

Master Drainage Plan
for
Garden Ranch Estates
August 1972

RETURN TO: [REDACTED]
Land Development [REDACTED]
101 West Cassin, Suite 127
Colorado Springs, CO 80905

Karcich & Weber, Inc.
3010 Mallard Drive
Colorado Springs, Colorado



RETURN TO:
Land Development
701 West Corral, Suite 122
Colorado Springs, CO 80909

August 11, 1972

Mr. George Jury
City Engineer
City Hall - Kiowa & Nevada
City 80902

Dear Mr. Jury,

Transmitted herewith is the Master Drainage Plan for Garden Ranch Estates. Included are cost estimates for all drainage facilities in the 210 + Ac. Subdivision. The area of this study lies totally within the North Shook's Run Templeton Gap Floodway Drainage Basin. Included in the body of this report are the following: Brief description of location, interior & exterior drainage characteristics, description of the method used, explanation of pipe design sizes, street flow data and a detailed breakdown of drainage basins & subbasins.

Very truly yours,
Karcich & Weber, Inc.

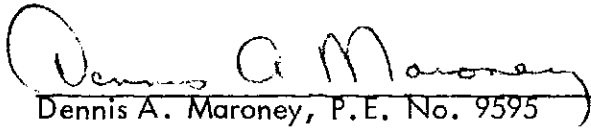
Dennis A. Maroney
P.E. No. 9595

NOTE: Corrections to the inlet locations will possibly have to be made when street profiles are submitted.

Robert A. Martin, Acting City Engineer

Registered Engineer

I, Dennis A. Maroney, a Registered Engineer in the State of Colorado, hereby certify that the attached drainage plan and report were prepared under my supervision and direction 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 and specifications and criteria.


Dennis A. Maroney, P.E. No. 9595

Owner or Developer of the site

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

By 

Title Owner

MASTER DRAINAGE PLAN GARDEN RANCH ESTATES

Location:

The subdivision is located in the E $\frac{1}{2}$ of the NW $\frac{1}{4}$ of Section 21 lying Southwesterly of Academy Blvd. and also in the SE $\frac{1}{4}$ of Section 21 and in the SW $\frac{1}{4}$ of Section 22 lying westerly of Garden Ranch Estates No. 2 and of Garden Ranch Subdivision, Ridgecrest Addition and Northeasterly of the Frank M. Houck tract. All the land lies within the city limits of Colorado Springs, The total area of the subdivision is 211.745 acres.

Interior Drainages:

The site slopes towards the south with two major drainage courses evident. These two drainage courses exist roughly on the proposed locations of Union Boulevard and Garden Way. Along these streets major storm sewer facilities have been proposed. An open channel has been proposed for the large quantities of water expected along Union Boulevard and a 66" CMP or its equal has been proposed to carry the storm water under Garden Way. Where necessary other storm drainage facilities have been proposed. The proposed facilities have been shown on the enclosed drainage plan. Drainage to the storm drain facilities is accomplished through street flows as well as along lot lines which will be graded so as to accomplish the proposed drainage pattern. All of this subdivision drains into a small holding reservoir located partly in the southerly part of the subdivision. The reservoir will be sized to allow for a minimum capacity of 41 acre ft. as indicated in the master drainage plan for the basin.

Exterior Drainage:

The subdivision lies in the North Shook's Run Templeton Gap Floodway Drainage Basin. There are three major offsite drainage courses on to the subdivision. Two of these emanate from the land lying to the north, Vista Grande Subdivision. One flow crosses Academy Boulevard at Montebello Drive West and proceeds southerly along Montebello Drive West until it reaches Garden Way at which point it heads east toward Union Boulevard. The proposed flow is 124 cfs as it crosses Academy Boulevard. The other major flow crosses Academy Boulevard at Union Boulevard and proceeds south along the open channel in Union Boulevard. This anticipated flow at Academy is 426 cfs. The third large off site flow entering the subdivision originates in Garden Ranch Estates No. 1 and joins the proposed subdivision at the easterly edge of Ridgeglen Road. This flow of 44.6 cfs is carried by street and pipe flow to Union Boulevard where it empties into the open channel. The drainage plan indicates all interior and exterior flows as well as any structures required to carry these flows.

