STRATTON FOREST

Master Development Drainage Plan

November, 1998
Revised: January, 1999
Revised: March, 1999
Revised: December, 1999

Prepared for:

Stratton Forest II LLC
6385 Corporate Center Drive, Suite 200
Colorado Springs, Colorado 80919

Prepared by:

Rockwell-Minchow Consultants, Inc.
2928 Straus Lane, Suite 100
Colorado Springs, CO 80907
475-2575

Project# 98-027

MASTER DEVELOPMENT DRAINAGE PLAN
for

STRATTON FOREST

DRAINAGE PLAN STATEMENTS

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 of Colorado Springs for drainage reports, and said drainage report is in conformity with the Development Basin Planning Study for the drainage basins. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Kent D. Rockwell, P.E.

COLORADO REGISTERED KENT D. ROCKWELL 25086 PROFESSIONAL ENGINEER 1/19/00

DEVELOPER'S STATEMENT

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

STRATTON FOREST II LLC

BY: _____ DATE 1/11/00

TITLE: Land Dev. Manager

ADDRESS: 6385 Corporate Center Drive, Suite 200
Colorado Springs, CO 80919

CITY OF COLORADO SPRINGS

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

CITY ENGINEER

1/21/00
DATE

STRATTON FOREST

MASTER DEVELOPMENT DRAINAGE PLAN

GENERAL LOCATION AND DESCRIPTION

The proposed Stratton Forest Development is located within El Paso County, Colorado, just southwest of the Cresta Road and Preserve Drive intersection. The site contains approximately 102.8 acres and lies within Sections 26 and 27, Township 14 South, Range 67 West of the 6th Principal Meridian (see Exhibit 1). The site is bounded on the west by Gold Camp Road, on the south and east by undeveloped park land, and on the north by developed and a soon to be developed residential development. Cheyenne Mountain High School is located approximately 900 feet to the east of the site.

The majority of the site drains to the east and northeast at slopes of 7% to 25% in its existing condition. The ground cover on the site consists of dense forest land. Several deep swales traverse the site carrying flows from west to east.

The northern one-third of the site lies in the Bear Creek Drainage Basin and the southern two-thirds of the site is within the Southwest Area Drainage Basin. The portions within the Southwest Area Basin are primarily within subbasins III-A-1 and III-A-2 of the DBPS.

SOILS DESCRIPTION

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the soils in the Stratton Forest Development fall under two classifications (see Exhibit 2). The soils in the eastern portion of the site are classified as the Chaseville series (Soil Type 17) and fall under Hydrologic Group A. The soils in the western portion of the site along Gold Camp Road are classified as Kutler-Broadmoor-Rock outcrop complex. The Kutler series is classified as a Hydrological Group C soil.

FLOOD PLAIN STATEMENT

The site is not located within a designated 100 year flood hazard area, as depicted on FIRM Community Panel Numbers 08041C736 F and 08041C725 F.

REFERENCES and MAPPING

Listed below are the reports reviewed as part of preparation of this study:

"Southwest Area Planning Study", prepared by Lincoln-De-Vore, dated 1984.

"Development Basin Planning Study for Bear Creek Basin", Prepared by Kiowa Engineering Corporation, not yet adopted.

"Master Development Drainage Plan Myron Stratton Home - Skyway Property", prepared by Nolte and Associates, Inc., revised December, 1996.

"Detention Pond Analysis, The Jefferson at Cheyenne Mountain", prepared by Kimley-Horn and Associates, Inc., dated November, 1998.

"Stratton Preserve Preliminary Drainage Plan and Report", prepared by Rockwell-Minchow Consultants, Inc., dated February, 1996.

"Preliminary and Final Drainage Plan and Report for The Village at Stratton Preserve Filing No. 1", prepared by Rockwell-Minchow Consultants, Inc., revised February, 1997.

"Master Development Drainage Plan, Cheyenne Mountain High School Campus", prepared by Kiowa Engineering Corporation, March, 1998.

2 foot contours are from Colorado Springs Utilities, FIMS mapping.

DRAINAGE CRITERIA

The current City of Colorado Springs/El Paso County Drainage Criteria was utilized in this report. Calculations were performed to determine runoff quantities during the 5 year and 100 year frequency storms for historic and developed conditions using the Rational Method as required for basins containing less than 100 acres.

HISTORIC DRAINAGE PATTERNS

This portion of the report analyzes the historic runoff for the proposed development, including off-site flows entering the site. The site has been divided into four (4) historic drainage basins to define the historic drainage patterns and drainage flows generated from this site and the surrounding upstream tributary areas. The enclosed Historic Drainage Plan (Exhibit 3) graphically depicts these basins. Coefficients used for the historic runoff calculations varied with the different soils areas.

Subbasins Historic (Hist-1) - 1, 2, & 3 are all within the Bear Creek Drainage Basin. Hist-1 is located at the northwest corner of the project. This 27.7 acre subbasin runs to the southeast then to the northeast in a well defined natural drainage swale. The 5 year and 100 year flows for this area are 23.2/60.0 cfs respectively. The flows continue to the northeast across future Pegasus to Constellation Drive. Runoff from the west side of Gold Camp drains to the north due to the superelevation of Gold Camp. There are no visible culvert crossings under the road.

Hist-2 is a small 2.1 acre subbasin along the north property line of the development. The 5/100 year flows are 1.7/4.3 cfs. Installation of the proposed roadway redirects this small area into Hist-3.

Hist-3 is 16.8 acres west of Stratton Preserve Subdivision. The 5/100 year flows of 12.6/32.3 cfs exit the property in a natural drainage swale and travels to the northeast to an existing 42" RCP in Brantfeather Grove. This location is shown as DP-10 in the Stratton Preserve Drainage Report.

Hist-4 is 99.5 acres in the Southwest Area Basin. The runoff from this subbasin travels east from Gold Camp Road in natural drainage swales to the west side of Cheyenne Mountain High School. The 5/100 year flows from this area are 67.3/173.0 cfs respectively. The report for Cheyenne Mountain High School show flows for this basin being 49/130 cfs. There is an existing 36" RCP at this location that was installed as part of the High School improvements. The current inlet condition allows for approximately 45 cfs to enter the pipe and the remaining flows cross the new practice field and go through the High School grounds as described in the report by Kiowa Engineering.

DEVELOPED DRAINAGE PATTERNS

This portion of the report analyzes the developed runoff for the proposed development, including off-site runoff entering the site. The drainage basins affecting this site are depicted on the enclosed Developed Drainage Plan (Exhibit 4 & 5). The proposed development of Stratton Forest is to consist of 38 residential lots ranging from 1.6 acres to 5.0 acres and approximately 7200 linear feet of private streets. The project will be constructed in three or four subdivision filings. Final drainage reports will be submitted with each filing.

To determine the on-site runoff coefficients, an approximate house location was determined for each lot. Twelve thousand square feet of impervious area was utilized for each on-site residential lot and approximate house location. On those lots where the house could be within two different basins, the impervious area was included in each of the basin runoff calculations.

Upon development of Stratton Forest, Basin Dev-1 will consist of 6.7 acres that begins at Gold Camp Road and travels to the southeast to end of proposed Stratton Forest Heights. The 5/100 year flows of 9.1/24.6 cfs will cross under Stratton Forest Heights through a 24" RCP into Basin Dev-2.

Basin Dev-2 is 15.6 acres in size on the south side of Stratton Forest Heights. This basin begins at Gold Camp Road and runs to the northeast in natural drainage swales. The 5/100 year flows of 15.0/36.7 cfs combine with the flows from Dev-1 at Design Point (DP-1) just west of Stratton Woods View. The combined flows of 22.4/55.7 cfs will travel under Stratton Forest Heights in a 36" RCP and outlet at the same location as Historic Basin Hist-1. The developed peak flows entering the drainage swale are slightly less than the historic due to a reduction of 5.1 acres of land in the tributary basin.

