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NORTHWEST STORM DRAINAGE STUDY VOLUME I

Project No. ST-74206.00

1977

arthur beard engineers, Inc.
Phoenix, Arizona

A026.303

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SYNOPSIS

This is Volume I of a two volume report which presents a recommended stormwater drainage master plan for a portion of Northwest Phoenix. This volume gives a brief description of the study and how the Northwest Storm Drainage Master Plan was developed. Volume II contains a detailed account of the technical aspects of the study.

The study area (Figure 1) contains approximately twenty-three square miles and is the major portion of the area commonly referred to as Deer Valley. The study area is bounded by Skunk Creek on the North, Black Canyon Freeway on the East, the Arizona Canal on the South, and 51st Avenue on the West.

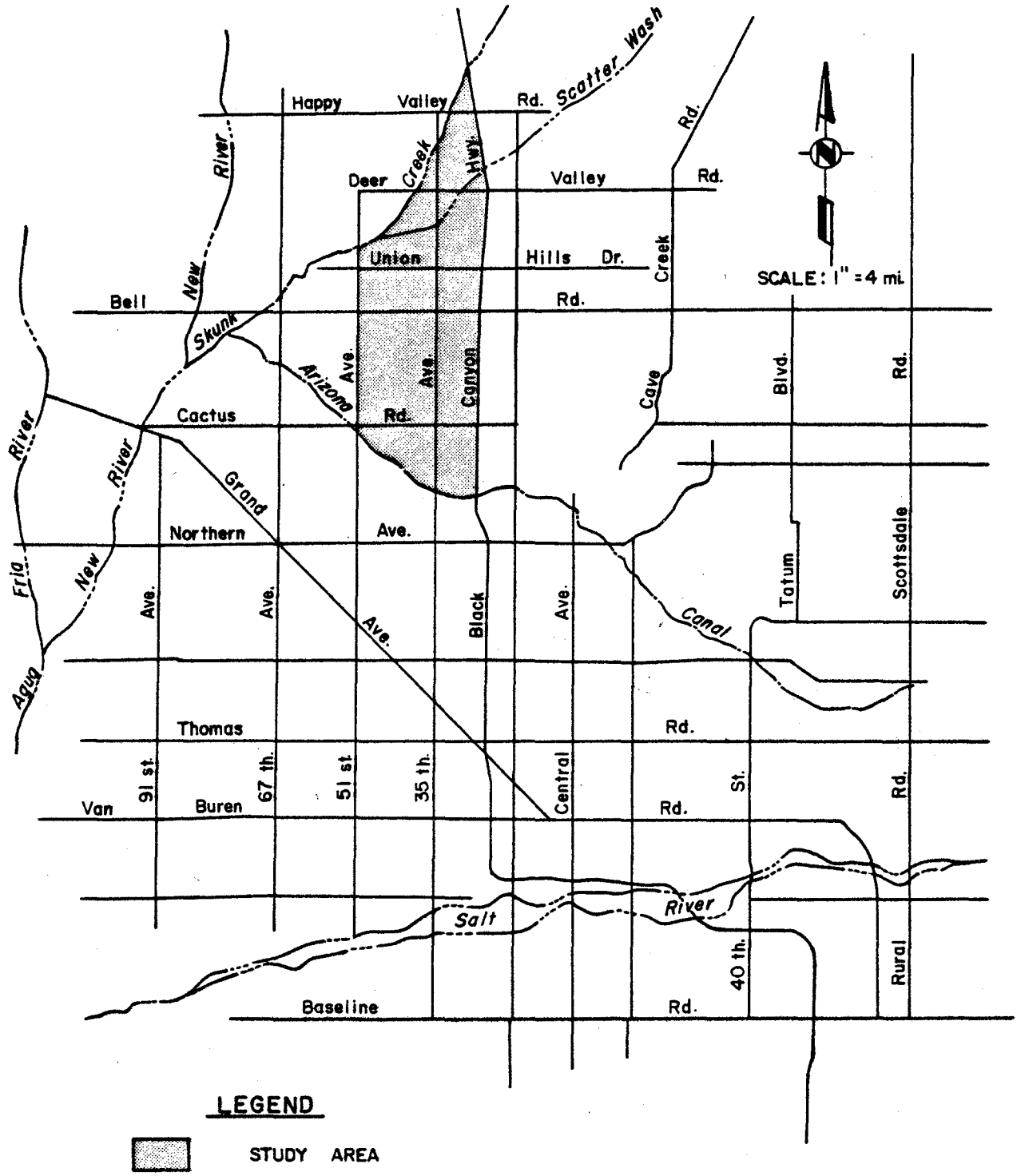
Several major design assumptions were made for this study: 1) The Central Arizona Project Aqueduct, Adobe Dam, and the Arizona Canal Diversion Channel will be constructed as presently proposed; 2) the existing drainage patterns for the contributing area east of the Black Canyon Freeway will not be altered; 3) the present integrity of Scatter Wash and Skunk Creek will be maintained; 4) the proposed on-site retention of storm water will not be achieved and therefore not relied upon within this study.

