STORM DRAINAGE STUDY

FOR

CEDAR VILLAGE FIFTH FILING

FORT COLLINS, COLORADO

JULY, 1979
July 25, 1979

Miller Homes, Inc.  
P.O. Box 1007  
Fort Collins, CO 80522  

ATTN: Bruce Miller

Dear Bruce:

Presented herein is a storm drainage report for Cedar Village Filing No. 5, located in the City of Fort Collins. This report conforms to both the subdivision regulations of the City of Fort Collins and the Federal Housing Authority. All calculations pertaining to this report are available upon request at our office.

Please feel free to contact us with your questions or comments.

Very truly yours,

M & I, INC.

Stan A. Myers

[Signature]

James M. Nichols, P.E.-L.S.

SAM/JMN/rb

Enclosures
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>II. Study Area</td>
<td>1</td>
</tr>
<tr>
<td>III. Existing Storm Drainage</td>
<td>1</td>
</tr>
<tr>
<td>IV. Design Criteria and Requirements</td>
<td>2-3</td>
</tr>
<tr>
<td>V. Drainage Plan</td>
<td>3-4</td>
</tr>
<tr>
<td>VI. Conclusions and Recommendations</td>
<td>5</td>
</tr>
</tbody>
</table>

Exhibit No. 1 "Vicinity Map"

Exhibit No. 2 "Design Flows"
I. INTRODUCTION

The purpose of this report is to present the developer with a proposed series of improvements which will provide for proper management of storm water runoff from both the Cedar Village Fifth Filing itself and adjacent contributing basins.

The scope of this report involves an analysis of the storm drainage characteristics of this property in both its historical and improved conditions, consisting of the following items:

1) Established rainfall intensity duration curves for the City of Fort Collins.
2) Storm runoff quantities and their general direction of flow.
3) The size and slope of storm drains required.
4) Size and location of detention ponds and culverts.

II. STUDY AREA

The area on which this study is focused is Cedar Village Filing No. 5 and its contributary basins. This subdivision is located in the southwest portion of Fort Collins, just west of Rocky Mountain High School. Exhibit No. 1 displays Cedar Village Filing No. 5's geographic location.

III. EXISTING STORM DRAINAGE FACILITIES

Cedar Village Filing No. 5 is bounded on the north by Cedar Village Filings No. 3 and No. 4. These subdivisions are fully developed. Drainage is facilitated in them predominantly by surface flow, however, a 21" RCP has been stubbed out at the subdivision boundary in Hanover Drive to provide for future anticipated flows. The general topography of the area is comprised of gently rolling features, basically sloping from south to north.
IV. DESIGN CRITERIA AND REQUIREMENTS

The initial and the major drainage system make up the storm runoff drainage system for an urban area. The initial drainage system should be designed to accommodate the runoff from a 2-year storm by utilizing the maximum capacity of the streets, overland swales and, if necessary, underground conduits. The major drainage system must be designed to handle a 100-year storm without extensive property damage or loss of life. Areas which may be susceptible to flooding must be examined. For purposes of the major storm analysis, it is assumed that the storm sewer has been blocked and rendered inefficentual. Floor elevations should be set to allow proper drainage between and around these houses without flooding. (See Exhibit No. 2).

The City of Fort Collins requires an improved site to limit its runoff to the amount resulting from a 2-year frequency storm occurring while the site is in its natural state. To accomplish this, it is usually necessary to design a detention pond with a total storage capacity of the maximum difference between the 100-year storm runoff from the developed area and the 2-year historical flow. An outlet structure is designed to limit the flow to the 2-year historical runoff value.

The amount of storm water runoff for the area, individual basins and streets was determined by the rational method. This procedure equates the design peak flow to the total area, amount of rainfall on that area, and a multiplier that is determined by the physical characteristics of the area under study. The rational method is commonly employed in the design of borrow ditches and storm sewer systems. The bulk of the procedures, methods and numerical constants were obtained from the Urban Storm Drainage Criteria Manual, published by the Denver Regional Council of Governments. The rainfall intensity duration curves used in this report were developed by the City of Fort Collins Engineering Department.
The ponding elevations, capacities of the channels and piping were determined by Manning's Formula, which equates a constant, a roughness factor, the area of the channel or pipe, the hydraulic radius and the slope, to the capacity of the channel or pipe.

V. DRAINAGE PLAN

The approach taken to develop a drainage plan for Cedar Village Filing No. 5 was effected considerably by the runoff flowing both to and from offsite areas. The central system of the project will consist of a piping system to be located in West Swallow Road and a detention pond to be situated in Tract "A" (See Exhibit No. 2). The pipe system was sized to handle the 2-year developed flows. The storage capacity of the pond was determined by the "Mass Diagram" procedure. Each of these designs, however, was modified due to offsite runoff considerations.