Description of Method:

All flows in the subdivision were calculated using the Hydrograph Method. The basic formula for the method is:

$$q_p = \frac{484 A Q}{T_p} \qquad T_p = \frac{D}{2} + .6T_c \qquad D = 1 \text{ hour}$$

q_p = peak flow generated in the area

A = area in square miles

Q = direct run-off in inches

T_p = time in hours from start of rise to peak rate

T_c = time of concentration, from most distant point to point of interest

The design storm was taken to be 2" of rain falling in 1 hour which corresponds to the 50 year storm for this region.

The calculated flows for each basin can be found immediately following this description as can the cumulative flows along channels. These flows are also shown on the drainage plan.

Pipe Design:

All pipes were sized using a N value equal to .024. Smaller N values would result in smaller pipe sizes as would be the case for concrete pipe. The pipes were designed using the same slope as the corresponding street.

Street Flow:

Also included are tables giving pertinent street data including slope, street capacity, street flow, and pipe flow, if any. In a few cases where street flow exceeds the street capacity one should note two things. First, the street flow given is the peak flow on the street and does not mean that the flow persists for a great length. Second, wherever this occurs a storm sewer structure is located at the nearest downstream intersection where storm flows can be picked up in the underground system.

MAJOR BASIN	SUB BASIN	AREA		BASIN		T _c	T _p	FLOW		MAIN CHANNEL FLOW			
		PLAN.	MI.	LENGTH	HEIGHT			Q	q _p	Q	T _p	q _p	
A	A-1	28.82	.0103	1150 ft	48 ft	49 min	.549	1.30"	11.7 cfs				
	A-2	12.51	.0045	600	24	5.9	.559	1.30	5.1				
	A-3	16.22	.0058	710	39	3.3	.533	1.20	6.3				
	A-4	39.47	.0142	1240	52	4.2	.542	1.20	15.2				
	A-5	19.11	.0069	1060	40	3.3	.533	1.20	7.5				
	A-6	10.03	.0037	940	18	4.2	.542	1.20	4.0				
	A-7	7.69	.0028	900	13	.8	.508	1.30	3.5				
	A-8	39.76	.0143	1000	20	9.0	.590	1.30	15.2				
		Collection Point Intersection of Academy Blvd. & Montebello Drive West											
											1.28"	.607	18.6
													124.0
											1.22"	.590	31.2
		Collection Point Entrance to Drainage Ditch on Saddle Drive											
		Collection Point Intersection of Drainage Ditch with Montebello Drive West											
												.615	142.6
											1.27"	.615	45.5

MAJOR BASIN	SUB BASIN	AREA		BASIN		T _c	T _p	FLOW		MAIN CHANNEL FLOW			
		PLAN.	MI.	LENGTH	HEIGHT			Q	q _p	Q	T _p	q _p	
B	B-1	22.43	.008	920 ft	56 ft	4.1 min	.541	1.20"	8.6 cfs				
	B-2	27.87	.010	1010	44	5.3	.553	1.20	10.5				
	B-3	13.64	.0049	750	48	3.1	.531	1.20	5.4				
	B-4	18.79	.0067	900	42	4.3	.543	1.20	5.6				
	B-5	14.38	.0052	700	20	2.7	.527	1.20	5.6				
	B-6	14.50	.0052	750	25	3.1	.531	1.20	5.7				
	B-7	35.40	.0127	1050	46	6.0	.56	.93	10.2				
	B-8	45.41	.0163	1080	48	4.8	.548	1.20	17.2				
	B-9	24.90	.0089	850	34	4.9	.549	.93	7.3				
		Collection Point Intersection of Montebello Drive West & Saddle Drive									1.20"	.568	40.9
		Collection Point Intersection of Montebello Drive West & Garden Way											
							Flow from	North Montebello Drive			.623	188.1	
							Flow from	South Montebello Drive			.623	67.3	
C	C-1	12.49	.0045	700	40	2.4	.524	1.20	5.0				
	C-2	6.01	.0022	500	27	2.5	.525	1.20	2.4				

