

MASTER DRAINAGE REPORT
FOR
DISCOVERY SUBDIVISIONS

Roger G. Berge
15 North Iowa Street
Colorado Springs, CO 80909

Approved 3/28/77
D.T. by CA.
(w/included supplement
dated 3/2/77)

SCANNED



H. J. KRAETTLI & SONS CONSULTING ENGINEERS

15 NORTH IOWA

PHONE 473-3774

COLORADO SPRINGS, COLORADO 80909



February 28, 1977

Mr. Don Jeffries
Colorado Springs City Engineer
City Hall
Colorado Springs, CO 80904

Dear Sir:

Transmitted herewith is the Master Drainage Report of a portion of the Northeast Quarter of Section 12, in Township 13 South, Range 67 West, in the City of Colorado Springs, El Paso County, Colorado, covering that part of DISCOVERY included in Discovery Subdivision Filing Nos. 3, 4, 6 and 7.

Respectfully submitted,

H. J. KRAETTLI & SONS

Roger G. Berge
Colorado P.E. No. 9646

MASTER DRAINAGE REPORT
FOR
DISCOVERY SUBDIVISION
FILING NOS. 3, 4, 6 AND 7

February 28, 1977

H. J. Kraettli & SONS
Colorado Springs, Colorado

Prepared By:

Roger G. Berge
Colorado P.E. No. 9646

TABLE OF CONTENTS

Letter of Transmittal	1
Title	2
Table of Contents	3
Report	4
Calculations	7
Certification	10

GENERAL:

Discovery Subdivision Filing Nos. 3, 4, 6, and 7 are located in the Northeast Quarter of Section 12, in Township 13 South, Range 67 West, in the City of Colorado Springs, El Paso County, Colorado and contains a total of 50 unplatted acres.

This Master Drainage Report is being prepared as a supplement to the original Master Drainage Report prepared by Peak Engineering. Its conclusions reflect changed conditions resulting from revised and/or completed construction plans. Drainage Reports prepared for Discovery Subdivision Filing Nos. 6 and 7 are attached to and made a part of this Report. Certain changes have been made regarding direction of storm drainage flow. In each case, the Master Drainage Plan figures supercede those differences found in Nos. 6 and 7. However, in no case do increased runoff figures exceed the capacity of structures designated in these supporting Reports. Details regarding drainage structures located within these two Subdivisions are dealt with in these individual Reports. This report deals with channel stabilization and an overall analysis of Delmonico Boulevard within Discovery.

The natural terrain within the study area is typified by gently sloping grassed lands, steeper sloping lands covered with differing varieties of pine trees, bushes and scrub oak, and two ravines whose environments vary from stable to erosive resulting from meandering and to unstable resulting from construction.

Runoff quantities were computed using the SCS synthetic hydrograph method as shown in the Bureau of Reclamation Publication, "Small Dams". The 50-year 2 inch storm of one hour duration was used as the design basis. Runoff quantities for the Southerly flowing major ravine were taken from the Discovery Master Drainage Plan prepared by Peak Engineering. Computed quantities listed in the calculations section reflect estimated flows resulting from the improvements as installed or to be installed. Certain characteristics such as street slope, sloping street intersections and curb opening locations were used as the basis for estimating runoff characteristics.

EXTERIOR AND INTERIOR DRAINAGE:

Exterior drainage flows onto the Subdivision from the North, West, and South. With the exception of the exterior drainage entering the Subdivision from the North in the Southerly flowing major ravine, all exterior drainage results from water flowing off the surrounding ridges onto the Subdivision. Drainage areas as identified on the Drainage Plan have been drawn to reflect natural topography and planned or constructed improvements. No effort has been made in this Report to separate drainage within a minor basin into interior (originating within the Subdivision) and exterior (origination outside the Subdivision).

