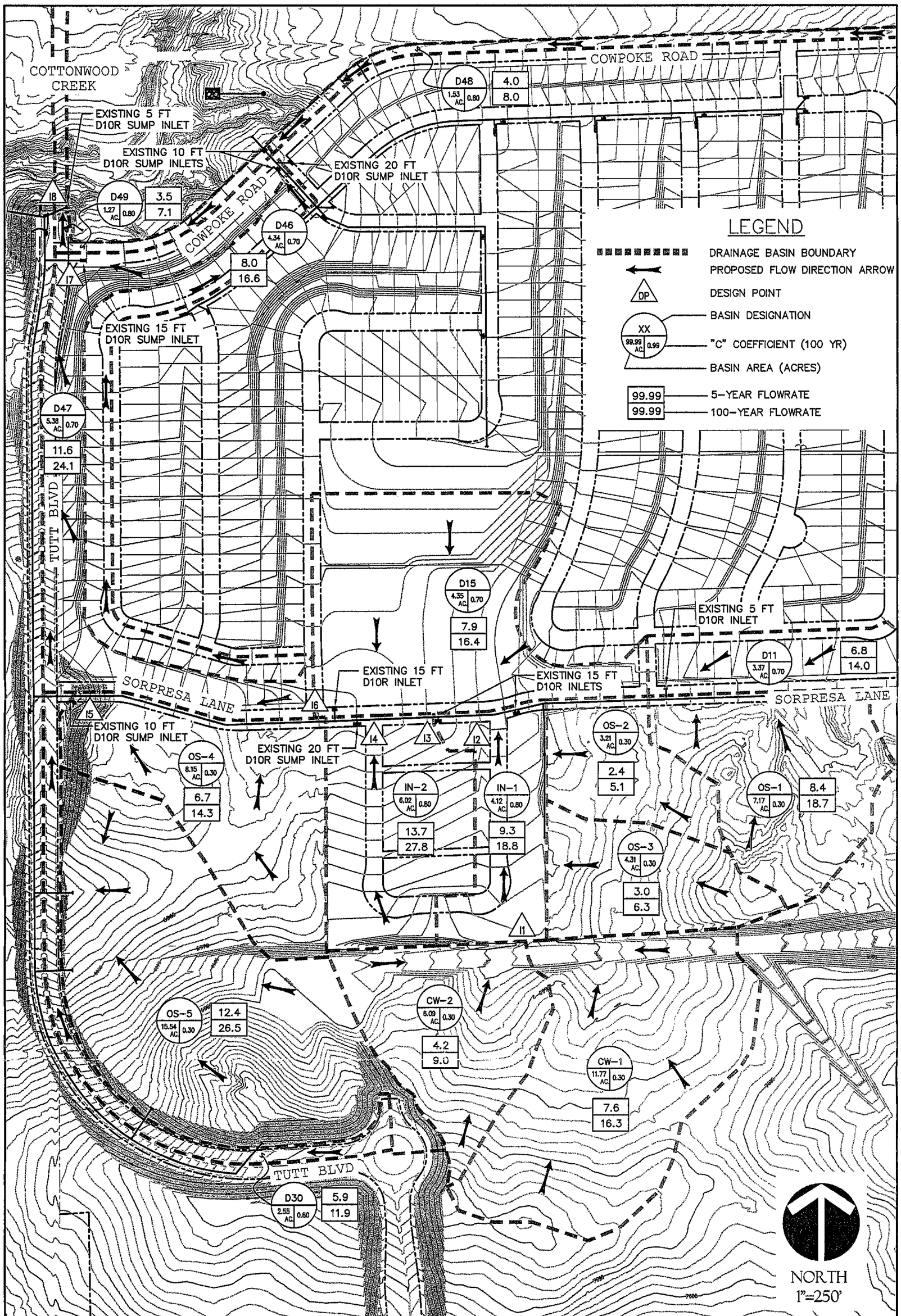


EXHIBIT A

STREET CAPACITY ANALYSIS

Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