MAJOR BASIN	SUB BASIN	AREA		BASIN		T _c	T _p	FLOW		MAIN CHANNEL FLOW		
		PLAN.	MI.	LENGTH	HEIGHT			Q	q _p	Q	T _p	q _p
		Collection Point	Intersection	of Garden	Way & 1st	Cul-de-sac						
											.635	270.7
												7.1
		Collection Point	Intersection	of Garden	Way & 2nd	Cul-de-sac				1.20	.635	
											.640	277.8
												10.2
		Collection Point	Intersection	of Garden	Way & Ranch	Drive						
											.641	288.0
												8.7
		Collection Point	Intersection	of Garden	Way Pipe & End	C-11						
											.643	296.7
												301.0
D	D-1	20.47	.00735	770 ft	15.4 ft	6.0 min	.5601	1.30"	8.3 cfs			
	D-2	15.52	.00556	1230	20.4	7.7	.577	1.30	6.1			
	D-3	19.80	.0071	670	13.4	3.9	.539	1.30	8.3			

MAJOR BASIN	SUB BASIN	AREA		BASIN		T _c	T _p	FLOW		MAIN CHANNEL FLOW				
		PLAN	MI.	LENGTH	HEIGHT			Q	q _p	Q	T _p	q _p		
		Collection Point Intersection Union Blvd. & Ranch Lane												
												.638	432.6	
												1.39	.638	62.5
E	E-1	24.01	.0086	670	14.0	5.2	.552	1.30	9.8					
	E-2	2.39	.00086	380	14.0	2.7	.527	1.30	1.1					
	E-3	6.06	.00217	330	15.0	2.5	.525	1.30	2.6					
	E-4	6.44	.0023	200	6	2.2	.522	1.30	2.8					
	E-5	30.80	.011	650	25	4.2	.542	1.30	12.8					
	E-6	18.28	.00656	500	64	2.2	.522	1.20	7.3					
		Collection Point Intersection Union Blvd. & Garden Way Pipe												
												.645	301.9	
												.645	495.1	
												1.30	.645	13.6
F	F-1	10.87	.0039	680	22	3.1	.531	1.20"	4.3 cfs					

MAJOR BASIN	SUB BASIN	AREA		BASIN		T _c	T _p	FLOW		MAIN CHANNEL FLOW		
		PLAN	MI.	LENGTH	HEIGHT			Q	q _p	Q	T _p	q _p
F	F-2	11.67	.0042	830	13	4.6	.546	1.20	4.4			
	F-3	9.89	.00354	920	22	4.2	.542	1.20	3.8			
	F-4	14.88	.00535	800	13	4.8	.548	1.20	5.7			
		Collection Point Intersection Ranch Drive, Nightingale Drive, & Ridgelen Road										
								Flow from Garden Ranch Estates No. 1				44.61
								Flow from Garden Ranch Estates No.2				26.1
								Added Flow F-1 thru F-4			.649	15.2
		Collection Point Intersection Union Blvd. channel & Ranch Drive										
								Flow in Union Blvd. Channel			.649	810.6
								Added Flow (Ranch Drive Drainage)			.649	85.9
								Added Flow E-5, E-6		1.26	.649	15.6
G	G-1	11.28	.00405	250	12	2.3	.523	1.30	4.9			

STREET	SECTION	TYPE CURB	SLOPE	STREET CAPACITY	STREET FLOW	PIPE FLOW
Academy Blvd.	A-1	Vertical	3.0%	30cfs	11.7cfs	none
Danny Drive	A-2	Ramp	.5%	11.2cfs	5.1cfs	none
Picket Drive	A-3	Ramp	6.3%	43.6cfs	6.3cfs	none
Picket Drive	A-4	Ramp	1.6%	21.0cfs	25.5cfs	none
Picket Place	A-4	Ramp	6.9%	41.4cfs	5.0cfs	none
Saddle Place	A-5	Ramp	4.2%	33.6cfs	3.0cfs	none
Saddle Place	A-5	Ramp	4.4%	34.4cfs	5.0cfs	none
Saddle Drive	A-5	Vertical	2.7%	70.0cfs	6.5cfs	none
Saddle Drive	A-4,A-5	Vertical	.5%	30.4cfs	25.5cfs	none
Academy Blvd.	A-6	Vertical	2.6%	30cfs	15.3cfs	none