PLANNED IMPROVEMENTS:

Delmonico Boulevard:

Design flows are identified on the Drainage Plan. Beginning at the North end, 22.7 c.f.s. flows in Delmonico Boulevard to the intersection of Delmonico Court. Due to the configuration of the intersection, it is estimated that 20% of the

drainage will flow onto Delmonico Court and the remaining 80% will continue Southward in Delmonico. Although the Easterly curb is to be constructed below the Westerly curb, no overflow is anticipated at design flow. At the intersection with the East-West ravine, 39.8 c.f.s. will empty into the ravine through four 8' D-10R catch basins. The 15.5 c.f.s. entering Delmonico Boulevard from Carved Terrace will probably split three ways with an estimated 6.3 c.f.s. entering the existing 4' D-10R, 7.2 c.f.s. crossing Delmonico and entering N. Wintery Loop and 2.0 c.f.s. flowing Southerly in Delmonico Boulevard. At S. Wintery Loop, it is estimated that 10% or 1.9 c.f.s. will turn the corner from Delmonico into S. Wintery Loop. At a point approximately 300 feet Southerly along Delmonico Boulevard, two 6' D-10R catch basins are to be installed and will draw off 21.2 c.f.s. to be carried Easterly to the North-South ravine in an 18" R.C.P. Pebble Way carries 32.2 c.f.s. to the existing bridge over the North-South ravine.

East-West Ravine:

Cross sections were surveyed at five locations to determine slope, depth of flow, and velocity. At design flow, velocities vary from between 6.8 f.p.s. to 7.6 f.p.s. except for one location where a velocity of 8.3 f.p.s. will occur. Depth of flow varies between 2 and 3 feet which is well contained by the existing channel. Increased values of "n" were tested with minor affects on flow characteristics.

West of Delmonico Boulevard, the East-West ravine is in a stable condition. Riprap sections are designated for the outlet of the 42" R.C.P. identified in the Discovery No. 7 Drainage Report and at the inlet of the 54" R.C.P.A. under Delmonico Boulevard. Drainage entering the East-West ravine through the four 8' D-10R catch basins in Delmonico Boulevard will flow down grouted riprap sections. East of Delmonico Boulevard is a completed sewer main crossing and several sections where the bank is eroding due to meandering. Two check dams are designated for this stretch, with one lying over and protecting the sewer main. The check dams will act to center drainage flow. Drainage flow down Delmonico Court will be carried in a combination concrete channel and driving surface as shown on the attached plan.

North-South Ravine:

All but the lower 750 feet of the ravine remain in natural condition. A series of gabian check dams and short sections of riprap, identified on the Drainage Plan, are designated for that portion of the channel in its natural condition. These check dams and riprap sections are to be placed to prevent erosive action by centering flow and protecting the sides of the channel. Location and height of check dams are to be established in the field and approved by the City Engineer prior to construction. Vertical height of check dams will be used to reduce velocities to the range of 7 feet per second. Construction methods are to be in accordance with City requirements to insure that the undisturbed portion of the channel remains natural. Gabian check dams are to be installed above ground in order to minimize channel disturbance and increase sedimentation thus retarding further bank erosion. Prior to construction, channel sections shall be checked by manning formula analysis for channel capacity and velocity and approved by the city. Riprap shall have a minimum thickness of 12 inches and a minimum volume of 2 cubic feet, with location and height to be

approved by the City prior to construction.

The lower 750 feet of the ravine, having been disturbed, will have a concrete lined section. A typical cross-section is shown on the Drainage Plan. Concrete check dams are to be included to limit velocities to 12 feet per second. These check dams are to be located in the field to match existing topography. City approval of height and location shall precede construction.

