



H. J. KRAETTLI & SONS CONSULTING ENGINEERS

15 NORTH IOWA

PHONE 473-3774

COLORADO SPRINGS, COLORADO 80909



March 21, 1977

Mr. Don Jeffries
City Engineer
Colorado Springs City Engineering
Colorado Springs, CO

Dear Don:

This is a supplement to the Master Drainage Report for Discovery Subdivision dated February 28, 1977. The attached typical sections are to be made a part of that report.

Section (1) is the proposed improved channel cross section check dam alternate that is to be installed as shown on the plan portion of the above described report. We recommend that 7 of these check dams be installed in this portion of the channel. Section (2) is an alternate to the check dam method of controlling the runoff. Both sections will carry the anticipated flow and the cost will determine what method is used.

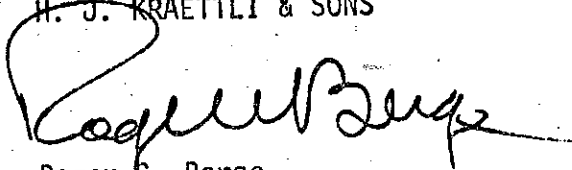
Section (3) shows the gabian check dams that we propose to install in the unlined portion of the main drainage channel. Their locations are to be as shown on the plan.

Also as previously agreed, we will provide a driveway from Delmonico Court to the main drainage channel. It will be 8 feet wide, 6 inches thick with 6 x 6 x 6 x 6 W W F wire mesh and its location shall be as shown on the plan.

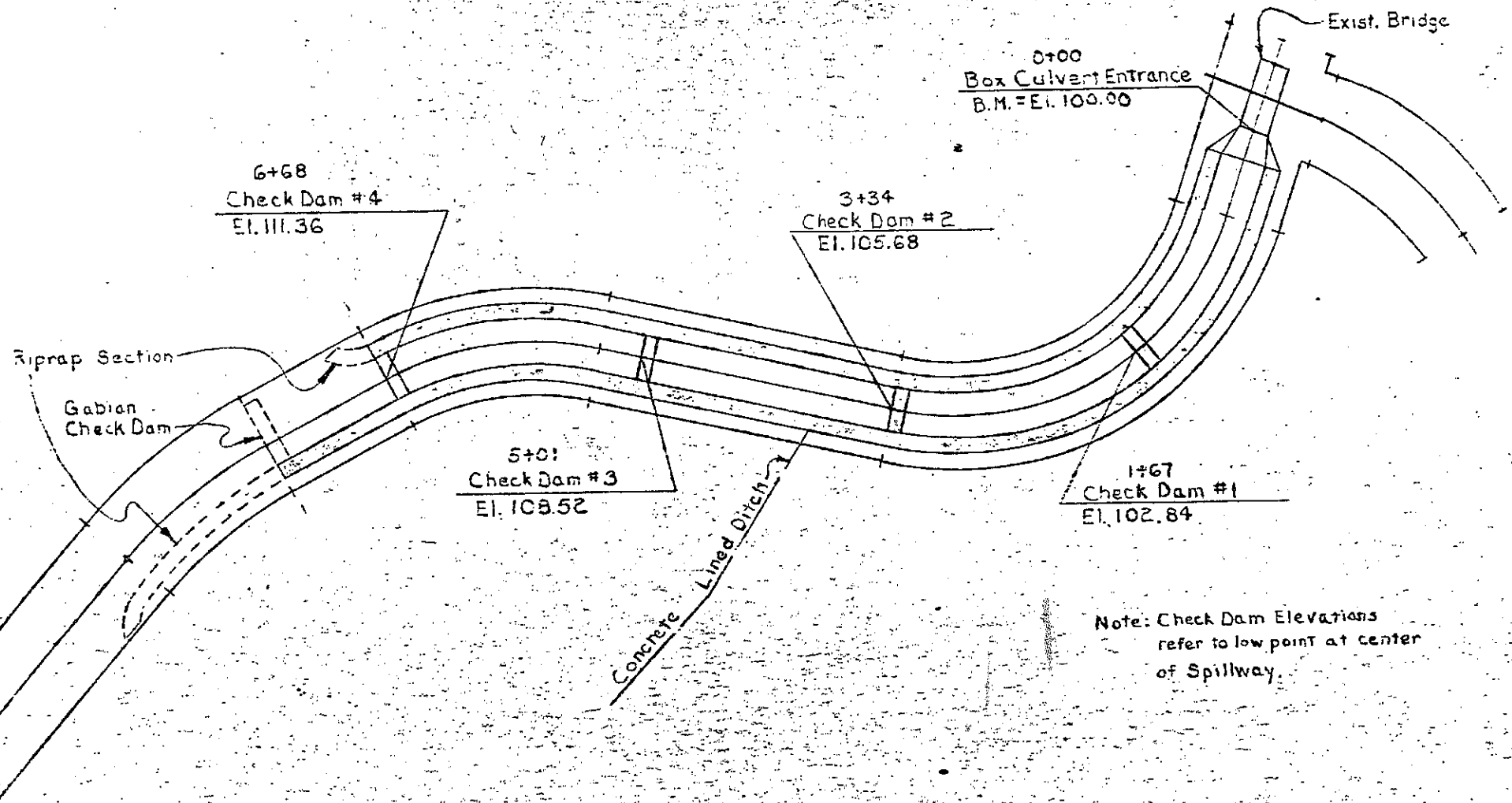
Please review this supplemental data and we can meet and discuss the plan at your convenience.