Basin Dev-3 is 10.1 acres in size and includes approximately 7 acres on the north side of Stratton Forest Heights along with a portion of Stratton Forest Heights and Stratton Woods View. The runoff from this basin flows from west to east to a low point in Stratton Forest Heights between Lots 29 and 32. The 5/100 year flows of 14.9/31.1 cfs will be picked up by two 6' sump inlets. An 18" RCP will carry the flows under Stratton Forest Heights then outlet by a 24" RCP to combine with flows from Basins Dev-4 and Dev-5.

Basin Dev-4 is 3.2 acres of open space that begins at Stratton Woods View and travels east to a proposed driveway crossing for Lot 25. The 5/100 year flows of 3.3/8.4 cfs will travel through a 15" RCP and combine with the 4.4/10.3 cfs from Basin Dev-5 at DP-2(A). The combined flows of 7.8/18.6 cfs will travel under Stratton Forest Heights in a 24" RCP, outlet into a natural swale on Lot 32. The combined flows at the outlet of the two 24" pipes (DP-2B) are 21.0/46.0 cfs.

Basin Dev-6 is 4.3 acres at the northwest corner of The Stratton Preserve. The 5/100 year flows of 5.3/12.2 cfs combine at the property line with the flows from DP-2B and exit the site in a natural drainage swale (DP-3). The total flows of 24.0/53.6 cfs are higher than the historic flows of 12.6/32.3 cfs. These higher flows were accounted for in the design of the 42" storm sewer system in Brantfeather Grove (DP-10). A letter of permission will be obtained from the adjacent land owner and the owner of the private system in Brantfeather Grove with the final report for this area.

Basin Dev-18 is 2.2 acres along the west boundary of The Stratton Preserve. The 5/100 year flows of 3.0/6.8 cfs sheet flow to the east.

The following basins Dev-7 through Dev-17 are within the Southwest Area Drainage Basin. Basin Dev-7 begins at Gold Camp Road. The flow from this 6.9 acre basin travel to the northeast to a 15" RCP crossing under Stratton Woods View. The 5/100 year flows of 7.1/15.0 cfs then combine with the 8.9 acre Basin Dev-8 at Stratton Forest Heights. The combined flows at this point of 15.6/32.2 cfs will cross under Stratton Forest Heights in a 24" RCP.

Basin Dev-9 is a portion of Lot 28, Lot 29, and the north half of Stratton Woods View. The 5/100 year flows of 9.2/17.9 cfs from this basin are picked up in two 4' sump inlets in Stratton Forest Heights. The flows will be conveyed to the east by a 24" RCP mentioned above. The total combined flows of 21.7/44.8 cfs are outlet into the natural drainage swale on Lot 33 (DP-4B).

Basin Dev-10 begins at DP-4 and continues east to a proposed 42" RCP under Stratton Forest Heights. The 15.9 acre basin is primarily open space and includes a portion of The Stratton Preserve form the north. The combined flows from Dev-10 and DP-4 at Stratton Forest Heights are 33.8/74.1 cfs. The flows will be picked up by a 36" RCP then travel east to connect with a 48" RCP at DP-5.

Basin Dev-12 is 9.1 acres in size beginning at Gold Camp Road. The 5/100 year flows of 7.4/19.2 cfs combine with Basin-13 at DP-7. The combined flows of 18.5/44.7 cfs will enter a 24" RCP at Stratton Forest Heights and travel east in the pipe to DP-8 where the flows from Basin Dev-15 enter the system. The combined flows of 33.7/81.5 cfs will continue east in a 30" RCP to DP-5, the low point in Stratton Forest View. The 30" RCP will connect with the 36" RCP under Stratton Forest Heights and outlet with a 48" RCP. A dissipation structure will be constructed at the outlet before it enters the park property.

Basin Dev-14 is a portion of Lot 11 together with the south half of Stratton Woods View and the south half of Stratton Forest Heights, east of Stratton Woods. The 6.7 acre basin has 5/100 year flows of 9.9/21.3 cfs at the low point in Stratton Forest Heights. These flows will be picked up by an 8' sump inlet.

Basin Dev-11 is a portion of Lot 34 together with a portion of Lot 23 from The Stratton Preserve, the west half of Preserve Drive and the north half of Stratton Forest Heights. The 5.9 acre basin has 5/100 year flows of 10.9/22.6 cfs at the low point in Cynthia Grove. An 8' sump inlet will be constructed across from the inlet for Dev-14 to pick up the flows. A 24" RCP will convey the combined street water to the 42" RCP under Stratton Forest Heights.

Runoff from Basins Dev-16 and Dev17 merge in the natural channel east of Stratton Forest Heights and continue east to the High School property. The combined developed flows at the existing 36" pipe are 85.4/196.8 cfs. These flows are approximately 11 percent higher than those of Historic Basin 4. The 5/100 year flows from the Cheyenne Mountain High School report are 49/130 cfs. A collection box will be constructed at the existing 36" RCP. The flows will be split approximately 40 cfs entering the 36" pipe and 156 cfs going into a new 48" RCP outfall. The 48" RCP outfall will be constructed around the north side of the high school to the existing 9'x8' corrugated arch under Crest Road. A dissipator will be installed at the outlet of the 48" pipe. A letter from the Cheyenne Mountain School District is included in the Appendix. A drainage and access easement will be provided to the City by the School District with the final construction plans.

DRAINAGE FACILITIES

The anticipated drainage facilities required for Stratton Forest based on preliminary calculations are listed below. Additional analysis will be performed as part of the Stratton Forest Final Drainage Reports to determine the actual size requirements. Facilities proposed for this development are separated into two categories, Public - reimbursable, and Private - non-reimbursable. All facilities within the Bear Creek Basin are private due to the private streets. The facilities within the Southwest Area Basin located in private streets are private and non-reimbursable. The facilities located in the public streets and across the High School are public and reimbursable. All private drainage facilities and private streets will be owned and maintained by a property owners association to be created when platting occurs.

BEAR CREEK BASIN:
PRIVATE - non-reimbursable:

Item	Quantity	Unit Cost	Total Cost
1. 15" RCP	125 L.F.	$20.00/lf	$ 2,500.00
2. 18" RCP	30 L.F.	$24.00/lf	720.00
3. 24" RCP	280 L.F.	$30.00/lf	8,400.00
4. 36" RCP	100 L.F.	$45.00/lf	4,500.00
5. 6' Inlet	2 Ea.	$3,000.00/ea	6,000.00
6. Rip rap	130 SY.	$35.00/sy	4,550.00
		Subtotal	26,670.00
		Engineering & Contingency (20%)	5,334.00
		TOTAL	$ 32,004.00

SOUTHWEST AREA BASIN:
PRIVATE - non-reimbursable:

Item	Quantity	Unit Cost	Total Cost
1. 15" RCP	415 L.F.	$20.00/lf	$ 8,300.00
2. 18" RCP	325 L.F.	$24.00/lf	7,800.00
3. 24" RCP	1,145 L.F.	$30.00/lf	34,350.00
4. 30" RCP	1,035 L.F.	$35.00/lf	36,225.00
5. 36" RCP	100 L.F.	$50.00/lf	5,000.00
6. 4' Inlet	2 Ea.	$2,600.00/ea	5,200.00
7. RipRap	100 SY	$35.00/SY	3,500.00
8. Manholes	5 Ea.	$2,500.00/ea	12,500.00
		Subtotal	112,875.00
		Engineering & Contingency (15%)	16,931.25
		TOTAL	$ 129,806.25

PUBLIC - reimbursable:

Item	Quantity	Unit Cost	Total Cost
1. 24" RCP	120 L.F.	$30.00/lf	$ 3,600.00
2. 8' Inlet	2 Ea.	$3,300.00/ea	6,600.00
3. 48" RCP	920 L.F.	$100.00/lf	92,000.00
4. Collection Box	1 Ea.	$15,000.00/ea	15,000.00
5. Dissipater	1 Ea.	$12,600.00/ea	12,600.00
6. Manholes	2 Ea.	$4,500.00/ea	9,000.00
		Subtotal	138,800.00
		Engineering & Contingency (15%)	20,820.00
		TOTAL	$ 159,620.00

DRAINAGE FEES

The Stratton Forest development lies within two major drainage basins. The Bear Creek Drainage Basin has approximately 42.4 acres and the remaining 60.4 acres lies within the Cheyenne Run of the Southwest Area Drainage Basin. The 2000 drainage and bridge fees are shown below. The actual fee for each final plan will be used at time of platting.