APPENDIX C

STANDARD DESIGN CHARTS AND TABLES

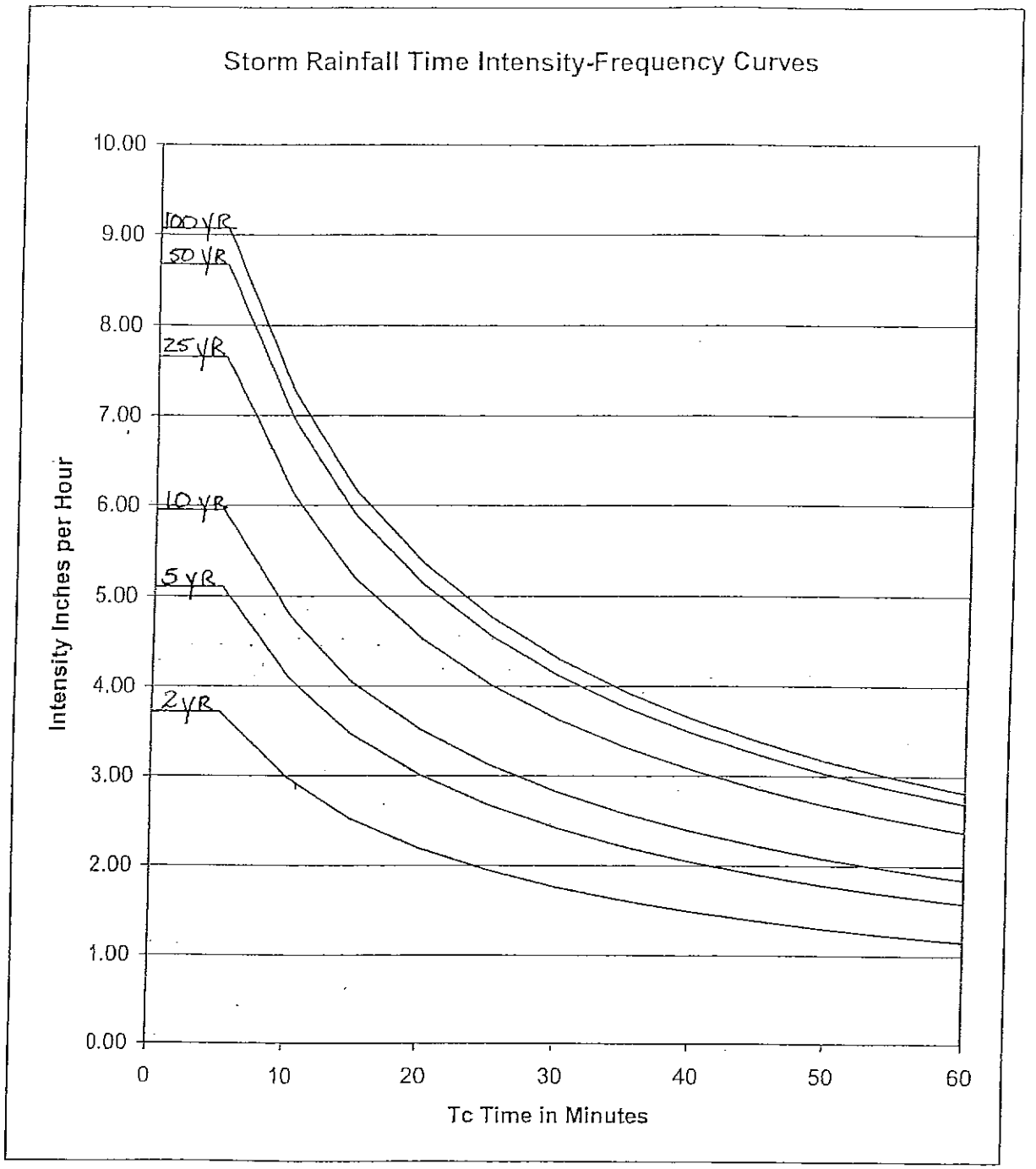
TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