Very truly yours,

H. J. KRAETTLI & SONS


Roger G. Berge

RGB/jel

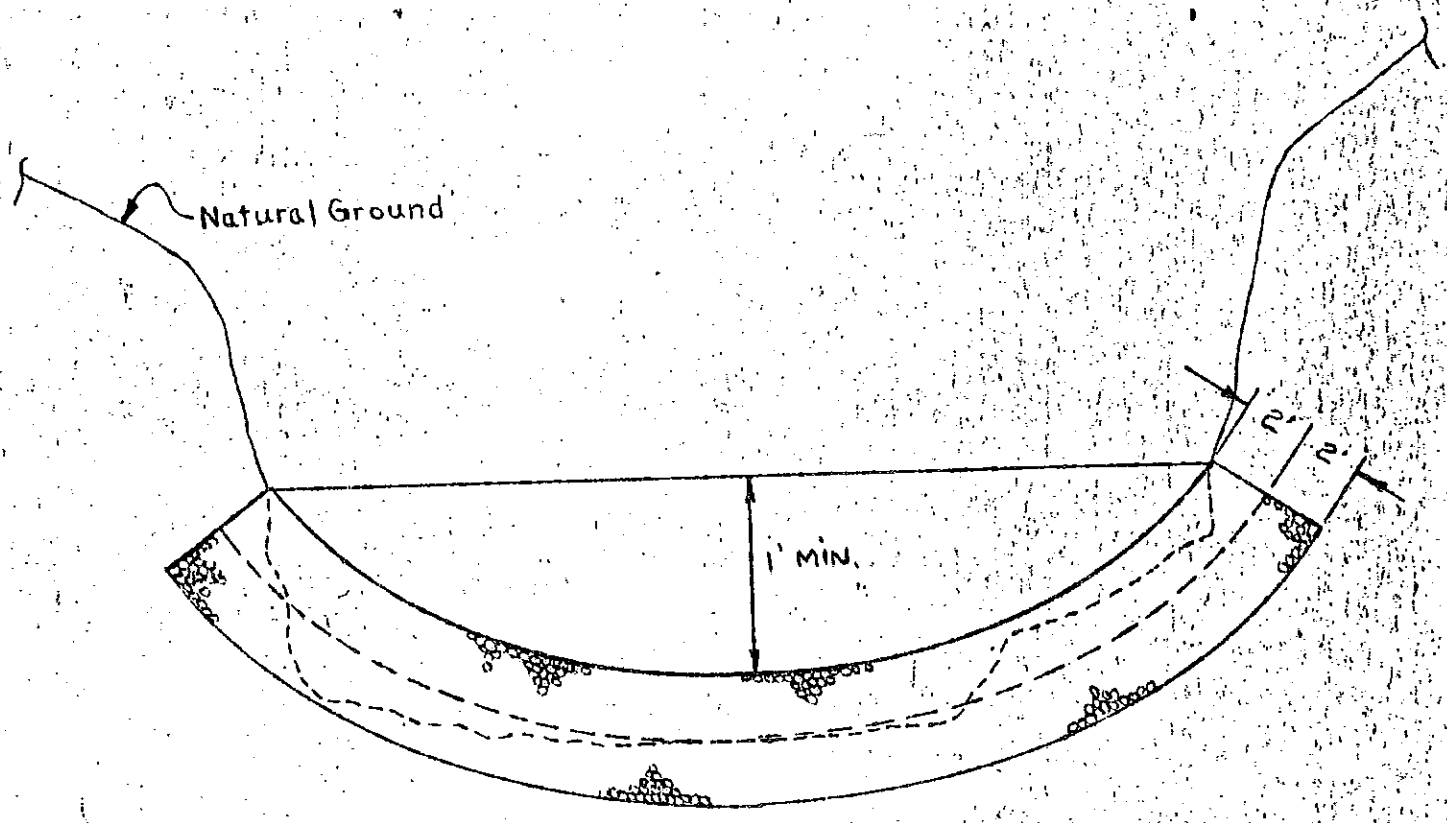
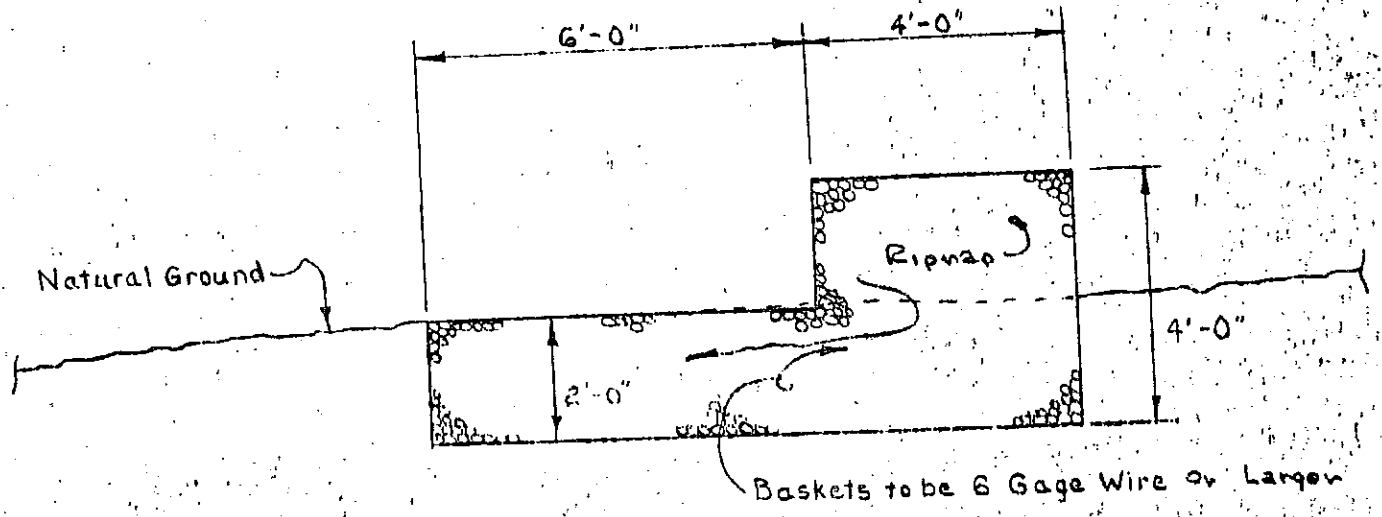


Note: Check Dam Elevations refer to low point at center of Spillway.

DISCOVERY MAIN CHANNEL IMPROVEMENTS
Check Dam Locations in Concrete Lined Section