Bear Creek Basin:

Drainage Fee - 42.4 acres @ $2,123.00 = $90,015.20
Bridge Fee - 42.4 acres @ $199.00 = $8,437.60

Southwest Area Basin:

Drainage Fee - 60.4 acres @ $7,182.00 = $433,792.80
Bridge Fee - No Fee

EROSION CONTROL

The areas outside of the proposed streets that are disturbed during construction will be revegetated. Hay Bales and rip-rap pads will be placed at the ends of phasing lines to prevent downstream erosion.

Hay bales will be placed at each of the Design Points during the time of construction to limit sediment discharging onto the natural drainage swales.

CONCLUSION

The development of single family lots within this development will only increase the runoff quantities above the historic rates from 0 to 11 percent. During the review of this development, detention was considered at the roadway crossings of the drainage ways. Due to the steepness of the terrain, there was not adequate storage volume at the roadway crossings to create detention without a tremendous amount of grading taking place.

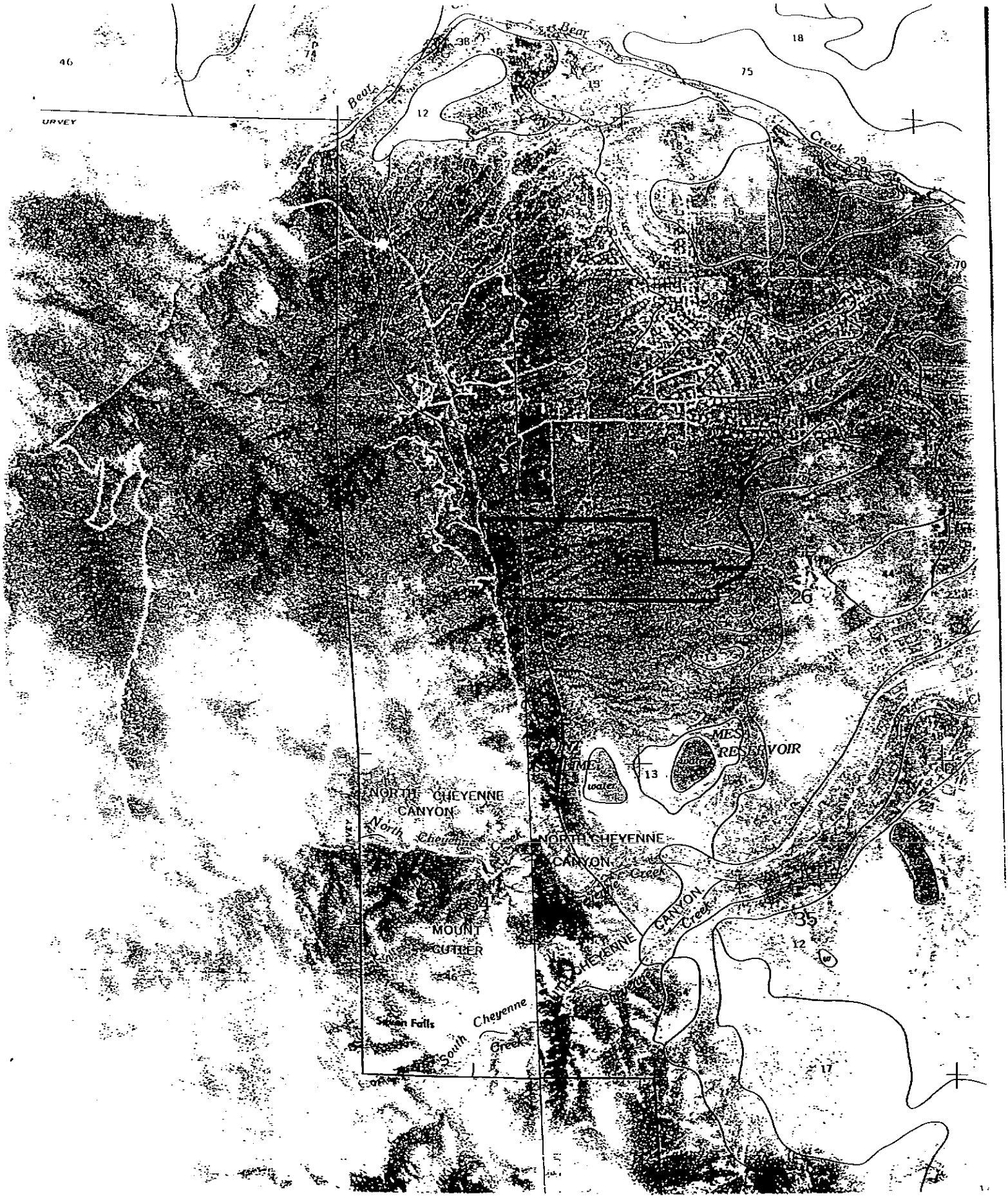
The Master Development Drainage Plan for the Myron Stratton Home - Skyway Property discussed the need for detention above the Cheyenne Mountain High School. With the Parks Department purchase of the Stratton Land, there is adequate capacity in the existing J.P.I. detention pond to accept developed flows from this development. The approved report by Kimley-Horn Associates discusses reducing the volume of the J.P.I. detention pond from 55.3 acre-ft to 54.55 acre-ft due to the Stratton Property becoming park land and not being developed. The report further states that the reduced volume of the pond (54.55 ac-ft) would be adequate in size to handle the fully developed scenario of the property (50.8 ac-ft).

The DBPS for the Southwest Area Basin, Prepared by Lincoln DeVore shows a roadway crossing and concrete lined channel from Preserve Drive (Road A) east to the existing crossing under Cresta Road as being a public – reimbursable system. In accordance with the City Park Board decision, the reach from Preserve Drive east to the High School will remain a natural channel with a $50,000 maintenance endowment being paid to the City Parks Department at the time of preliminary acceptance of the outfall storm system. The reach from the park to Cresta will be piped through the school property. A public drainage and access easement will be obtained from School District 12 prior to construction. The Drainage Board approved this system as being reimbursable.

APPENDIX

Vicinity Map

Exhibit 1



Soils Map

Exhibit 2

May 20, 1999

HAND DELIVERED
Mr. Larry Peifer
Cheyenne Mountain School District 12
1118 W. Cheyenne Rd.
Colorado Springs, CO 80906

RE: Proposed Letter of Understanding on Storm Sewer

Dear Larry:

Enclosed herewith please find the following items: (i) Memorandum dated May 18, 1999 from Dennis Minchow to you on behalf of Cheyenne Mountain School District 12 (the "Memo") and (ii) Schematic plan view drawing of the proposed storm sewer and accompanying improvements dated May 18, 1999 prepared by Rockwell Minchow Consultants, Inc (the "Plan").

Please accept this letter and the accompanying attachments as a Letter of Understanding between Elite Properties of America, Inc. d/b/a Classic Homes and the School District upon the following terms and conditions:

1. School District 12 shall agree to grant to the City of Colorado Springs the easements necessary to construct the storm sewer depicted in the Plan. It is acknowledged and agreed that the Plan represents a schematic drawing only, and that final construction drawings shall be prepared by Rockwell Minchow and coordinated with you on behalf of School District 12 and the City of Colorado Springs.

2. In consideration of the School District granting the easements, Classic Homes agrees as follows:

   A. To construct and install all improvements described in the Memo and the Plan. The work shall be accomplished in a good and workmanlike manner in compliance with the published standards of the City of Colorado Springs in effect upon the date of commencement of the work.

   B. To restore all District property disturbed by Classic Homes in connection with performing the work as nearly as possible to the condition and grade that existed prior to performing the work. The restoration shall include, without limitation, replacement of disturbed natural and turf grass; repair of fencing, sprinkler system, utilities and any disturbed asphalt or concrete.

   C. To provide the District with a two year warranty against any construction defects applicable to the work. This warranty is longer than the one year warranty which is typically required for this type of work.

   D. To coordinate the construction work with your office to ensure that the work is completed without disruption to the football practice field schedule. It is our understanding that the work must either: (i) be completed by July 15, 1999, or, (ii) if this schedule is not feasible, be commenced after November, 1999, in order to allow the use of the practice field for football purposes.