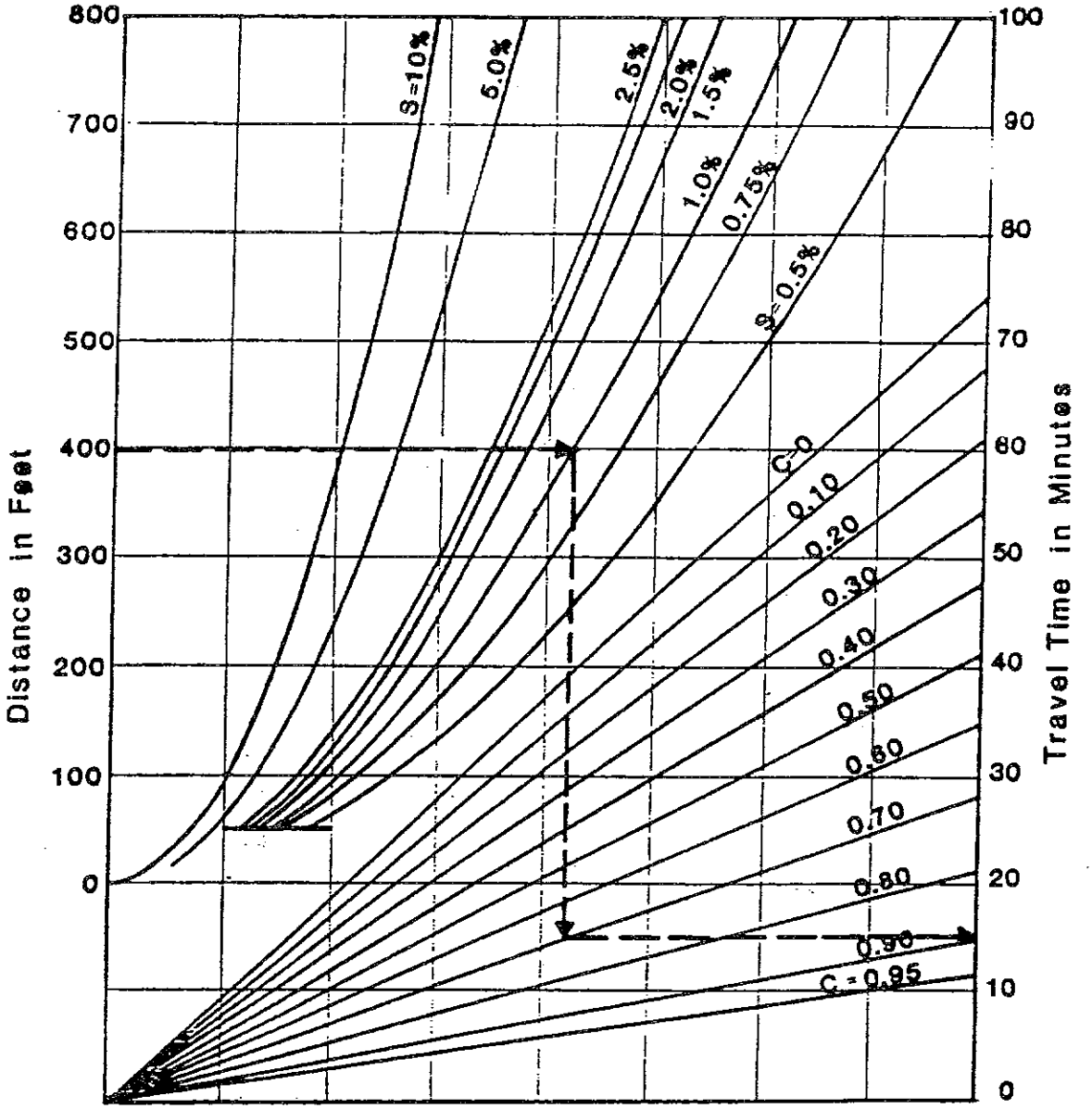
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group

9/30/90



Rainfall Depth - Duration - Frequency Table derived from Rainfall Atlas III for Colorado
Resource: Guo, James C.Y., (2001) "Urban Storm Water Modeling", Chapter 5: Runoff Prediction for Small Catchment, published by Auraria Campus Book Company, University of Colorado at Denver, Denver, Colorado.



REFERENCE : Wright – McLaughlin Engineers, Urban Storm Drainage Criteria Manual, Vol. 1, Denver Regional Council of Governments, Denver, Co. 1977