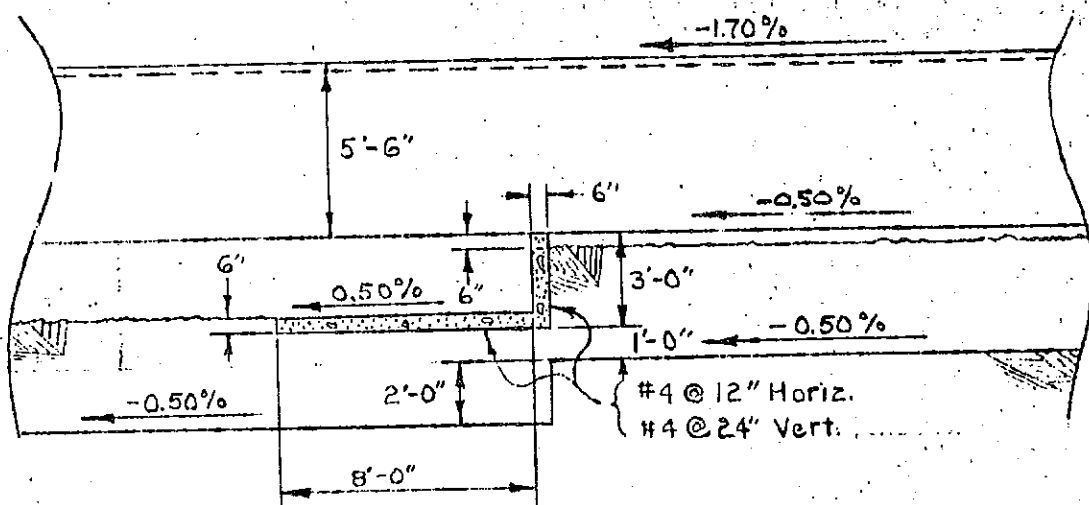
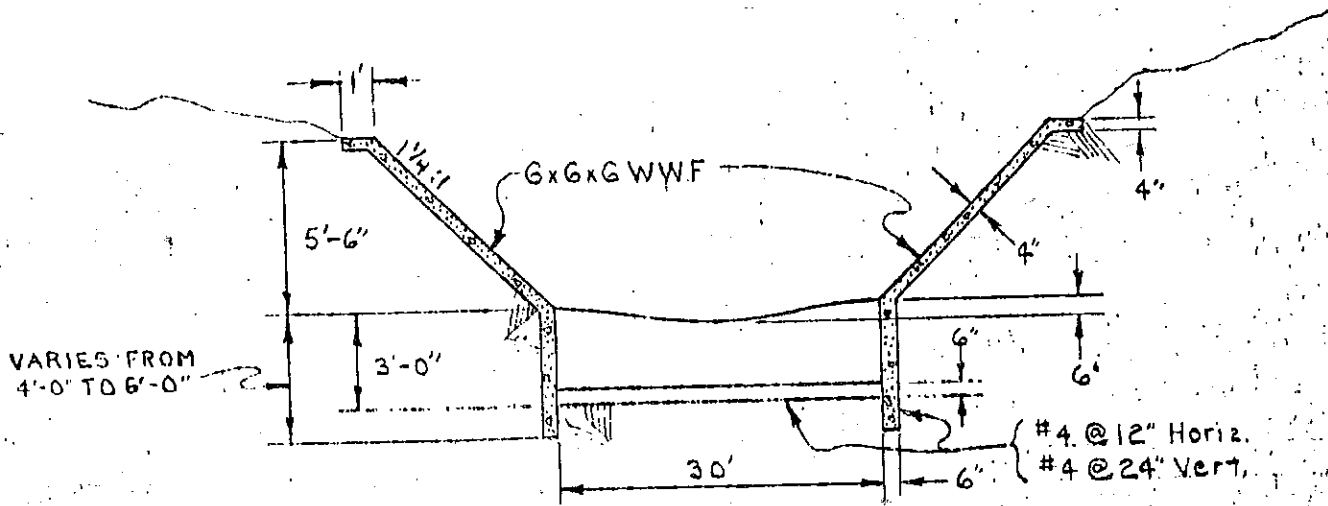
Roger G. Berge
Consulting Engineer