888 Garden of the Gods Road, Suite 200
Colorado Springs
Colorado, 80907

Tel: 719.592-9333

E. To backfill the top 12" of any construction trench lying under the parking lot with not less than 12" of material known as "flowable fill". The flowable fill material is a lean high slump concrete that will minimize the chances of settlement.

3. Under this proposal, Classic Homes would not be obligated to provide any further compensation or remuneration to the School District for granting of the easement, as both parties recognize that the District will receive several benefits from the work described above and in the Plan and Memo. The benefits to the District include the following:

A. The high school storm sewer system capacity will be increased; thereby resulting in a reduced probability of storm damage to the buildings in the event of a major storm.

B. The construction work shall include an addition to the existing 36" pipe south of the main construction that will aid in solving an existing drainage problem from that sub-basin.

C. The construction work shall include a sub-system to the north of the main construction that will intercept drainage that currently flows onto the practice field.

D. The construction work shall also include an asphalt emergency turn around where none presently exists.

E. The construction work shall include installation of an area inlet, and installation of an inlet at the west side and northeast corner of the affected parking lot and agrated manhole cover to further facilitate water flows in these areas.

4. Classic Homes and the District acknowledge and agree that the obligation of Classic Homes to perform the work described above is conditioned upon Classic Homes and the District agreeing upon the final plans and specifications applicable to the work. The obligations are further conditioned upon Classic Homes and the City of Colorado Springs successfully agreeing upon terms and conditions acceptable to Classic Homes relative to the drainage requirements applicable to the City property located to the immediate west of the high school site. In the event that either of the two conditions are not satisfied, Classic Homes shall be under no obligation to perform the work described under this Letter of Understanding.

Larry, we appreciate the work which you and the Board members have undertaken in connection with trying to reach an acceptable resolution to this issue. We would appreciate an opportunity to present this proposal to the full School Board at their earliest convenience. Please contact me if you have any questions concerning this proposal.

Regards,

Douglas M. Stimple
President

ACKNOWLEDGMENT

School District 12 hereby acknowledges that it has read, considered and accepted the above Letter of Understanding upon the terms and conditions outlined herein.

By:_____

Its: Authorized Agent

CHEYENNE MOUNTAIN SCHOOL DISTRICT 12

May 26, 1999

Classic Homes
Attn: Doug Stimpie
888 Garden of the Gods Rd. Suite 200
Colorado Springs, CO 80906

Post-it® Fax Note 7671	Date 5/27/99	# of pages ▶
To Doug Stimpie	From L. Pazdan	
Co./Dept.	Co.	
Phone #	Phone #	
Fax # 457-1023	Fax #	

Dear Doug:

Pursuant to your Letter of Understanding dated May 20, 1999 we are notifying you that the Board of Education approved the Rockwell Minchow Consultants, Inc. schematic plan for storm sewer improvements dated May 18, 1999. This approval incorporates your May 20 correspondence, Rockwell Minchow Consultants, Inc. memorandum dated May 18,1999 the aforementioned "Stratton Forrest Outfall Storm-Cheyenne Mountain" plans as well as the following modifications and provisos:

- The proposed storm sewer pipe will be enlarged from 42" to 48".
- The 1,200 sq. ft. asphalt emergency turn around pad will be 6 inches deep with 6 inches of base material below the asphalt.
- All disturbed areas will be compacted to a minimum of 95% standard proctor at a moisture content of plus or minus 2% of optimum. Classic will reimburse the district for compaction, asphalt and concrete testing.
- All non-sodded areas which are disturbed will be revegitated with a wood cellulose hydro-mulch and Dryland Seed mix. "Foothill Mix" available at Arkansas Valley Seed Company (303) 320-7500 or approved equal. This seed mix is to be mechanically drill seeded at a rate of 20 lbs per acre.

Doug, Cheyenne Mountain School District thanks you for your commitment to be an exemplary community partner by providing these enhancements to our district and the local area.

Sincerely,

Larry J. Peifer
Director of Business Affairs

cc: H. Else
E. Wangelin
P. Martin
J. Mayerl

TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B* Sandy	10 C&D* Clay	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

ROCKWELL MINCHOW
CONSULTANTS, INC.

STRATTON FOREST
PRELIM. DRAINAGE
DATE PAGE of

ASSUMPTIONS FOR RUN OFF

OPEN SPACE - USE SAME AS HISTORIC
$C_5 = 0.25$ $C_{100} = 0.35$

ROADWAY + $C_5 = 0.90$ $C_{100} = 0.95$

DEVELOPED CONDITION =

BUILDING LOCATIONS HAVE APPROXIMATED BY DEVELOPMENT PLAN. WILL USE 12,000 SF OF IMPERVIOUS AREA FOR EACH SITE.