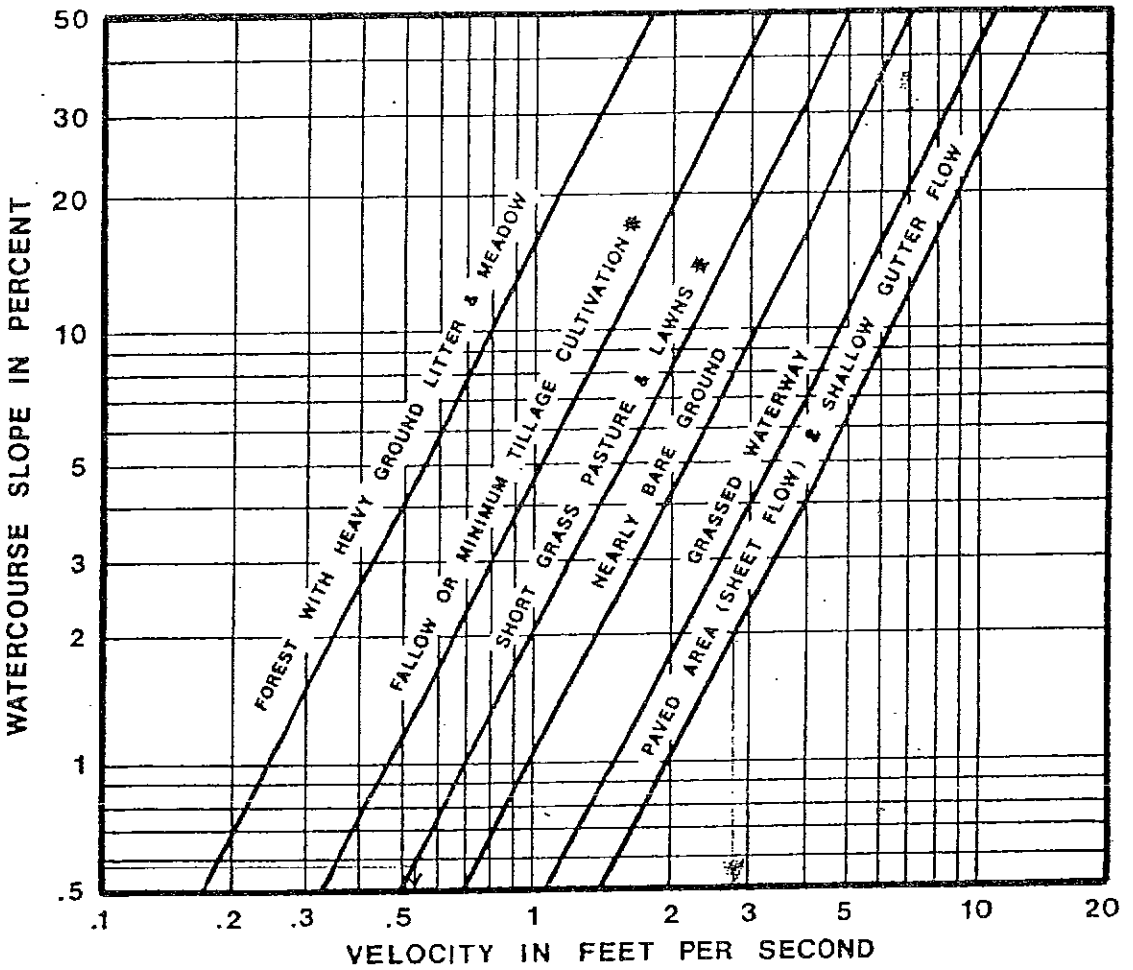
HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Overland Flow Curves