STREET	SECTION	TYPE CURB	SLOPE	STREET CAPACITY	STREET FLOW	PIPE FLOW
Academy Blvd.	A-7	Vertical	1.3%	30cfs	18.6cfs	none
Montebello Drive	A-8	vertical	2.3%	30cfs	21cfs	124cfs
Montebello Drive	B-9	vertical	1.5%	30cfs	23cfs	165.1cfs
Picket Drive	B-1	ramp	6.5%	41.4cfs	8.6cfs	none
Picket Drive	B-2	ramp	2.4%	25.8cfs	10.5cfs	none
Bridle Place	B-3	ramp	6.1%	40.6cfs	5.4cfs	none
Picket Drive	B-4	ramp	3.4%	30.6cfs	5cfs	none
Saddle Drive	B-4	vertical	5.4%	95.0cfs	7.2cfs	none
Montebello Drive	B-5	vertical	2.3%	30cfs	40.9cfs	none
Saddle Drive	B-6	vertical	3.8%	83.0cfs	5.7cfs	none

STREET	SECTION	TYPE CURB	SLOPE	STREET CAPACITY	STREET FLOW	PIPE FLOW
Montebello Drive	B-8 before catch basin	vertical	2.6%	30cfs	33.2cfs	16.8cfs
Montebello Drive	B-8	vertical	2.6%	30cfs	16.4cfs	33.6cfs
Garden Way	B-8, B-9, C-2, C-1	ramp	3.0%	28.8cfs	11.9cfs	243.5cfs
Garden Way	C-3, C-4	ramp	3.0%	28.8cfs	12.4cfs	249.1cfs
Garden Way	C-5, C-6	ramp	3.0%	28.8cfs	13.2cfs	257.5cfs
Garden Way	C-7, C-8	ramp	3.0%	28.8cfs	11.9cfs	265.9cfs
Garden Way	C-9	ramp	3.0%	28.8cfs	13.7cfs	274.3cfs
Brown Valley Lane	C-1	ramp	5.7%	39.6cfs	5cfs	none
Garden Trail	C-3	ramp	3.2%	29.8cfs	4cfs	none
Garden Trail	C-3	ramp	6.9%	45.6cfs	8.1cfs	none

STREET	SECTION	TYPE CURB	SLOPE	STREET CAPACITY	STREET FLOW	PIPE FLOW
Garden Trail	C-10	ramp	8.1%	47.2cfs	7cfs	none
Garden Place	C-10	ramp	7.4%	45.2cfs	1.5cfs	none
Garden Ranch Drive	C-10	vertical	.5%	30.4cfs	7.6cfs	none
Garden Ranch Drive	C-9	vertical	.5%	30.4cfs	9cfs	none
Garden Ranch Drive	C-8	vertical	5.0%	95.4cfs	2cfs	none
Ranch Lane	D-1	vertical	2.0%	60.2cfs	8.3cfs	none
Ranch Lane	D-3	vertical	2.0%	60.2cfs	21.8cfs	none
Ranch Lane	D-5	vertical	5.5%	100.8cfs	39.4cfs	none
Ranch Drive	D-9	vertical	4.5%	90.4cfs	3.4cfs	none
Academy Blvd.	D-10	vertical	1.4%	30cfs	4.6cfs	none