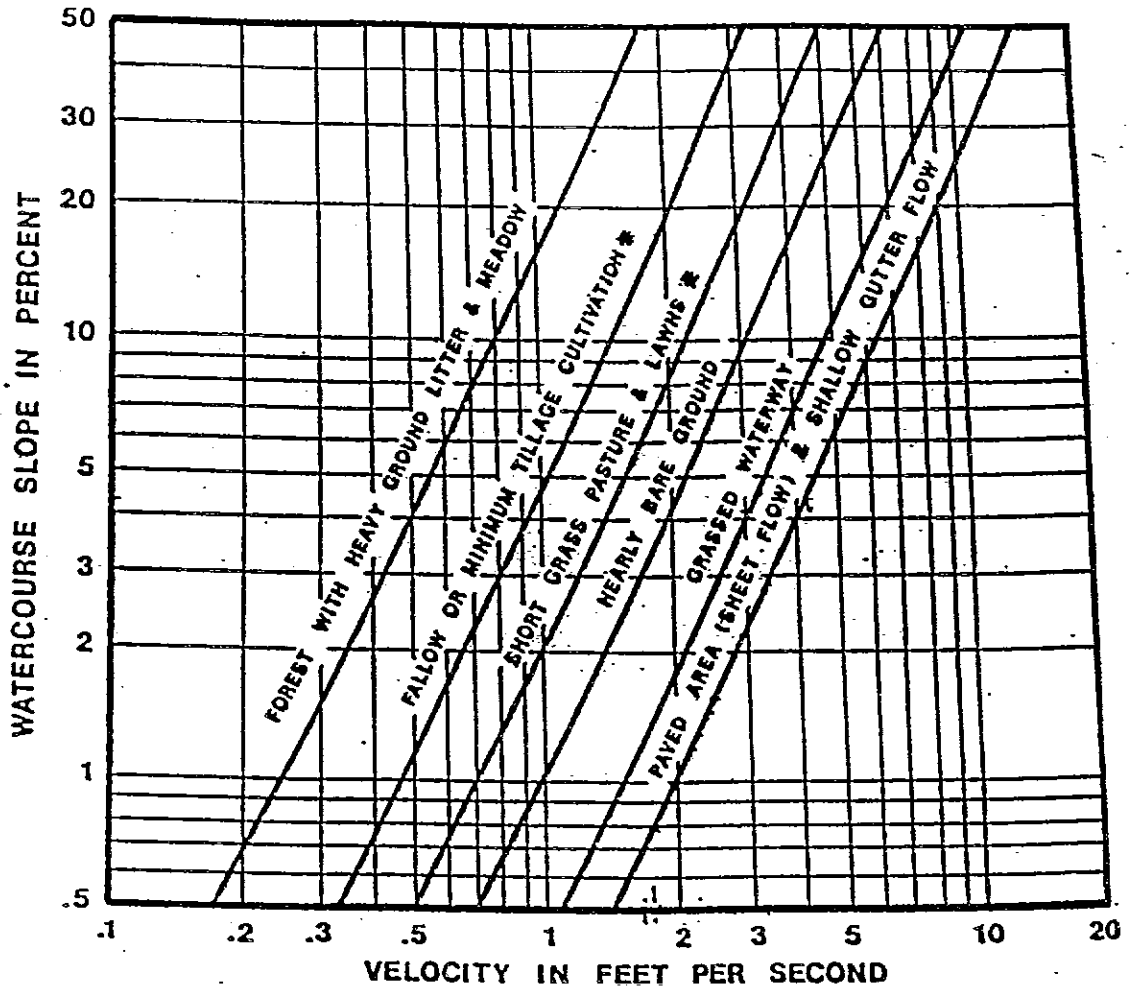
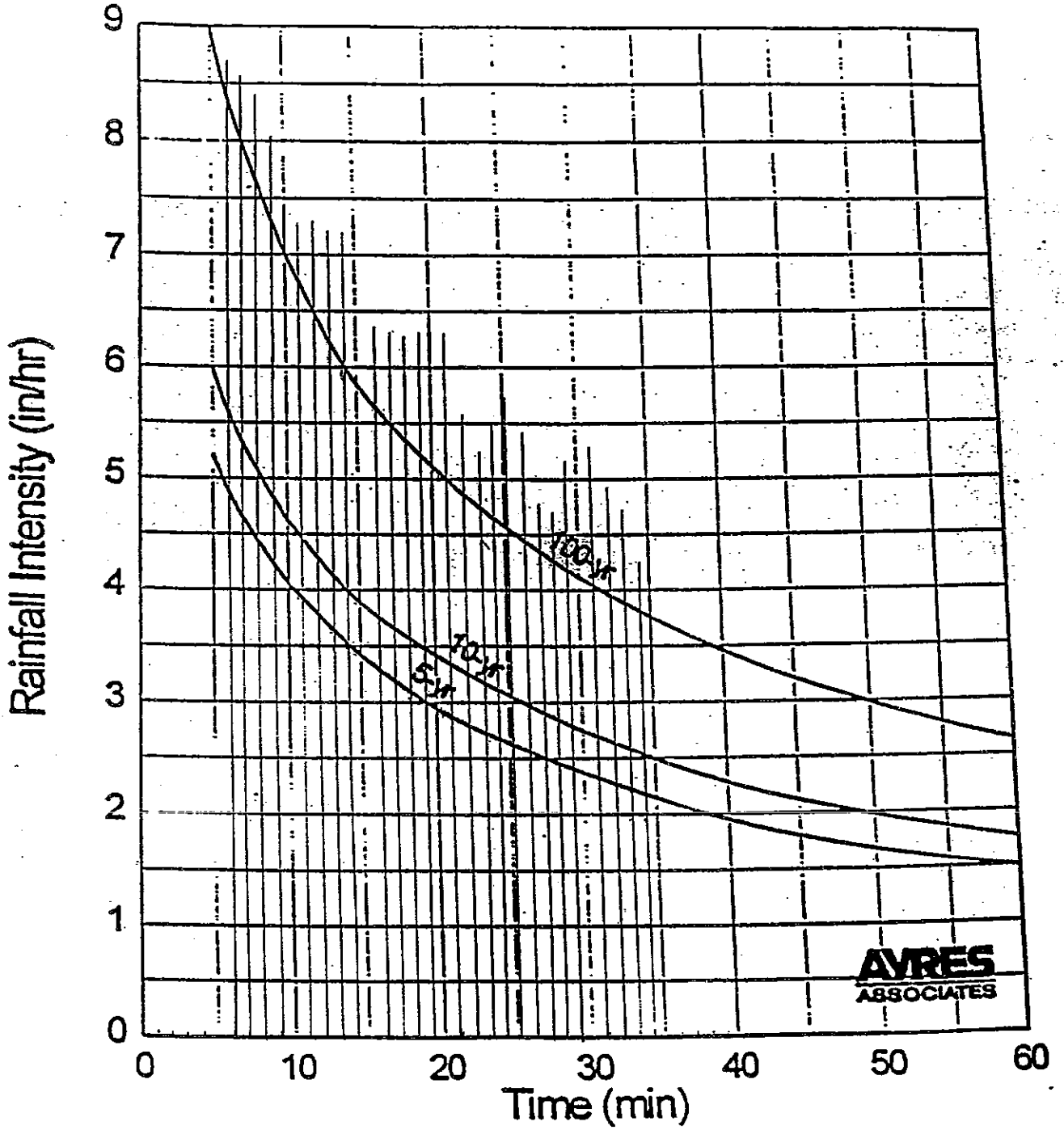


FIGURE 3-2. ESTIMATE OF AVERAGE FLOW VELOCITY FOR USE WITH THE RATIONAL FORMULA.

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

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



Interim Release October 12, 1994 , Rainfall Intensity Curves
City Of Colorado Springs Drainage Criteria Manual

2000 DRAINAGE, BRIDGE AND POND FEES -- CITY OF COLORADO SPRINGS

Code No.	Basin Name		Drainage Fee/Acre	Bridge Fee/Acre	Pond Fees/Acre	
					Land	Facilities
01	Sand Creek	1995	$6,394.00	$381.00	$414.00	$1426.00*
02	Spring Creek	1977	$5,689.00			
03	Templeton Gap	1977	$3,751.00	$41.00		
04	Douglas Creek	1981	$6,899.00	$152.00		
05	19th Street	1964	$2,161.00			
06	Pope's Bluff	1976	$2,197.00	$375.00		
07	Camp Creek	1964	$1,216.00			
08	Peterson Field	1984	$6,929.00	$321.00		
09	South Rockrimmon	1976	$2,579.00			
10	Pulpit Rock	1968	$3,637.00			
11	Dry Creek	1966	$3,128.00			
12	North Rockrimmon	1973	$3,300.00			
13	Cottonwood Creek	1994	$5843.00 - $6573.00	$294.00 - $582.00	$116.00	$354.00
14	Miscellaneous	n/a	$6,384.00			
15	Mesa	1986	$5,736.00			
16	21st Street	1977	$3,300.00			
17	Bear Creek	1980	$2,123.00	$199.00		
18	Southwest Area	1984	$7,182.00			
19	Windmill Gulch	1991	$7,554.00	$153.00	$1,406.00	
20	Black Squirrel Creek	1989	$7,523.00	$859.00	$361.00	
21	Monument Branch	1987	$5,067.00		$408.00	
22	Middle Tributary	1987	$3,750.00		$515.00	
23	Little Johnson	1988	$7,166.00		$565.00	
25	Big Johnson, Crews	1991	$8,213.00	$674.00	$110.00	
26	Fishers Canyon	1991	$6,880.00		$544.00	

Notes for 2000 Fees:

All Drainage, Bridge and Detention Pond Facility Fees are increased by 3% over 1999; 1/00 City Council Resolution

Land Fees are based on the Park Land Dedication Fee of $35,280.00 per acre for 2000.

1999 Sand Creek Drainage Fees were amended by City Council Resolution 1/00

1999 Sand Creek Detention Pond Land Fees were amended by City Council Resolution 8/99

*Detention Pond Surcharge:

Pond #1 (per Springs Ranch/U.S. Home Agreement) = $941.00/acre

Pond #2 (per Ridgeview MDDP) = $714.00/acre

STRATTON FOREST South Sump Inlets

DEV-3

		5 YEAR	100 YEAR		
APPROACH FLOWS (worse case)		7.5 cfs	15.6 cfs	S(x)=	0.02
	d =	0.42 feet	0.55 feet	S(l)=	0.002
				n=	0.016
TOTAL FLOWS		7.5 cfs	15.6 cfs		
	d(max) =	0.27 feet	0.56 feet	L=	6

STRATTON FOREST South Sump Inlets

DEV-9

		5 YEAR	100 YEAR		
APPROACH FLOWS (worse case)		9.2 cfs	17.9 cfs	S(x)=	0.02
	d =	0.45 feet	0.58 feet	S(l)=	0.002
				n=	0.016
TOTAL FLOWS		9.2 cfs	17.9 cfs		
	d(max) =	0.41 feet	0.73 feet	L=	4

STRATTON FOREST South Sump Inlets

DEV-11

		5 YEAR	100 YEAR
APPROACH FLOWS (worse case)		10.9 cfs	22.6 cfs
	d =	0.48 feet	0.63 feet
TOTAL FLOWS		10.9 cfs	22.6 cfs
	d(max) =	0.34 feet	0.67 feet