Date: OCT. 1987

Figure: 5-2

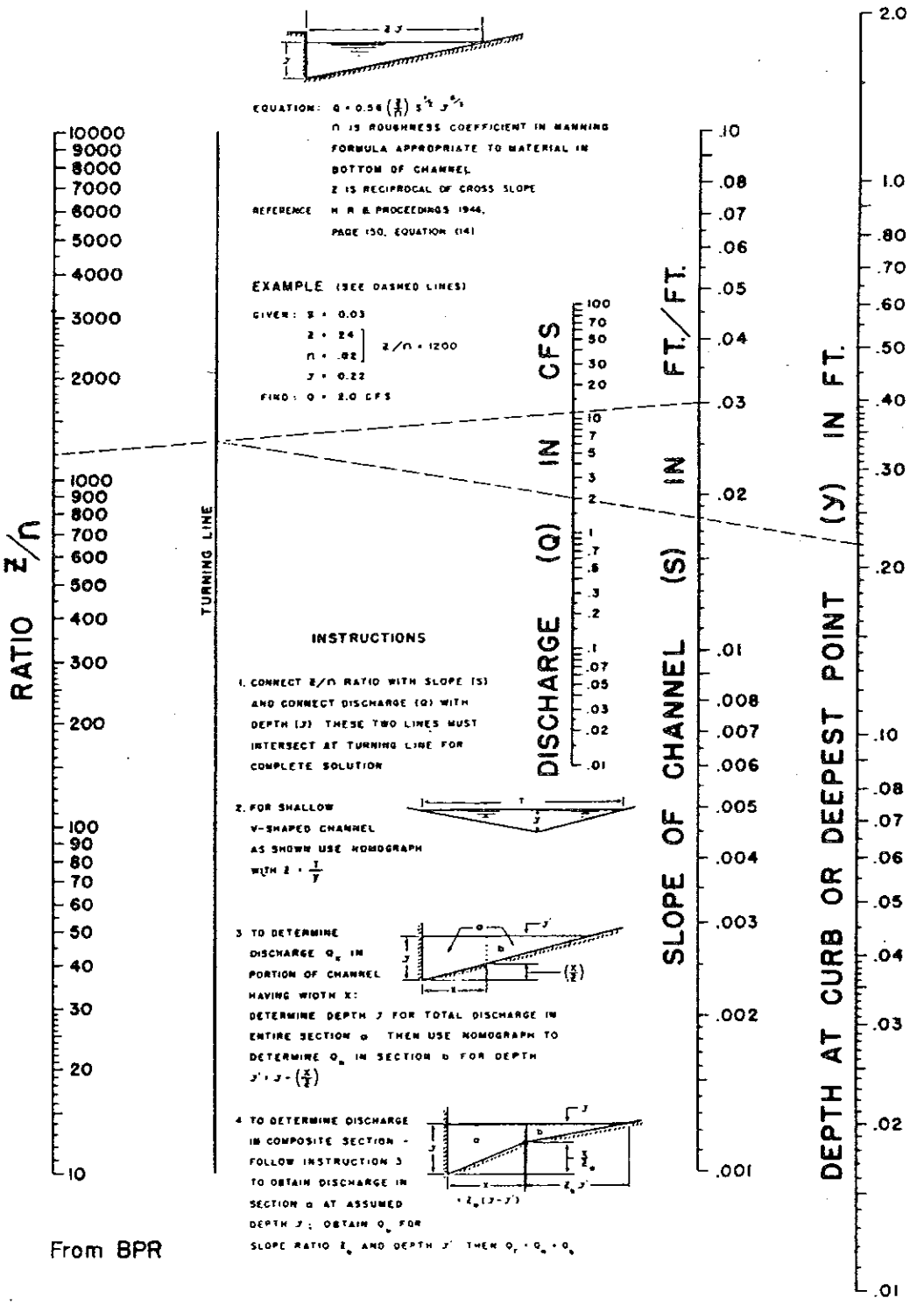


ESTIMATE OF AVERAGE FLOW VELOCITY FOR USE WITH THE RATIONAL FORMULA.

* MOST FREQUENTLY OCCURRING "UNDEVELOPED" LAND SURFACES IN THE DENVER REGION.

REFERENCE: "Urban Hydrology For Small Watersheds" Technical Release No. 55, USDA, SCS Jan. 1975.

FIGURE 2



NONOGRAPH FOR FLOW IN TRIANGULAR GUTTERS
(From U.S. Dept. of Commerce, Bureau of Public Roads, 1965)

HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

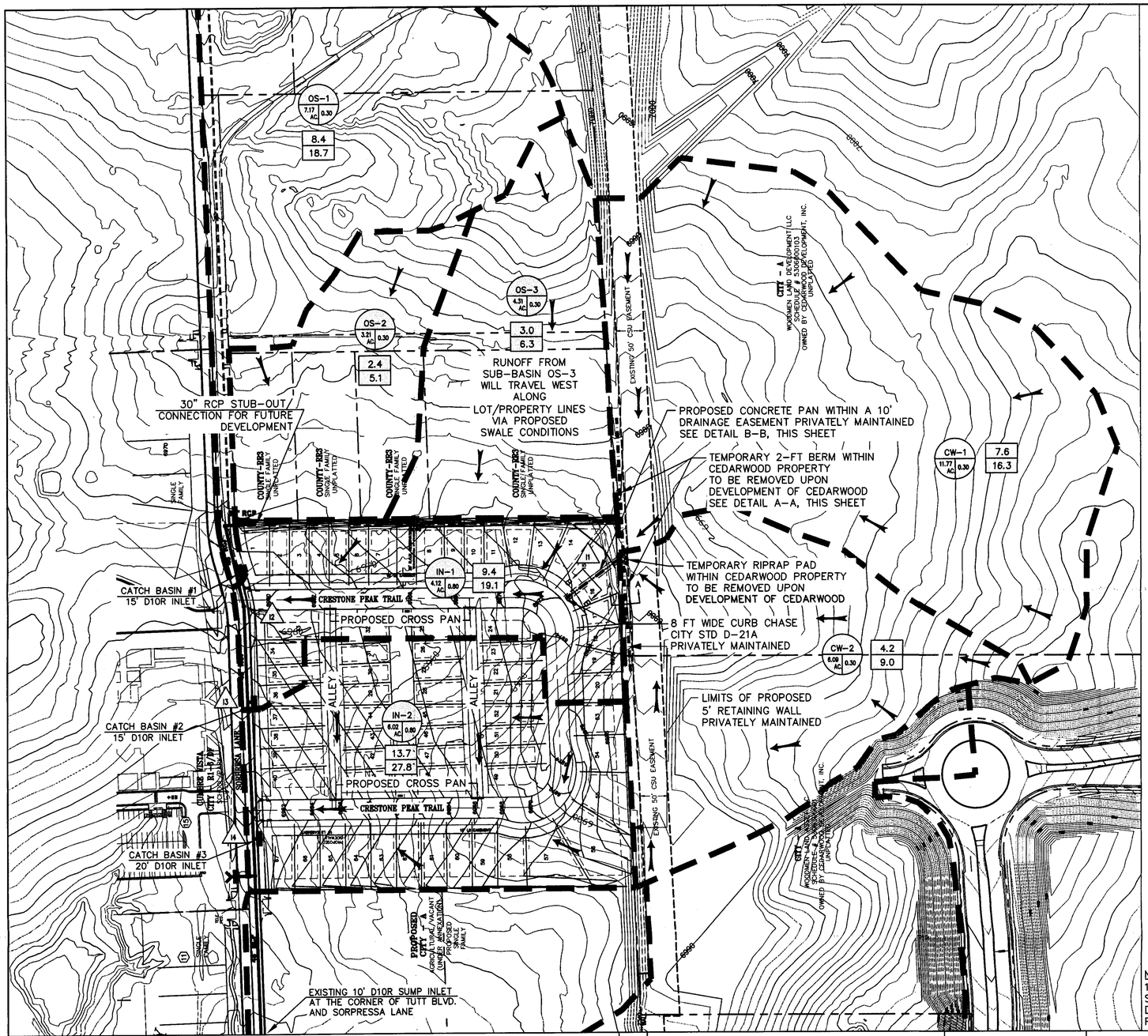
NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

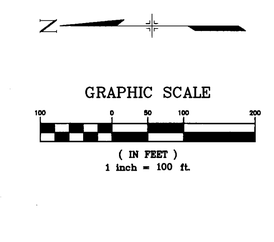
Date
OCT. 1987

Figure
7 - 2

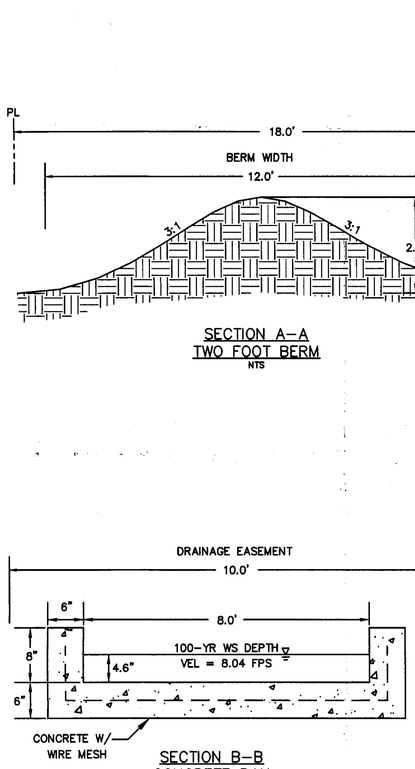
APPENDIX D

DRAINAGE MAPS

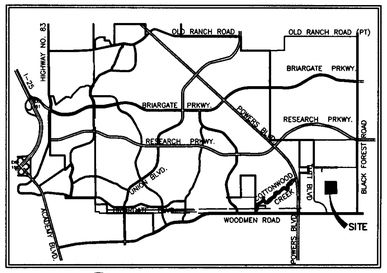




SECTION A-A
TWO FOOT BERM
NTS



SECTION B-B
CONCRETE PAN
NTS



NORTH
N.T.S.