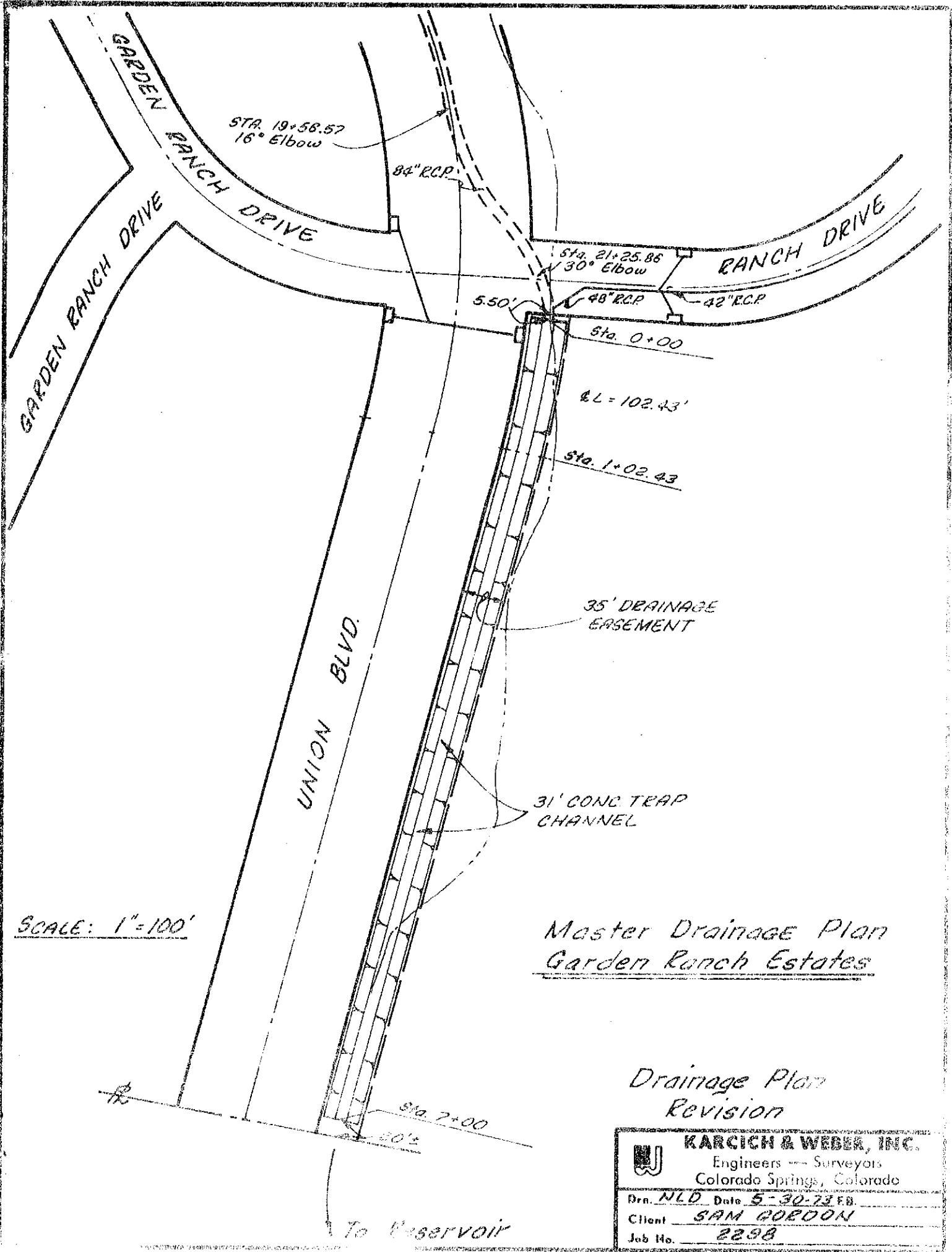
STREET	SECTION	TYPE CURB	SLOPE	STREET CAPACITY	STREET FLOW	PIPE FLOW
Academy Blvd.	D-11	vertical	1.0%	30cfs	3cfs	none
Union Boulevard	D-7	vertical	4.44%	30cfs	10cfs	426cfs
Union Boulevard	D-7	vertical	3.5%	30cfs	20cfs	426cfs
Union Boulevard	E-1	vertical	2.95%	30cfs	20cfs	478.5cfs
Union Boulevard	E-1	vertical	2.55%	30cfs	22cfs	478.5cfs
Union Boulevard	E-5	vertical	2.55%	30cfs	23cfs	791.6cfs
Union Boulevard	G-1	vertical	.5%	28.4cfs	9cfs	908.4cfs
Nightingale Drive	F-1	ramp	3.0%	28.8cfs	4.3cfs	none
Nightingale Drive	F-2	ramp	1.6%	21.0cfs	8.5cfs	none
Nightingale Drive	F-3	ramp	5.8%	40.0cfs	8.8cfs	none

STREET	SECTION	TYPE CURB	SLOPE	STREET CAPACITY	STREET FLOW	PIPE FLOW
Ranch Drive	F-3	ramp	5.0%	37.2cfs	26.1cfs	none
Ridgeglen Road	F-4	ramp	1.6%	21.0cfs	44.6cfs	none
Ranch Drive	F-4	vertical	.5%	30.2cfs	30.2cfs	76cfs
Garden Ranch Drive	E-6	vertical	4.7%	92.4cfs	7.3cfs	none
Garden Ranch Drive	E-6	vertical	4.0%	85.2cfs	2cfs	none
Brown Valley Lane	H-1	ramp	7.9%	46.6cfs	7.8cfs	none
Brown Valley Lane	H-3	ramp	7.8%	46.4cfs	9cfs	none
Garden Ranch Drive	H-3	vertical	6.7%	111.2cfs	4cfs	none