S(x)=	0.02
S(l)=	0.002
n=	0.016
L=	8

STRATTON FOREST South Sump Inlets

DEV-14

		5 YEAR	100 YEAR
APPROACH FLOWS (worse case)		9.9 cfs	21.3 cfs
	d =	0.46 feet	0.61 feet
TOTAL FLOWS		9.9 cfs	21.3 cfs
	d(max) =	0.31 feet	0.63 feet

S(x)=	0.02
S(l)=	0.002
n=	0.016
L=	8

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc Min.	I	SOIL GROUP	DEV. TYPE	C	BASIN		RETURN PERIOD
		PLANIMETER READING	Ac.	LENGTH	HEIGHT						Q	Cq	
BEAR CREEK	HIST-1		27.7	1750		17.3/15.4	3.1/5.7	B+C	OPEN SPACE + RES.	0.27/0.38	23.2/60.0		5/100
"	HIST-2		2.1	600		16.7/14.7	3.2/5.9	B	OPEN SPACE	0.25/0.35	1.7/4.3		5/100
"	HIST-3		16.8	2200		18.9/17.1	3.0/5.5	B	OPEN SPACE	0.25/0.35	12.6/32.3		5/100
SOUTHWEST AREA	HIST-4		99.5	5400		23.7/22.1	2.7/4.8	B+C	OPEN SPACE	0.26/0.37	69.8/176.7		5/100
BEAR CREEK	DEV-1		6.7	750		10.4/8.5	4.0/7.5	C	OPEN + RESIDENTIAL	0.34/0.49	9.1/24.6		5/100
"	DEV-2		15.6	1600		18.7/16.5	3.0/5.6	B+C	"	0.32/0.47	15.0/36.7		5/100
"	DEV-3		10.1	2850		17.0/15.7	3.2/5.7	B	" + STREET	0.46/0.54	14.9/31.1		5/100
"	DEV-4		3.2	650		15.9/14.0	3.3/6.0	B	OPEN	0.25/0.35	2.6/6.7		5/100
"	DEV-5		3.5	350		11.1/9.8	3.8/7.0	B	OPEN + RES	0.33/0.42	4.4/10.3		5/100
"	DEV-6		4.3	1180		12.7/11.4	3.7/6.6	B	"	0.33/0.43	5.3/12.2		5/100
SOUTHWEST AREA	DEV-7		6.9	1350		11.2/10.6	3.8/6.8	B+C	"	0.27/0.32	7.1/15.0		5/100
"	DEV-8		8.9	1360		11.5/11.0	3.7/6.6	B	"	0.31/0.36	10.2/21.1		5/100
"	DEV-9		2.4	1450		5.8/4.8	5.0/9.0	B	" + STREET	0.77/0.83	9.2/17.9		5/100

HYDROLOGIC COMPUTATION BASIC DATA
RATIONAL METHOD Q=CIA

PAGE 1 OF 3

ROCKWELL MINCHOW CONSULTANTS INC.

PROJECT: STRATTON FOREST
BY: D. MINCHOW DATE:

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc Min.	I	SOIL GROUP	DEV. TYPE	C	BASIN		RETURN PERIOD
		PLANIMETER READING	Ac.	LENGTH	HEIGHT						Q	Q_p	
SOUTHWEST AREA	DEV-10		15.9	1800		17.1/15.6	3.2/5.7	B	OPEN + RES.	0.30/0.40	15.3/36.3		5/100
"	DEV-11		5.9	1250		12.6/11.4	3.7/6.6	B	OPEN RES STREET	0.50/0.58	10.9/22.6		5/100
"	DEV-12		9.1	1550		20.1/17.6	2.9/5.4	B+C	OPEN + RES	0.28/0.39	7.4/19.2		5/100
"	DEV-13		11.7	1400		16.9/15.0	3.2/5.8	B	"	0.37/0.46	13.9/31.2		5/100
"	DEV-14		6.7	3500		15.7/14.6	3.3/5.9	B	OPEN RES STREET	0.45/0.54	9.9/21.3		5/100
"	DEV-15		20.8	2550		23.4/21.0	2.7/5.0	B	OPEN RES	0.27/0.37	15.2/38.5		5/100
"	DEV-16		5.5	1350		18.2/16.3	3.1/5.6	B	OPEN	0.25/0.35	4.3/10.8		5/100
"	DEV-17		5.7	1300		15.1/13.6	3.4/6.1	B	OPEN RES	0.33/0.42	6.4/14.6		5/100
BEAR CREEK	DEV-18		2.2	450		12.3/10.9	3.7/6.7	B	OPEN RES	0.37/0.46	3.0/6.8		5/100

HYDROLOGIC COMPUTATION BASIC DATA
RATIONAL METHOD Q=CIA

PAGE 2 OF 3

ROCKWELL MINCHOW

PROJECT: STRATTON FOREST
BY: D. MINCHOW DATE:

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc Min.	I	SOIL GROUP	DEV. TYPE	C	BASIN		RETURN PERIOD
		PLANIMETER READING	AC	LENGTH	HEIGHT						Q	A_p	
BEAR CREEK	DP-1		22.6			18.7/16.5	3.0 / 5.6			0.35 / 0.44	22.4 / 55.7		5 / 100
"	DP-2A		6.7			10.3/9.4	4.0 / 7.1			0.29 / 0.39	7.8 / 18.6		5 / 100
"	DP-2B		16.8			17.0/15.7	3.2 / 5.7			0.39 / 0.48	21.0 / 46.0		5 / 100
"	DP-3		21.1			18.7/17.4	3.0 / 5.4			0.38 / 0.47	24.0 / 53.6		5 / 100
SOUTHWEST AREA	DP-4A		15.8			14.4/13.8	3.4 / 6.0			0.29 / 0.34	15.6 / 32.2		5 / 100
"	DP-4B		18.2			14.4/13.8	3.4 / 6.0			0.35 / 0.41	21.7 / 44.8		5 / 100
"	DP-5A		34.1			19.0/18.4	3.0 / 5.3			0.33 / 0.41	33.8 / 74.1		5 / 100
"	DP-5B		54.2			24.8/22.3	2.6 / 4.8			0.34 / 0.44	47.9 / 114.5		5 / 100
"	DP-5C		88.3			24.8/22.3	2.6 / 4.8			0.34 / 0.43	78.1 / 182.3		5 / 100
"	DP-6A		11.2			25.6/23.7	2.6 / 4.6			0.29 / 0.39	8.4 / 20.1		5 / 100
"	DP-6B		98.5			25.6/23.7	2.4 / 4.6			0.33 / 0.43	85.4 / 196.8		5 / 100
"	DP-7		20.8			23.2/20.7	2.7 / 5.0			0.33 / 0.43	18.5 / 44.7		5 / 100
"	DP-8		41.6			24.1/21.6	2.7 / 4.9			0.30 / 0.40	33.7 / 81.5		5 / 100

HYDROLOGIC COMPUTATION BASIC DATA
RATIONAL METHOD Q=CIA

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ROCKWELL MINCHOW CONSULTANTS, INC.