3/23/77

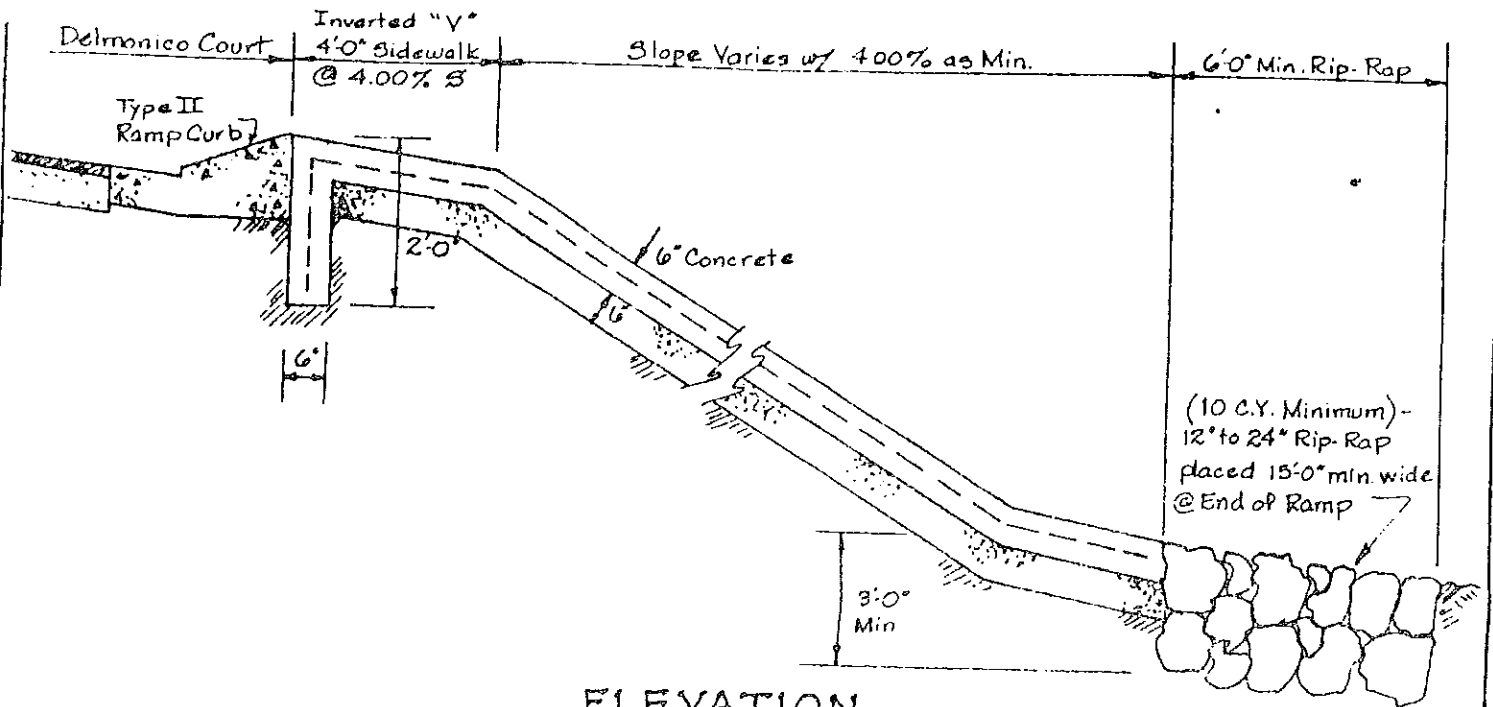


Gabion Checkdam
Typical Section

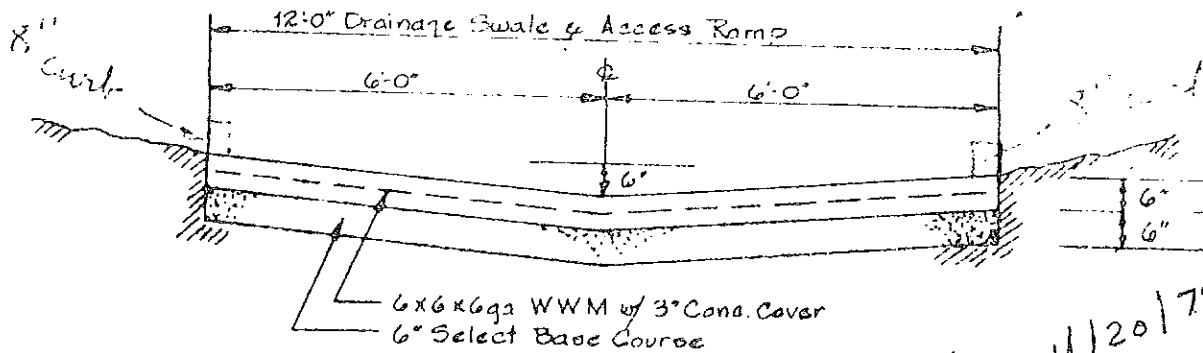
Roger G. Berge
3/21/77



Proposed Improved Bridge Structure
 [Illegible text]



ELEVATION
No Scale



SECTION
Scale: 1" = 3'

O.K. 4/20/79
D.R.S.

DRAINAGE SWALE & ACCESS RAMP
DELMONICO CT., DISCOVERY NO. 7

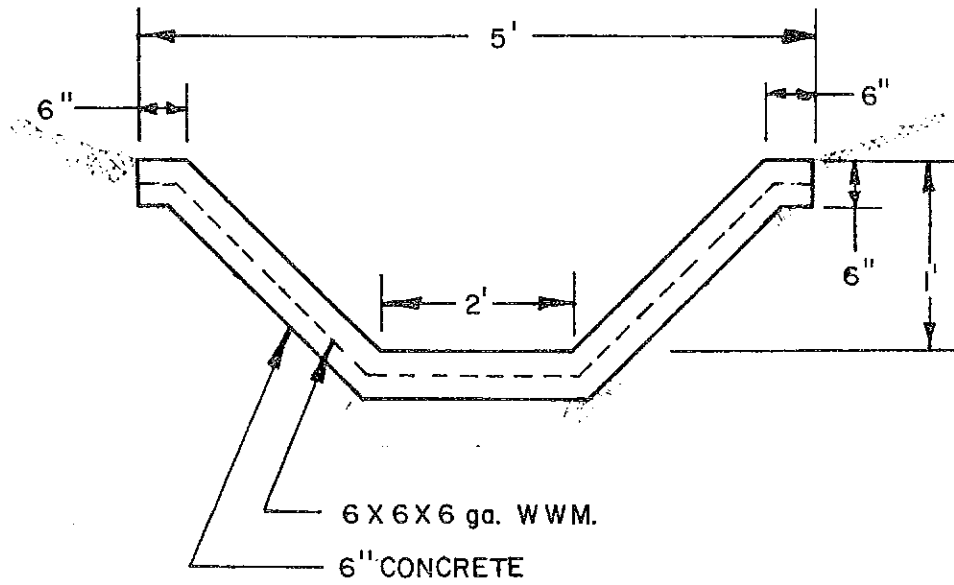
$d = 0.50'$
 $n = 0.013$
 $S = 4.00\%$ (Min.)

$A = 3.00$ Sq. Ft.
 $WP = 12.00$ Ft.
 $R = 0.25$ Ft.

OK
D.R.S.