DRAINAGE STRUCTURES AND DRAINAGE FEE:

18" R.C.P.	115 l.f. @ \$ 10.90 per l.f.	\$ 1,253.50
6' D-10R curb inlet	2 each @ \$1,000.00 each	2,000.00
8' D-10R curb inlet	4 each @ \$1,200.00 each	4,800.00
Check Dams	12 each @ \$ 75.00 each	900.00
Riprap	75 c.y. @ \$ 15.00 per c.y.	1,125.00
Concrete Ramp	90 s.y. @ \$ 15.00 per s.y.	1,350.00
Concrete Channel	1000 s.y. @ \$ 15.00 per s.y.	<u>15,000.00</u>
TOTAL		\$ 26,428.50
Discovery No. 7		<u>53,164.00</u>
TOTAL		\$ 79,592.50

The drainage fee summary for Discovery is as follows:

1977 Fees for Dry Creek Basin:

50 acres @ \$1,008.00 per acres	\$ 50,400.00
owed from previous Filings	<u>\$ 29,063.53</u>
TOTAL	\$ 79,463.53

It should be noted that as of January 1, 1977, the City is holding letters of credit for drainage improvements amounting to \$35,084.71.

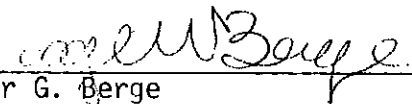
LASIN	ACRES	SQ. MI.	L. FT.	H(FT)	T _c (HR)	T _p (HR)	Q (IN)	Q _p (CFS)
Area M	116.6	0.1822	5500	355	0.27	0.66	0.8	106.9
Concentration Point M								106.9
Area L	26.8	0.04188	1600	190	0.090	0.55	1.0	36.9
Concentration Point M								106.9
Concentration Point L								143.8
Area K	17.1	0.02672	2100	200	0.12	0.57	1.0	22.7
Concentration Point K								22.7
Area J	6.2	0.00969	800	90	0.083	0.55	1.0	8.5
A Portion of Concentration Point L								13.1
A Portion of Concentration Point K								18.2
Concentration Point J								39.8
Area E	7.5	0.01172	650	40	0.083	0.55	1.0	10.3
A Portion of Concentration Point K								4.5
Concentration Point E								14.8
Area H	11.3	0.01766	1500	180	0.083	0.55	1.0	15.5

BASIN	ACRES	SQ. MI.	L. FT.	H(FT)	T _c (HR)	T _p (HR)	Q (IN)	Q _p (CFS)
Concentration Point H								15.5
Area I	5.2	0.00813	800	100	0.083	0.55	1.0	7.2
A Portion of Concentration Point L								130.7
A Portion of Concentration Point J								19.9
A Portion of Concentration Point H								6.3
Concentration Point I								164.1
Area D	2.2	0.00344	600	50	0.083	0.55	0.8	3.0
A Portion of Concentration Point J								19.9
Concentration Point I								164.1
Concentration Point D								187.0
Area G	12.6	0.01969	1000	90	0.083	0.55	1.0	17.3
Concentration Point G								17.3
Area F	27.4	0.04281	1800	160	0.10	0.56	1.0	37.0
Concentration Point F								37.0
Area C	9.0	0.01406	1200	60	0.10	0.56	1.0	12.2

BASIN	ACRES	SQ. MI.	L. FT.	H(FT)	T _c (HR)	T _p (HR)	Q (IN)	Q _p (CFS)
A Portion of Concentration Point H								7.2
A Portion of Concentration Point G								1.9
Concentration Point C								21.3
Area B	2.8	0.00438	100	10	0.083	0.55	1.0	3.9
Area A	3.0	0.00469	200	20	0.083	0.55	1.0	4.1

CERTIFICATION

I, Roger G. Berge, a registered engineer in the State of Colorado, hereby certify that the attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. I further certify that said drainage report is in accordance with all City of Colorado Springs Ordinances, specifications and criteria.

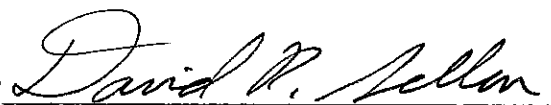


Roger G. Berge
Colorado P.E. No. 9646

OWNERS STATEMENT

"The developer has read and will comply with all of the requirements specified in this drainage report as approved by the City Engineer."

DISCOVERY SUBDIVISIONS

By 

Title Sec. DELO CORP.