PROJECT: STRATTON FOREST
BY: D. MINCHOW DATE:

Hydrology

Location: HIST - 1 BEAR CREEK
Area: 22.7 Ac.
Soil or Landuse: B + C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	80
OPEN	0.30	0.45	19
RESIDENCE	0.90	0.95	1

Composite: C5 0.27 C100: 0.38 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
OVERLAND	600	18		14.6	12.7
SWALE	1150	12	7	2.7	2.7
				17.3	15.4

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.1 in/hr I100: 5.7 in/hr

Peak Flow: Q = CIA in cfs

Q5: 23.2 cfs Q100: 60.5 cfs

Hydrology

Location: HIST - 2 BEAR CREEK
Area: 2.1 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	100

Composite: C5 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
OVERLAND	600	13		16.7	14.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.2 in/hr I100: 5.9 in/h

Peak Flow: Q = CIA in cfs

Q5: 1.7 cfs Q100: 4.3 cfs

Hydrology

Location: HIST-3 BEAR CREEK
Area: 16.8 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	

Composite: C5 0.25 C100: 0.35 100%

Time of Concentration: To, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	600	16		15.6	13.8
SWALE	1600	14	8	3.3	3.3
				18.9	17.1

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.0 in/hr I100: 5.5 in/hr

Peak Flow: Q = CIA in cfs

Q5: 12.6 cfs Q100: 32.3 cfs

Hydrology

Location: HIST-4 SOUTHWEST
Area: 99.5 Ac.
Soil or Landuse: B+C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	85
OPEN	0.30	0.45	15

Composite: C5 0.26 C100: 0.37 100%

Time of Concentration: To, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	850	17		20.2	17.5
SWALE	2500	16	8	5.2	5.2
				25.4	22.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.6 in/hr I100: 4.7 in/h

Peak Flow: Q = CIA in cfs

Q5: 67.3 cfs Q100: 173.0 cfs

Hydrology

Location: DEV. - 1 BEAR CREEK
Area: 6.7 Ac.
Soil or Landuse: B + C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.30	0.45	93
EXIST. RES.	0.90	0.95	3
PROP. RES	0.90	0.95	4

Composite: C5 0.34 C100: 0.49 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
OVERLAND	300	18		2.5	2.6
SWALE	450	15	8	0.9	0.9
				10.4	8.5

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 4.0 in/hr I100: 8.5 in/hr

Peak Flow: Q = CIA in cfs

Q5: 9.1 cfs Q100: 24.6 cfs

Hydrology

Location: DEV - 2 BEAR CREEK
Area: 15.6 Ac.
Soil or Landuse: B+C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN - B	0.25	0.35	71
OPEN - C	0.30	0.45	20
RES - (5)	0.90	0.95	9

Composite: C5 0.32 C100: 0.42 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
OVERLAND	1000	20		17.2	15.0
SWALE	600	12	6.5	1.5	1.5
				18.7	16.5

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.0 in/hr I100: 5.6 in/h

Peak Flow: Q = CIA in cfs

Q5: 15.0 cfs Q100: 36.7 cfs

Hydrology

Location: DEV - 3 BEAR CREEK
Area: 10.7 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	68
RES (2.5)	0.90	0.95	7
STREET	0.90	0.95	25

Composite: C5 0.46 C100: 0.54 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	12		11.0	9.7
SWALE	250	15	8	0.5	0.5
GUTTER	2300	12	7	5.5	5.5
				17.0	15.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.2 in/hr I100: 5.7 in/hr

Peak Flow: Q = CIA in cfs

Q5: 14.9 cfs Q100: 21.1 cfs

Hydrology

Location: DEV - 4 BEAR CREEK
Area: 3.2 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	100

Composite: C5 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	650	17		15.9	14.0

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.3 in/hr I100: 6.0 in/h

Peak Flow: Q = CIA in cfs

Q5: 2.6 cfs Q100: 6.7 cfs

Hydrology

Location: DEV - 5 BEAR CREEK
Area: 3.5 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	88
RES. (1.5)	0.90	0.95	12

Composite: C5 0.33 C100: 0.42 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	12		11.0	9.7
SWALE	50	12	6.5	.7	.7
				11.7	9.8

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.8 in/hr I100: 7.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 4.4 cfs Q100: 10.3 cfs

Hydrology

Location: DEV - 6 BEAR CREEK
Area: 4.3 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	87
RES. (2)	0.90	0.95	13

Composite: C5 0.33 C100: 0.43 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	12		11.0	9.7
SWALE	680	12	6.5	1.7	1.7
				12.7	11.4

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.7 in/hr I100: 6.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 5.3 cfs Q100: 12.2 cfs

Hydrology

Location: DEV - 7 SOUTHWEST
Area: 6.9 Ac.
Soil or Landuse: B+C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.30	80
OPEN	0.30	0.35	18
RES (.5)	0.90	0.95	2

Composite: C5 0.27 C100: 0.32 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	2.5		9.3	8.7
SWALE	1050	18	9	1.9	1.9
				11.2	10.6

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.8 in/hr I100: 6.8 in/hr

Peak Flow: Q = CIA in cfs

Q5: 7.1 cfs Q100: 15.0 cfs

Hydrology

Location: DEV - 8 SOUTHWEST
Area: 3.9 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.30	91
RES (3)	0.90	0.95	9

Composite: C5 0.31 C100: 0.36 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	25		8.8	8.3
SWALE	1060	12	6.5	2.7	2.7
				11.5	11.0

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.7 in/hr I100: 6.6 in/h

Peak Flow: Q = CIA in cfs

Q5: 10.2 cfs Q100: 21.1 cfs

Hydrology

Location: DEV-9 SOUTHWEST
Area: 2.4 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	20
RES	0.90	0.95	11
ROAD	0.90	0.95	69

Composite: C5 0.77 C100: 0.83 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	12		4.7	3.9
GUTTER	150	2	2.8	0.9	0.9
				5.8	4.8 min

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 5.0 in/hr I100: 9.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 9.2 cfs Q100: 17.9 cfs

Hydrology

Location: DEV-10 SOUTHWEST
Area: 15.9 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	92
RES (4.5)	0.90	0.95	8

Composite: C5 0.30 C100: 0.40 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	10		12.1	10.6
SWALE	1500	8	5	5.0	5.0
				17.1	15.6

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.2 in/hr I100: 5.7 in/h

Peak Flow: Q = CIA in cfs

Q5: 15.3 cfs Q100: 36.3 cfs

Hydrology

Location: DEV - 11 SOUTHWEST
Area: 5.9 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	61
RES (2.5)	0.90	0.95	21
ROAD	0.90	0.95	18

Composite: C5 0.50 C100: 0.58 100%

Time of Concentration: Tc, In minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc_5	Tc_{100}
Overland	300	12		8.6	7.4
Gutter	1450	9	6	4.0	4.0
				12.6	11.4

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.7 in/hr I100: 6.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 10.9 cfs Q100: 22.6 cfs

Hydrology

Location: DEV - 12 SOUTHWEST
Area: 9.1 Ac.
Soil or Landuse: B+C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	73
OPEN	0.30	0.45	25
RES (.5)	0.90	0.95	2

Composite: C5 0.28 C100: 0.39 100%

Time of Concentration: Tc, In minutes:

Travel Type	L(ft)	s(%)	v (fps)	Tc_5	Tc_{100}
OVERLAND	1000	17		19.0	16.5
SWALE	550	16	8	1.1	1.1
				20.1	17.6

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.9 in/hr I100: 5.4 in/hr

Peak Flow: Q = CIA in cfs

Q5: 7.4 cfs Q100: 19.2 cfs

Hydrology

Location: DEV313 SOUTHWEST
Area: 11.7 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	82
RES (7.5)	0.90	0.95	18

Composite: C5 0.37 C100: 0.46 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	800	16		15.5	13.6
SWALE	600	13	7	1.4	1.4
				16.9	15.0

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.2 in/hr I100: 5.8 in/hr

Peak Flow: Q = CIA in cfs

Q5: 13.9 cfs Q100: 34.2 cfs

Hydrology

Location: DEV-14 SOUTHWEST
Area: 6.7 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	69
RES. (1)	0.90	0.95	4
ROAD	0.90	0.95	27

Composite: C5 0.45 C100: 0.54 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	18		8.1	7.9
GUTTER	3200	11	7	7.6	7.6
				15.7	14.6

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.3 in/hr I100: 5.9 in/h

Peak Flow: Q = CIA in cfs

Q5: 9.9 cfs Q100: 21.3 cfs

Hydrology

Location: DEV - 15 SOUTHWEST
Area: 20.8 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	97
RES (2)	0.90	0.95	3

Composite: C5 0.27 C100: 0.37 100%

Time of Concentration: Tc, in minutes:

Travel Type	L (ft)	s (%)	v (fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	850	12		19.9	17.5
SWALE	1700	16	8	3.5	3.5
				23.4	21.0

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.7 in/hr I100: 5.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 15.2 cfs Q100: 38.5 cfs

Hydrology

Location: DEV - 16 SOUTHWEST
Area: 5.5 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	

Composite: C5 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L (ft)	s (%)	v (fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	600	14		16.3	14.4
SWALE	250	12	6.5	1.9	1.9
				18.2	16.3