VELOCITY = 9.07 fps by MANNINGS EQUATION
CAPACITY = 27.2 cfs

TYPICAL DITCH SECTION

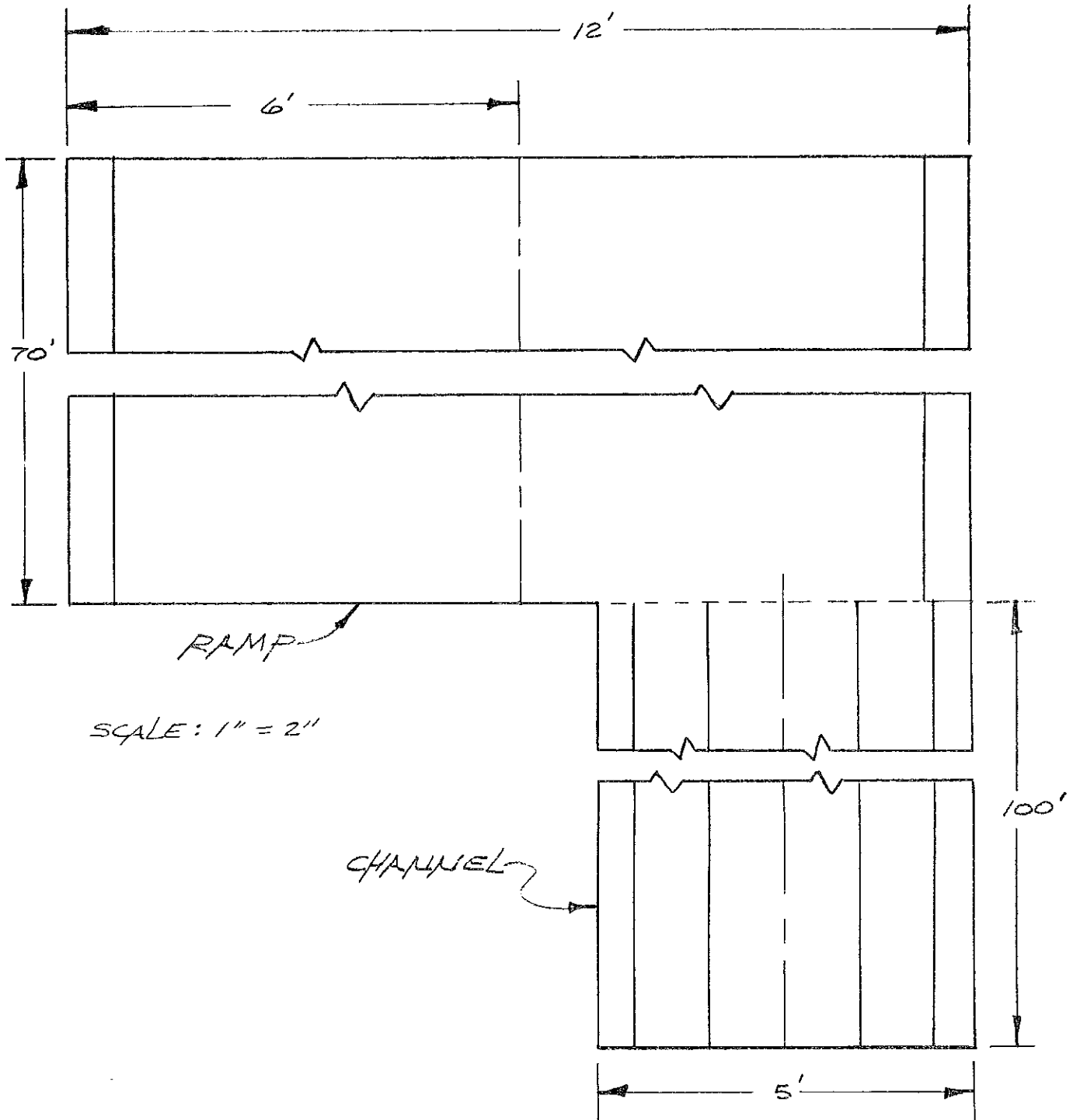


SECTION

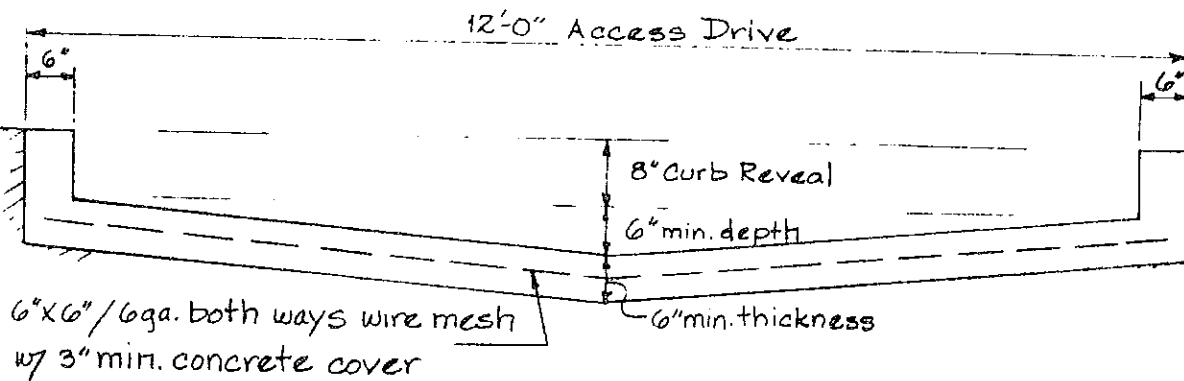
Scale: 1" = 2'

DELMONICO CT., DISCOVERY NO. 7

RAMP & CHANNEL ALIGNMENT

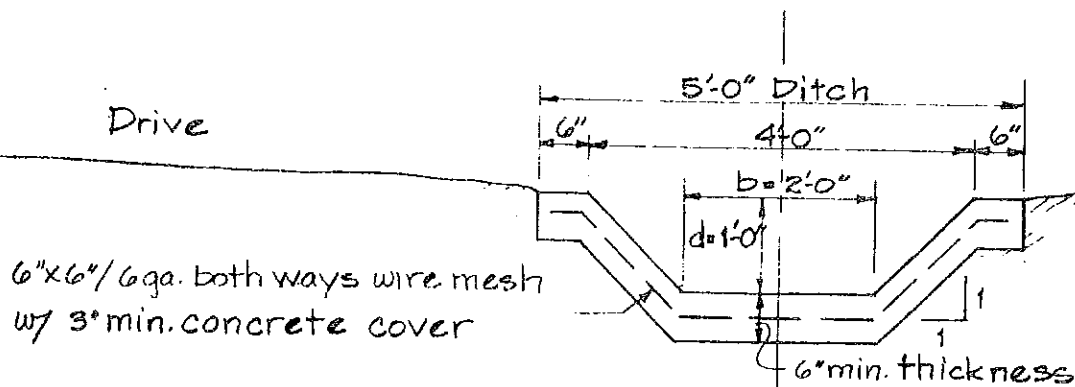


DELMONICO CT., DISC. NO. 7



TYPICAL SECTION

(UPPER - 70')



TYPICAL SECTION

(LOWER - 100'±)

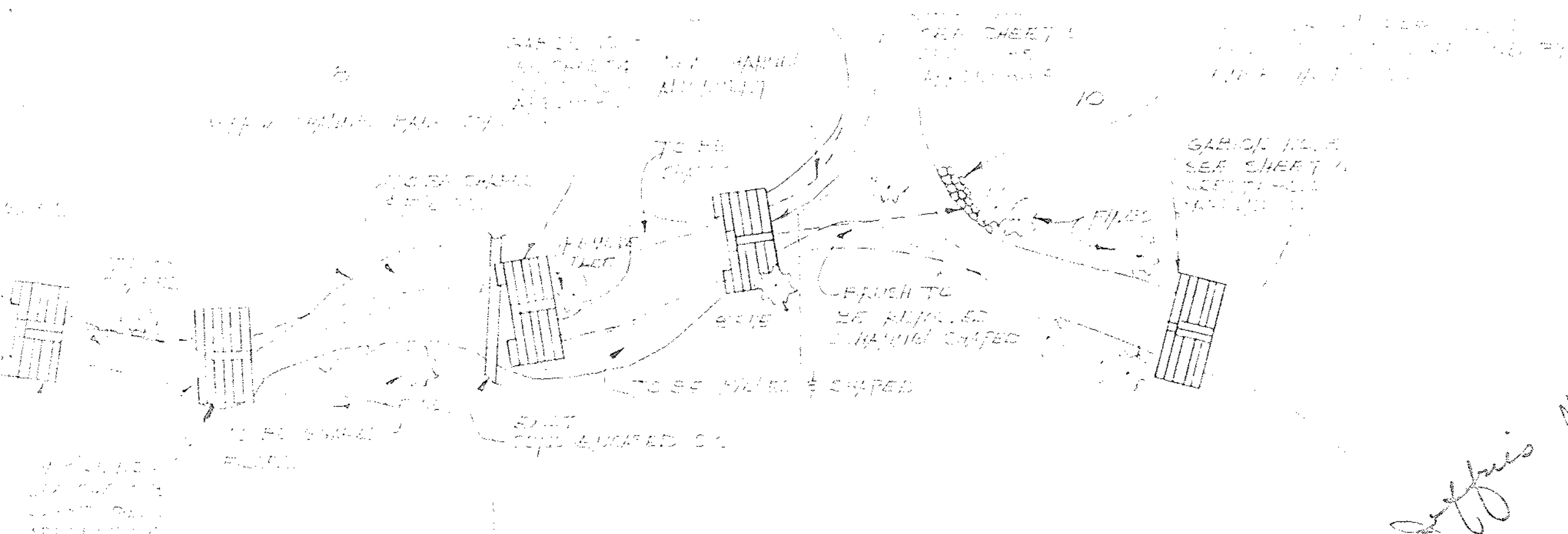
PROPOSED DRAINAGE STRUCTURES

FROM

DELMONICO COURT

DISCOVERY SUBDIVISION NO. 7

SCALE: 1" = 2'-0"