One of the offsite considerations, involved the four streets at the north subdivision boundary, which drain into Cedar Village Filings No. 3 and No. 4. Although each of these streets drain relatively small areas the difference between 2-year historic flows and 100-year developed flows accumulates to a total of 10.8 cfs. This difference, of course, must be compensated for by reducing the outfall flow allowed from the proposed detention pond. However, runoff is also flowing into the subdivision from the west and east ends of Swallow Road also increases the outfall flow allowed from the proposed pond. In this case the difference between the 2-year historic flows and 100-year developed flows amounts to 8.67 cfs. This means, of course that the design outfall from the pond needs to be reduced only by 2.13 cfs. It should be noted that runoff quantities flowing out of Cedar Village Filing No. 5 from Haywood Place, Yosemite Drive and Tawson Avenue have no affect on the above calculations because they will be contained in another separate drainage system, which will be developed in the future.
The runoff contributed by Basins 2 and 3 is to be collected entirely by curb inlets at the intersection of Dunbar Avenue and Swallow Road. This is proposed in order to avoid valley pans across this principal intersection. These inlets have also been sized to handle the runoff flowing into the subdivision from the proposed Silverplume Development located immediately east of Cedar Village Filing No. 5. The runoff from Basin 1 will also be collected entirely at the intersection of Dunbar Avenue and Swallow Road from this point, because of flowline and slope considerations the accumulated runoff will be piped directly to the pond proposed in tract "A". Another small storm sewer located just south of the proposed pond will facilitate the drainage of the sump area in Swallow Road into which Basins 4 and 5 drain.

The detention pond in Tract "A" will have a storage capacity of 1.76 acre-feet. This allows for over 1.0 foot of freeboard. The pond will have an outlet of 4.0 cfs. This figure reflects a reduction of 2.13 cfs., which was discussed earlier. The pond will outlet into the existing 21" RCP located in Hanover Drive which eventually flows into Spring Creek. A spillway located in the northwest corner of the pond allows for control of outfall should the pond overtop.

Another major consideration was the runoff generated by the proposed Rossborough Subdivision located just south of Cedar Village Filing No. 5. Considerable analysis and investigation revealed that due to problems with invert elevations and minimum slopes as well as cost considerations no runoff from Rossborough could be handled through the subdivision. It is recommended that two year and 100 year flows from Rossborough be piped west into the proposed by-pass ditch, which will run north along the west 1/16th line of Section 27.

During a major (100-year frequency) storm, there are only two areas susceptible to flooding. Exhibit No. 2 illustrates these two points, the areas covered, and the maximum depth, as measured at the flowline of the gutter. In all three cases no damage would occur to homes in the immediate area.
VI. CONCLUSIONS AND RECOMMENDATIONS

This drainage design will satisfy all hydraulic considerations as well as governmental regulations in providing this future community with both a safe and equitable solution to the problem of handling storm water run-off.

The following is recommended:

1) Storm water runoff should be routed as shown on Exhibit No. 2.

2) All drainage facilities and detention ponds should be constructed as shown on Exhibit No. 2.

3) The Federal Housing Administration minimum requirements be maintained on overlot grading and street design.
CEDAR VILLAGE FILING NO. 5
EXHIBIT NO. 2

DESIGN FLOWS FOR 2 YR. AND 100 YR. FREQUENCY STORMS

TRACT 'A' DETENTION POND
CAP = 1.76 AC. FT.
HIGH WATER ELEV = 69.5

5070
5072
5074
5078

5070
5072
5074
3080

5082
5084

5082
5084

100 YR. PONDING LEVEL
MAX. DEPTH TO E = 0.36

BASIN 2
AREA = 5.60 AC.

BASIN 3
AREA = 0.46 AC.

BASIN 4
AREA = 37 AC.

BASIN 5
AREA = 1.89 AC.

PROPOSED SILVERPLUME DEVELOPMENT

100 YR. PONDING LEVEL
MAX. DEPTH TO E = 0.42'

PLACE

LEGEND

DESIGNATES DRAINAGE BASIN

INDICATES DIRECTION & QUANTITY OF FLOW IN CUBIC FEET PER SECOND - "C.F.S."

CITY OF FORT COLLINS STANDARD CATCH BASIN

CITY OF FORT COLLINS STANDARD 6' VALLEY PAN

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For additional information or an official copy, please contact City of Fort Collins Utilities 700 Wood Street Fort Collins, CO 80524 USA