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.1 in/hr I100: 5.6 in/h

Peak Flow: Q = CIA in cfs

Q5: 4.3 cfs Q100: 10.8 cfs

Hydrology

Location: DEV - 17 SOUTHWEST
Area: 5.7 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
OPEN	0.25	0.35	88
RES (2.5)	0.90	0.95	12

Composite: C5 0.33 C100: 0.42 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
Overland	300	10		11.8	10.3
SWALE	1,000	8	5	3.3	5.3
				25.1	15.6

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.4 in/hr I100: 6.1 in/hr

Peak Flow: Q = CIA in cfs

Q5: 6.4 cfs Q100: 14.6 cfs

Hydrology

Location: DEV - 18 BEAR CREEK
Area: 2.2 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone		C5	C100	% Area
OPEN		0.25	0.35	81
RES.	1.5	0.90	0.95	19

Composite: C5 0.37 C100: 0.46 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
OVERLAND	300	10		11.1	9.7
SWALE	150	10	2.1	1.2	1.2
				12.3	10.9

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I: 3.7 in/hr I100: 6.7 in/h

Peak Flow: Q = CIA in cfs

Q: 30 cfs Q100: 6.8 cfs

Hydrology

BEAR CREEK (DEV-1 + DEV-2)

Location: DP-1
Area: 22.6 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-1 (6.7)	0.34	0.49	30
DEV-2 (15.6)	0.32	0.42	70

Composite: C5 0.33 C100: 0.44 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
FROM DEV-2				18.7	16.5

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.0 in/hr I100: 5.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 22.4 cfs Q100: 55.7 cfs

Hydrology

BEAR C

Location: DP-2(A) (DEV-4 + DEV-5)
Area: 6.7 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-4 (3.2)	0.25	0.35	48
DEV-5 (3.5)	0.33	0.42	52

Composite: C5 0.29 C100: 0.39 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
FROM DEV 4				9.4	8.5
SWALE	330	12	6.5	0.9	0.9
				10.3	9.4

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 4.0 in/hr I100: 7.1 in/h

Peak Flow: Q = CIA in cfs

Q5: 7.8 cfs Q100: 18.6 cfs

Hydrology

BEAR CREEK

Location: DP-2 (B) (DEV-3, 4, +5)
Area: 16.8 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-3 (10.1)	0.46	0.54	60
DEV-4 (3.2)	0.25	0.35	19
DEV-5 (3.3)	0.33	0.42	21

Composite: C5 0.39 C100: 0.48 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
FROM DEV-3				12.0	15.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.2 in/hr I100: 5.7 in/hr

Peak Flow: Q = CIA in cfs

Q5: 24.0 cfs Q100: 46.0 cfs

Hydrology

BEAR K

Location: DP-3 (DEV-3, 4, 5, + 6)
Area: 21.1 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-3 (10.1)	0.46	0.54	48
DEV-4 (3.2)	0.25	0.35	15
DEV-5 (3.5)	0.33	0.42	17
DEV-6 (4.3)	0.33	0.43	20

Composite: C5 0.38 C100: 0.47 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
FROM DEV-3				12.0	15.7
SWALES	650	12	6.5	1.7	1.7
				18.7	17.4

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.0 in/hr I100: 5.4 in/h

Peak Flow: Q = CIA in cfs

Q5: 24.0 cfs Q100: 53.6 cfs

Hydrology

SOUTHWEST AREA

Location: DP-4(A) (DEV-2 + DEV-8)
Area: 15.8 Ac.
Soil or Landuse: B+C

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-7 (6.9)	0.27	0.32	44
DEV-8 (8.9)	0.31	0.36	56

Composite: C5 0.29 C100: 0.34 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
DEV-7				11.2	10.6
SWALE	1360	13	7	3.2	3.2
				14.4	13.8

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.4 in/hr I100: 6.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 15.6 cfs Q100: 32.2 cfs

Hydrology

SOUTH

Location: DP-4(B) (DEV-7, 8+9)
Area: 18.2 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-7 (6.9)	0.27	0.32	38
DEV-8 (8.9)	0.31	0.36	49
DEV-9 (2.4)	0.77	0.83	13

Composite: C5 0.35 C100: 0.41 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
DP-6(A)				14.4	13.8

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.4 in/hr I100: 6.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 21.7 cfs Q100: 44.8 cfs

Hydrology

Location: DP-5(A)
Area: 34.1 Ac.
Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DP-4(B) (18.2)	0.35	0.41	53
DEV-10 (15.9)	0.30	0.40	47

Composite: C5 0.33 C100: 0.41 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	V(fps)	T_{c_5}	$T_{c_{100}}$
DP-4(B)				14.4	13.8
SHEET	1800	12	6.5	4.6	4.6
				19.0	18.4

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 3.0 in/hr I100: 5.3 in/hr

Peak Flow: Q = CIA in cfs

Q5: 33.8 cfs Q100: 74.1 cfs

Hydrology

Location: DP-5(B)
Area: 54.2 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DP-8 (41.6)	0.30	0.40	77
DEV-11 (5.9)	0.50	0.58	11
DEV-14 (6.7)	0.45	0.54	12

Composite: C5 0.34 C100: 0.44 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	V(fps)	T_{c_5}	$T_{c_{100}}$
DP-8				24.1	21.6
PIPE FLOW	1000	8	25	0.7	0.7
				24.8	22.3

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.6 in/hr I100: 4.8 in/hr

Peak Flow: Q = CIA in cfs

Q5: 47.9 cfs Q100: 114.5 cfs

Hydrology

SOUTHWEST

Location: DP-5C
Area: 88.3 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DP-5A (34.1)	0.33	0.41	39
DP-BB (54.2)	0.34	0.44	61

Composite: C5 0.34 C100: 0.43 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
DP-5B				24.8	22.3

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.6 in/hr I100: 4.8 in/hr

Peak Flow: Q = CIA in cfs

Q5: 78.1 cfs Q100: 182.3 cfs

Hydrology

SOUTHWEST

Location: DP-6A
Area: 11.2 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEV-16	5.5 0.25	0.35	49
DEV-17	5.7 0.33	0.42	51

Composite: C5 0.29 C100: 0.39 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
Tc - DEV-16				21.3	19.4
SWALE	1300	8	5	4.3	4.3
				25.6	23.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.6 in/hr I100: 4.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 8.4 cfs Q100: 20.1 cfs

Hydrology

Location: DP-6 B
Area: 99.5 Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DP-5C (88.3)	0.34	0.43	89
DP-6A (11.2)	0.29	0.39	11

Composite: C5 0.33 C100: 0.43 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	T_{c_5}	$T_{c_{100}}$
DP-6A				25.6	23.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.6 in/hr I100: 4.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 85.4 cfs Q100: 196.8 cfs

Hydrology

Location:
Area: Ac.
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area

Composite: C5 C100: 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: in/hr I100: in/hr

Peak Flow: Q = CIA in cfs

Q5: cfs Q100: cfs

Hydrology

SOUTHWEST AREA

Location: DP-7 (DEU-12 + 13

Area: 20.8 Ac.

Soil or Landuse: B

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEU-12 (9.1)	0.28	0.39	44
DEU-13 (11.7)	0.37	0.46	56

Composite: C5 0.33 C100: 0.43 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
DEU-12				20.1	17.6
SWALE	1400	15	2.5	3.1	3.1
				23.2	20.7

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.7 in/hr I100: 5.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 18.5 cfs Q100: 44.7 cfs

Hydrology

SOUTHWEST AREA

Location: DP-8 (DEU-12, 13, +15)

Area: 41.6 Ac.

Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
DEU-12 (9.1)	0.28	0.39	22
DEU-13 (11.7)	0.37	0.46	28
DEU-15 (20.8)	0.27	0.37	50

Composite: C5 0.30 C100: 0.40 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc_5	Tc_{100}
DP-7				23.2	20.7
PIPE FLOW	900	10	16	0.9	0.9
				24.1	21.6

Tc Total:

Intensity, I (inches/hr) from Fig 5-1

I5: 2.7 in/hr I100: 4.9 in/h

Peak Flow: Q = CIA in cfs

Q5: 33.7 cfs Q100: 81.5 cfs