Approved: *[Signature]* Nov. 29, 1978

BLK 2
DISCOVERY CHANNEL EAST OF
DEL MONICO BLVD

TABLE	
GABION NO.	NO. OF BASKETS
1	27
2	25
3	28
4	25
5	29
TOTAL = 134	

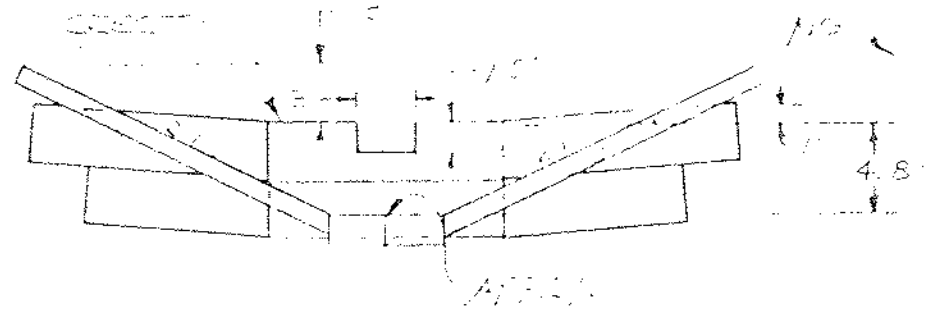
ALL RE-SHAPED.
SEE SHEET 1 & 2.

SEE THE CONTRACT.

GABION BASKETS
TO BE REMOVED.

DISCOVERY CHANNEL EAST OF DEL MONICO BLVD		
SCALE: NONE	APPROVED BY: <i>[Signature]</i>	DRAWN BY: RWT
DATE: 10-30-78		REVISED:
DEVELOPMENT DIRECTORS WEST		
		DRAWING NUMBER 1 OF 6

DISCOVERY CHANNEL
APRIL 75.71



LINE WITH 1/4" BLACK PLASTIC

QTY	SIZE	QTY	SIZE	QTY	SIZE	QTY	SIZE
12	12x3x1	11	12x3x1	12	12x3x1	11	12x3x1
2	2x3x1	3	2x3x1	2	2x3x1	3	2x3x1
1	2x3x1	1	2x3x1	1	2x3x1	1	2x3x1
1	2x3x1	1	2x3x1	1	2x3x1	1	2x3x1

		TOTAL
7	3x3x1.5	1
6	6x3x1	10
5	9x3x1	2
4	9x3x3	2
3	12x3x1	8
2	12x3x1.5	2
1	12x3x3	4
NUMBER	SIZES	QUANTITY
TOTAL		

DISCOVERY CHANNEL - GABICU NO. 5 -

SCALE: NONE	APPROVED BY: <i>Ken W. Bay</i>	DRAWN BY: RWT
DATE: 11-30-75	REVISED:	
DEVELOPMENT DIRECTOR'S OFFICE		
		DWG. NO. 6 OF 6

Peak Engineering Co.



2860 S. Circle Drive • Telephone 576-8530 • Colorado Springs, Colorado 80906

November 29, 1972

Mr. DeWitt Miller
Director of Public Works
City Hall
Colorado Springs, Colorado

Re: Drainage Plan and Report, Discovery Filing #2

Dear Deke:

The subject filing contains 20.21 acres and lies in the northwesterly area covered by the Master Drainage Plan and Report for the Discovery Subdivision approved by the City Engineer 10/12/72 (See attached Peak Engineering Drawing No. 72-104.)

Based upon the approved Master Drainage Plan, the drainage fees for the referenced filing are as follows:

Unstudied basin area 4.8 acres @ \$735.00 = \$3,528.00 ✓
Dry Creek Basin area 15.41 acres @ \$821.84 = \$12,664.55

Total acreage = 20.21 acres
Total cash drainage fee = \$3,528.00
Total letter of credit - \$12,664.55

Should you have any questions concerning the above information, please do not hesitate to call on us at your convenience.

Sincerely,

Frederick P. Blessing
Frederick P. Blessing, P.E.

cc: DELD Corporation, David Sellon

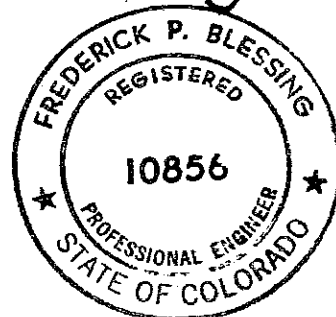
Approved By

APPROVED

City of Colorado Springs

[Signature]
CITY ENGINEER

12/7/72



CONSULTING • CONSTRUCTION INSPECTION & SUPERVISION

FILE

Peak Engineering Co.



2860 S. Circle Drive • Telephone 576-8530 • Colorado Springs, Colorado 80906

November 1, 1972

Mr. DeWitt Miller
Director of Public Works
City Hall
Colorado Springs, Colorado

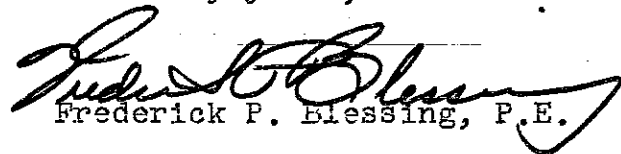
Re: Master Drainage Plan, Discovery Subdivision, Filing No. 1
Colorado Springs, Colorado. Peak Engineering
Drawing No. 72-104

Dear Deke:

A discussion concerning the referenced Master Drainage Plan was held at City Engineering on October 20, 1972. Attending the meeting were Robert Martin, acting City Engineer, David Sellon, partner, DELD Corporation and the undersigned, Peak Engineering Company partner. During this discussion, it was agreed by Mr. Sellon and the undersigned that the Rip Rapped ditches called for in the plan would be designed with check dams to limit the surface runoff velocity in these ditches to 12 foot per second. This would then suffice in lieu of concrete lined ditches.

If you have any questions concerning the above, do not hesitate to call on us.

Sincerely yours,


Frederick P. Blessing, P.E.

FPB/maj

Peak Engineering Co.