VICINITY MAP

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- DRAINAGE BASIN BOUNDARY
- PROPOSED BERM
- PROPOSED DIVERSION SWALE
- 6520 PROPOSED CONTOUR
- 6520 EXISTING CONTOUR
- PROPOSED FLOW DIRECTION ARROW
- DP DESIGN POINT
- XX-1 BASIN DESIGNATION
- 99.99 / Ac. 99.99 "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)
- 99.99 5-YEAR FLOWRATE
- 99.99 100-YEAR FLOWRATE

NOTES:
1)STORM SEWER SYSTEM CONSTRUCTED PER SORPRESSA LANE STORM SEWER PLANS, DATED MAY 2006 REVISED JULY 2007

ROUTED SURFACE FLOWS
DESIGN POINT SUMMARY

DESIGN POINT	TRIBUTARY SUB-BASINS	Q_5 (cfs)	Q_{100} (cfs)
I1	CW1, CW2	11.6	24.7
I2	DP I1, IN1	18.2	38.1
I3	OS1(fb), DP I2	19.0	43.5
I4	DP I2(fb), IN2	18.5	47.5

REFERENCE DRAWINGS

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\05.206.001\dwg\DRAINAGE\DR01.dwg
PCP: Matrix.ctb
PLOT DATE: Thu Nov 15, 2007 3:33pm
By: gerrit_slatter

BENCHMARK DATA(ELEV.) 6901.818'
(DATUM) FIMS
(DESCRIPTION/LOCATION) SEE RIGHT

BENCHMARK:

FIMS 2" DIAMETER ALUMINUM CAP STAMPED "CSU FIMS CONTROL BG16" ON THE NORTHEAST CORNER OF THE CONCRETE BASE FOR ELECTRIC VAULT #FBBX-1, 260 FEET NORTH OF THE NORTH EDGE OF WOODMEN ROAD.

ELEV: 6901.818'

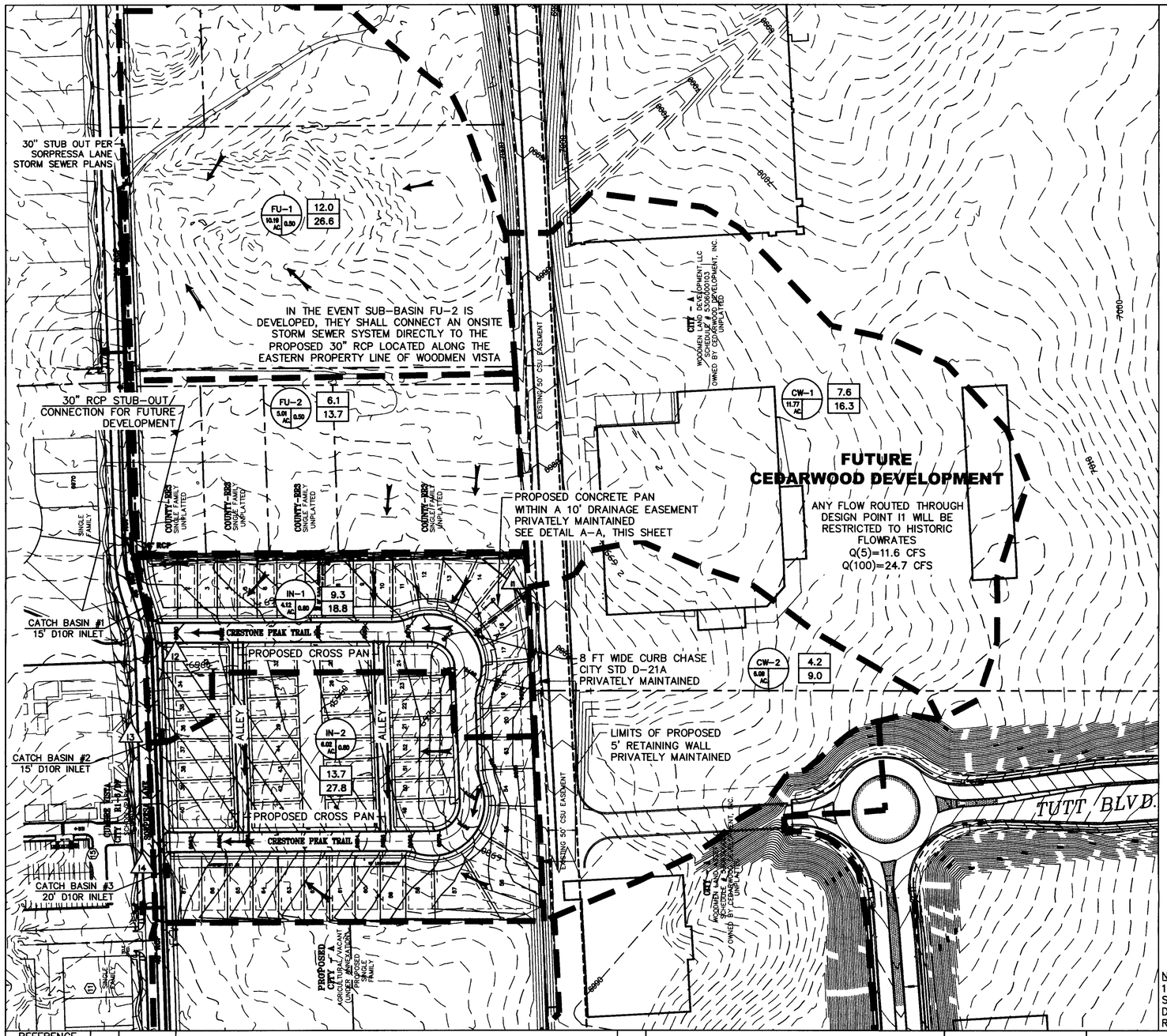
Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