Pipe Size	Length	Unit Price	Subtotal	Total
18" CMP	70'	6.93	485.00	
21" CMP	300'	9.00	2,700.00	
24" CMP	550'	10.00	5,500.00	
30" CMP	540'	12.50	6,750.00	
42" CMP	30'	20.50	615.00	
48" CMP	970'	25.00	24,250.00	
60" CMP	1520'	37.00	56,200.00	
66" CMP	1000'	40.00	40,000.00	
			<u>\$136,500.00</u>	\$136,500.00

Catch Basin Size	Quantity	Unit Price	Subtotal	Total
4'	3	350.00	1,050.00	
6'	10	400.00	4,000.00	
10'	2	600.00	1,200.00	
12'	8	700.00	5,600.00	
16'	1	775.00	775.00	
			<u>\$12,625.00</u>	\$149,125.00


Channel	Quantity	Unit Price	Subtotal	Total
4'-0-2:1:2'	860'	9.10	7,380.00	
Union Blvd.	1575'	25.00	39,375.00	
Union Blvd.	600'	30.00	18,000.00	
Union Blvd.	600'	35.00	21,000.00	
Union Blvd.	75'	200.00	15,000.00	
Box Channel or Pipe Intersections with Union Blvd. Channel	3	2000.00	6,000.00	
			<u>\$106,755.00</u>	\$255,880.00



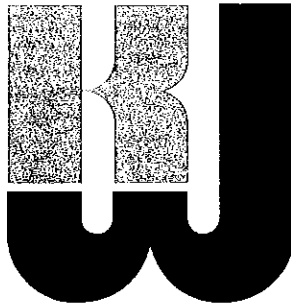
SCALE: 1"=100'

Master Drainage Plan
Garden Ranch Estates

Drainage Plan
Revision

	KARCICH & WEBER, INC.
	Engineers -- Surveyors Colorado Springs, Colorado
Drn. NLD	Date 5-30-73 EB
Client	SAM GORDON
Job No.	2298

To Reservoir



April 5, 1974

Mr. Bob Martin
City Engineering Dept.
P. O. Box 1575
Colorado Springs, Colo.

Re: Garden Ranch Estate - Drainage

Dear Mr. Martin:

Reference is made to a recent inspection of the storm drainage facilities installed in the Garden Ranch Subdivision. In particular, concern should be given the existing reservoir and its relationship to the proposed storm sewer outfall from the Garden Ranch Subdivision.

Existing downstream facilities (84" RCP) are currently experiencing heavy silting due to backwater effects and silting of the downstream reservoir.

As you are aware several design alternatives have been proposed for the drainage reach between the reservoir and the current outfall from the 84" RCP. Before a design can be finalized in this reach further information is needed to clarify the status of the existing reservoir and inform all concerned parties of possible liability involved in the case of future flood damage.

We would like to request a meeting with the City to solidify our understanding of drainage and legal ramifications of improvements made in the drainage basin upstream of the existing reservoir on Dr. Houck's property. In general, we would like to review the propriety of the existing systems and their compliance with the master drainage plan approved for the basin.

In discussions with the developer, Mr. Gordon, it was felt that extending the existing 84" RCP prior to determining the future of the existing reservoir would not be the most economical nor logical approach in further developing the drainage facilities.

It should also be noted that the existing reservoir might fail due to erosion of the spillway section if sufficient water is generated from the watershed and the W.S. depth exceeds existing spillway elevations. Since the reservoir does not meet current state standards and since no improvements have been made since the drainage basin study in 1963, where will the liability fall for such a failure?

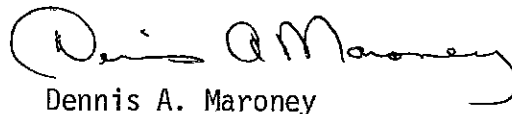
Bob Martin
Page 2

April 5, 1974

It would be appreciated if a meeting could be scheduled between yourself, the Assistant City attorney, Mr. Sam Gordon, and representatives of our office to discuss the potential drainage problems relating to the existing reservoir. A meeting set up at your earliest convenience would be appreciated.

Sincerely yours,

KARCICH & WEBER, INC.



Dennis A. Maroney

DAM/ss