2860 S. Circle Drive • Telephone 576-8530 • Colorado Springs, Colorado 80906

November 29, 1972

Mr. DeWitt Miller
Director of Public Works
City Hall
Colorado Springs, Colorado

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Frederick P. Blessing
Frederick P. Blessing, P.E.

cc: DELD Corporation, David Sallon

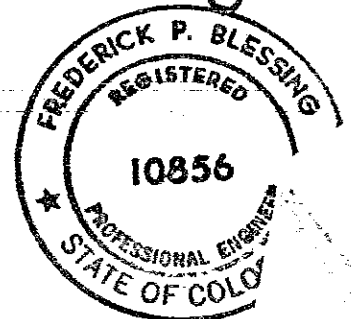
Approved By

APPROVED

City of Colorado Springs

[Signature]
CITY ENGINEER

12/7/72



MASTER DRAINAGE REPORT
FOR
DISCOVERY SUBDIVISION

Peak Engineering Company
Suite 333 Garden Valley Center
2860 South Circle Drive
Colorado Springs, Colorado



Peak Engineering Co.
Colorado Springs, Colo.

Drainage Report
Discovery Subdivision

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Cost Estimate 5
Drainage Plan . . .Drawing No. 72-104



Peak Engineering Co.
Colorado Springs, Colo.

September 8, 1972

Mr. DeWitt Miller
Director of Public Works
City Hall
Colorado Springs, Colorado

Dear Mr. Miller:

Transmitted herein is the Master Drainage Report for the Discovery Subdivision, located in the City of Colorado Springs, El Paso County, Colorado. If any questions arise from your examination of this report, please feel free to contact us at your convenience.

Respectfully yours,

W.C. Barker

W.C. Barker, Design Engineer
Peak Engineering Company

APPROVED

Drainage Report Approved By: _____

CITY ENGINEER

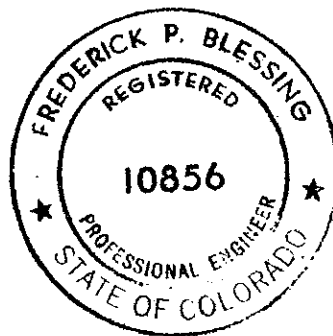
Date: _____



Peak Engineering Co.
Colorado Springs, Colo.

I, Frederick P. Blessing, 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.

Frederick P. Blessing
Frederick P. Blessing
Colorado P.E. No. 10856



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

By: *David R. Sellon*
David R. Sellon
Secretary, DELD Corporation



Peak Engineering Co.
Colorado Springs, Colo.

General Description:

The Discovery Subdivision is located in a portion of the northeast quarter of Section 12, Township 13 south, Range 67 west of the 6th P.M., El Paso County, Colorado, and lies within the Dry Creek Basin, a portion to the north which lies in an unstudied area, and a portion to the southwest which lies within the north Rockrimmon Basin. The area within the boundary of the subdivision is broken into approximately $\frac{1}{2}$ acre tracts which will be primarily used for single-family dwellings. The terrain of the subdivision is of rolling hills, to steep slopes, covered with trees, grass cover and rock formations, and contains approximately 140 acres.

Exterior Drainage:

When the subdivision is completely developed with the installation of the recommended drainage facilities, no runoff is anticipated to enter the developed areas, except as indicated by the Drainage Plan. It is estimated that 1557.3 C.F.S. of runoff will enter into the Discovery Subdivision by means of an existing Greenbelt, on the north and west side of the subdivision, the areas to the west and south are undeveloped areas, the east boundary of the subdivision is bordered by Raven Hills, Filing No. 3, and the north side of the subdivision is bordered by Woodman Road.

It is worth noting at this time that the Dry Creek Drainage Report, dated November, 1966, was used for the amount of runoff entering the subdivision. However, it is our belief that the coefficients of runoff used for the Dry Creek Basin Study are insufficient, due to slope and soil characteristics. In an attempt to remedy this problem, the coefficient of runoff was increased by 3.2% in areas A through C, and increased by .85% in areas D through G. It is our belief that the percentage of increase in the areas stated give a better representation of runoff; however, these figures are rough calculations and should be treated as such. Enclosed in this report is a copy of the areas in the Dry Creek Study as they were listed in the November, 1966, report, and as we adjusted those areas previously stated.



Interior Drainage:

The area of Discovery Subdivision is divided into basins A through P, and sub-Basins. The Drainage Plan, Drawing No. 72-104, indicates both the direction and amount of runoff within each basin and sub-basin. The majority of runoff is carried by streets, "V" ditch and catch basins to the Greenbelt, at which point it is then carried to Monument Creek. Runoff in the amount of 20.6 C.F.S. is carried to the undeveloped area to the south by means of the minor residential street which runs northwest and southeast. Runoff is carried in Buckeye Drive in the amount of 2.0 C.F.S. to the Raven Hills Subdivision on the east border. It is recommended that these two streets should have 8" vertical curbs.

North Rockrimmon Basin

Basin P develops 8.4 C.F.S. which is carried to the south and west corner of the subdivision and discharged to an undeveloped area.

Unstudied Basin

Runoff in Basins C, D, G, & H, is carried overland to an existing ditch along Woodman Road on the north border of the subdivision and is then carried to Monument Creek.

The remaining areas of runoff are carried to the Greenbelt and then to Monument Creek, through two (2) box culverts, to be installed at Pebble Way. Total runoff of 322.4 C.F.S. is anticipated to be developed in Discovery Subdivision.