WOODMEN VISTA FILING NO. 1 & 2

FINAL DRAINAGE REPORT

INTERIM DEVELOPED CONDITIONS DRAINAGE MAP

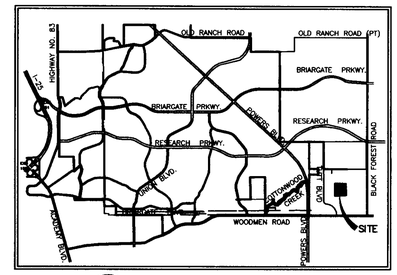
DESIGNED BY: ZDH
DRAWN BY: ZDH
CHECKED BY: GES
SCALE HORIZ: 1"=100' VERT: N/A
DATE ISSUED: JULY 2007
SHEET NO. 1 OF 2 SHEETS
DR01



GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.

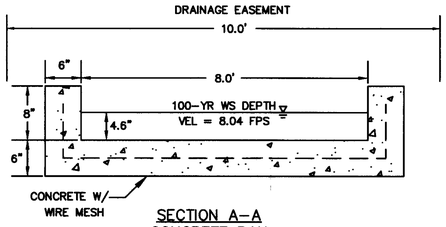


VICINITY MAP

NORTH
N.T.S.

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- DRAINAGE BASIN BOUNDARY
- PROPOSED DIVERSION SWALE
- 6520 PROPOSED CONTOUR
- 6520 EXISTING CONTOUR
- PROPOSED FLOW DIRECTION ARROW
- DP DESIGN POINT
- XX-1 (99.99 Ac 99.99) BASIN DESIGNATION, "C" COEFFICIENT (100 YR), BASIN AREA (ACRES)
- 99.99 5-YEAR FLOWRATE
- 99.99 100-YEAR FLOWRATE



SECTION A-A
CONCRETE PAN
NTS

ROUTED SURFACE FLOWS
DESIGN POINT SUMMARY

DESIGN POINT	TRIBUTARY SUB-BASINS	Q_5 (cfs)	Q_{100} (cfs)
I1	CW1, CW2	11.6	24.7
I2	DP I1, IN1, OS3	18.2	38.1
I3	OS1(fb), DP I2	19.0	43.5
I4	DP I2(fb), IN2	18.5	47.5

NOTES:
1)STORM SEWER SYSTEM CONSTRUCTED PER SORPRESSA LANE STORM SEWER PLANS, DATED MAY 2006 REVISED JULY 2007

REFERENCE DRAWINGS

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\05.206.001\dwg\DRAINAGE\DR02.dwg
PCP: Matrix.ctb
PLOT DATE: Thu Nov 15, 2007 3:12pm
By: gerrit_slatter

BENCHMARK DATA(ELEV.) 6901.818'
(DATUM) FIMS
(DESCRIPTION/LOCATION) SEE RIGHT

BENCHMARK:

FIMS 2" DIAMETER ALUMINUM CAP STAMPED "CSU FIMS CONTROL BG16" ON THE NORTHEAST CORNER OF THE CONCRETE BASE FOR ELECTRIC VAULT #FBBX-1, 260 FEET NORTH OF THE NORTH EDGE OF WOODMEN ROAD.

ELEV: 6901.818'

Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

WOODMEN VISTA FILING NO. 1 & 2

FINAL DRAINAGE REPORT

FUTURE DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY: ZDH
DRAWN BY: ZDH
CHECKED BY: GES

SCALE
HORIZ: 1"=100'
VERT: N/A

DATE ISSUED: JULY 2007

SHEET NO. 2 OF 2 SHEETS

DR02