C A L C U L A T I O N S

ZONE	ACRES	AREA SQ. MI.	L FT.	H FT.	Tc HRS.	Tp HRS.	Q IN.	Qp CFS
A	--	--	--	--	--	--	--	--
a1	9.39	.01467	580	38	.048	.5288	1.6	21.5
a2	4.75	.00743	480	32	.042	.5252	1.6	11.0
B	8.31	.01298	840	130	.046	.5276	1.6	19.1
C	8.20	.01280	600	100	.035	.5210	1.6	19.0
D	6.31	.00986	510	120	.023	.5138	1.6	14.7
E	--	--	--	--	--	--	--	--
e1	5.53	.00864	450	98	.027	.5162	1.6	12.9
e2	2.50	.00390	300	56	.019	.5114	1.6	5.9
e3	3.01	.00470	150	14	.028	.5168	1.6	7.0
F	--	--	--	--	--	--	--	--
f1	2.39	.00373	400	60	.027	.5162	1.6	5.6
f2	2.59	.00405	210	24	.025	.5150	1.6	6.1
f3	2.69	.00420	350	64	.025	.5150	1.6	6.3
G	5.44	.00850	500	60	.035	.5210	1.6	12.6
H	2.02	.00316	200	70	.017	.5102	1.6	4.8
J	2.55	.00400	350	80	.020	.5120	1.6	6.1
K	--	--	--	--	--	--	--	--
k1	5.28	.00825	500	110	.026	.5156	1.6	12.4
k2	3.56	.00556	700	64	.049	.5249	1.6	8.2
k3	2.20	.00344	350	20	.036	.5216	1.6	5.1
L	--	--	--	--	--	--	--	--
l1	7.35	.01148	760	28	.075	.5450	1.6	16.3
l2	5.60	.00875	700	46	.056	.5336	1.6	12.7
l3	11.8	.01847	1300	130	.075	.5450	1.6	26.2
l4	7.67	.01198	700	52	.053	.5318	1.6	17.4
M	--	--	--	--	--	--	--	--
m1	10.28	.01606	600	26	.059	.5354	1.6	23.2
m2	5.99	.00936	660	52	.049	.5249	1.6	13.8
m3	4.32	.00674	460	26	.044	.5264	1.6	19.9
N	--	--	--	--	--	--	--	--
n1	3.26	.00509	340	30	.024	.5144	1.6	7.7
n2	1.42	.00222	300	20	.029	.5174	1.6	3.3
n3	2.23	.00348	300	16	.032	.5192	1.6	5.2
P	3.58	.00559	300	48	.022	.5132	1.6	8.4

Total C.F.S. Runoff 140.2 Acres = 322.4 C.F.S.

Hydrograph: $Q_p = \frac{484 A Q}{T_p}$ $T_p = \frac{D}{2} + 0.6 T_c$ D taken at 1 hour

A = Area in square miles

Q = Direct runoff in inches

D = Excess period of rainfall: period of time

Tp = Time in hours from start of rise to peak rate

Tc = Time of concentration, from most distant point to point of interest



Peak Engineering Co.
Colorado Springs, Colo.

CALCULATIONS

Dry Creek Drainage Basin

Major Basin	Sub-Basin	Area		Basin		Tc(Hr.)	Tp(hr.)	Runoff Flow Q(in.)		Peak Flow (CFS) Qp	
		Acres	Sq.Mi.	L(ft.)	H(ft.)			Original	Adjusted	Original	Adjusted
A	1	71.25	0.111	2200	1000	0.06	0.536	0.25	0.80	25.05	80.19
	2	115.14	0.180	6100	2080	0.15	0.590	0.25	0.80	36.91	118.13
	3	78.64	0.120	5700	1480	0.15	0.590	0.25	0.80	<u>24.61</u>	<u>78.75</u>
Total Basin A										86.57	277.07
B	1	62.96	0.098	2800	1320	0.07	0.542	0.25	0.80	21.88	70.01
	2	54.00	0.085	3300	1180	0.09	0.554	0.25	0.80	18.56	60.72
	3	70.01	0.109	5000	970	0.16	0.596	0.25	0.80	22.13	70.81
	4	62.30	0.097	5000	970	0.16	0.596	0.25	0.80	<u>18.69</u>	<u>63.02</u>
Total Basin B										81.26	264.56
C	1	85.07	0.133	3300	1140	0.09	0.554	0.25	0.80	29.05	92.96
	2	47.63	0.074	2900	1080	0.08	0.548	0.25	0.80	16.41	52.29
	3	56.89	0.089	2700	1200	0.07	0.542	0.25	0.80	19.87	63.58
	4	67.39	0.105	3600	1000	0.10	0.560	0.25	0.80	<u>22.69</u>	<u>72.60</u>
Total Basin C										88.02	281.43
D	1	41.29	0.065	3000	400	0.13	0.578	0.35	0.65	19.00	35.38
	2	74.25	0.116	3900	820	0.13	0.578	0.35	0.65	34.10	63.14
	3	63.29	0.099	5000	820	0.17	0.602	0.35	0.65	<u>27.10</u>	<u>51.74</u>
Total Basin D										80.20	150.26
E	1	106.58	0.167	6000	470	0.26	0.656	0.35	0.65	42.90	80.09
	2	108.14	0.169	4300	230	0.23	0.638	0.35	0.65	<u>44.60</u>	<u>83.33</u>
Total Basin E										87.50	163.42

Dry Creek Drainage Basin

Calculations - Sheet FNo. 2

Major Basin	Sub-Basin	Area		Basin		Tc(Hr.)	Tp(Hr.)	Runoff Flow Q(in.)		Peak Flow (CFS) Qp	
		Acres	Sq.Mi.	L(ft.)	H(ft.)			Original	Adjusted	Original	Adjusted
F	1	64.57	0.101	5700	230	0.33	0.698	0.45	0.65	31.51	45.52
	2	66.99	0.105	3600	330	0.18	0.608	0.35	0.65	29.23	54.33
	3	100.32	0.157	4200	300	0.20	0.620	0.30	0.65	36.76	79.66
	4	68.70	0.107	3500	200	0.19	0.614	0.40	0.65	<u>33.75</u>	<u>54.82</u>
Total Basin F										131.26	234.33
G	1	94.19	0.147	4400	180	0.27	0.662	0.45	0.65	48.52	69.86
	2	72.38	0.113	3500	150	0.22	0.632	0.35	0.65	30.28	56.25
	3	78.82	0.123	5500	410	0.24	0.644	0.30	0.65	<u>27.73</u>	<u>60.09</u>
Total Basin G										106.53	186.20

COST ESTIMATE

ITEM	QUANTITY	UNIT	UNIT COST	AMOUNT
Rip Rap	1656	Sq. Yd.	15.00	\$24,840.00
Concrete Box Culvert	121	Cu. Yd.	200.00	24,200.00
Inlets-Conc.	2	Ea.	150.00	300.00
6' CB	2	Ea.	900.00	1,800.00
10' CB	2	Ea.	1200.00	2,400.00
Conc. "V" Ditch	1300	L.F.	17.00	22,100.00
Conc. Spillways	3	Ea.	200.00	600.00
48" RCP	250	L.F.	34.00	8,500.00
Rip Rap Retainers	150	Sq. Yd.	20.00	3,000.00
Gabian Check Dams 6'6" x 1'8" x 3'3"	35	Ea.	50.00	1,750.00
Engineering				<u>4,570.00</u>
				\$94,060.00

Dry Creek Basin- $\frac{94,060.00}{114.45 \text{ ac.}} = 821.84/\text{Acre}$

Fee = 661.00/Ac x 114.45 = \$75,651.00

North Rockrimmon-No Improvements

Fee = 697.00/Ac x 3.58 = \$2,495.00

Unstudied Basin-No Improvements

Fee = 735.00/Ac x 21.97 = \$16,147.00



Peak Engineering Co.
Colorado Springs, Colo.