Initially, three alternative plans were studied for the selection of a master plan. These alternate plans are discussed in detail in Volume II.

The Soil Conservation Service Method as applied in the computer program SCS-TR-20 was utilized to compute the surface runoff from the 1, 2, 10, and 50 year frequency storms based on the SCS Type II, 24 Hour Storm Distribution for the three alternates.

Preliminary estimates were then calculated for collection systems capable of handling the 1, 2, 10, and 50 year storms for each of the alternates. Based upon the presented material, a slightly modified version of Alternate I was selected for the optimum Northwest Storm Drainage Master Plan.

Using the 2 year storm as the design frequency and the Illinois Storm Sewer System Simulation Computer Model, final pipe sizes for the system were selected. Based on this data, the estimated cost of construction for the master plan is $18,200,000 based on January 1, 1977 prices.



STUDY AREA LOCATION MAP

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NORTHWEST STORM DRAINAGE MASTER PLAN

The Northwest Storm Drainage Master Plan is shown on Plate 1. This plan directs all storm drainage north of Union Hills Drive directly to either Skunk Creek or Scatter Wash. All storm drainage south of Union Hills Drive will be conducted to the Arizona Canal Diversion Channel by means of trunk storm sewers in 35th Avenue, 43rd Avenue and 51st Avenue.

In developing the master plan, the majority of the utility conflicts involving water lines 16" and greater and sanitary sewers 12" and greater were resolved using slope adjustment. Initially, all pipe slopes were established by approximating the existing ground slopes from the outlet sources to the points of beginning. Outlet elevations along the natural features of Skunk Creek and Scatter Wash generally conform with the channel bottom due to pipe cover limitations and to prevent extensive channel excavation work.

51st, 43rd, and 35th Avenue outlet elevations along the proposed Arizona Canal Diversion Channel were established by calculating the approximate 25 year frequency storm water surface profile within the channel and using this as the preliminary criteria for establishing the pipe inverts. The 25 year storm elevation allows the flexibility for change in outlet inverts, should the need occur.

Profiles for all drainage lines can be found in Plate 2. In addition to pertinent drainage data such as pipe sizes, slope, and invert elevations, all major utility pipe locations, sizes, and elevations are shown.

Although the majority of the storm drain lines can be placed according to the standard location 4 feet south or 4 feet west of the monumented centerline, there are locations where shifts from the standard are dictated. The following is a list of these locations:

1. Greenway Road (Black Canyon Freeway to 39th Avenue) - Storm sewer relocated 4 feet north of the centerline of Greenway Road to avoid conflict with a 51" sanitary sewer being designed and located 4 feet south of the centerline (Figure 2).

2. Paradise Lane (39th Avenue to 43rd Avenue) - Change location of storm sewer to 8 feet north of centerline to avoid sanitary sewer which meanders from the centerline of Paradise Lane to a point 9 feet south.

3. 35th Avenue (Greenway to Arizona Canal Diversion Channel) - Pipe to be placed 25 feet east of the centerline preventing a conflict with a 36" - 42" waterline located 9 feet east of the centerline. Also, a conflict may be eliminated at the Greenway Road intersection where the waterline crosses the centerline to a location 18 feet west. (Figures 2, 3 and 4)

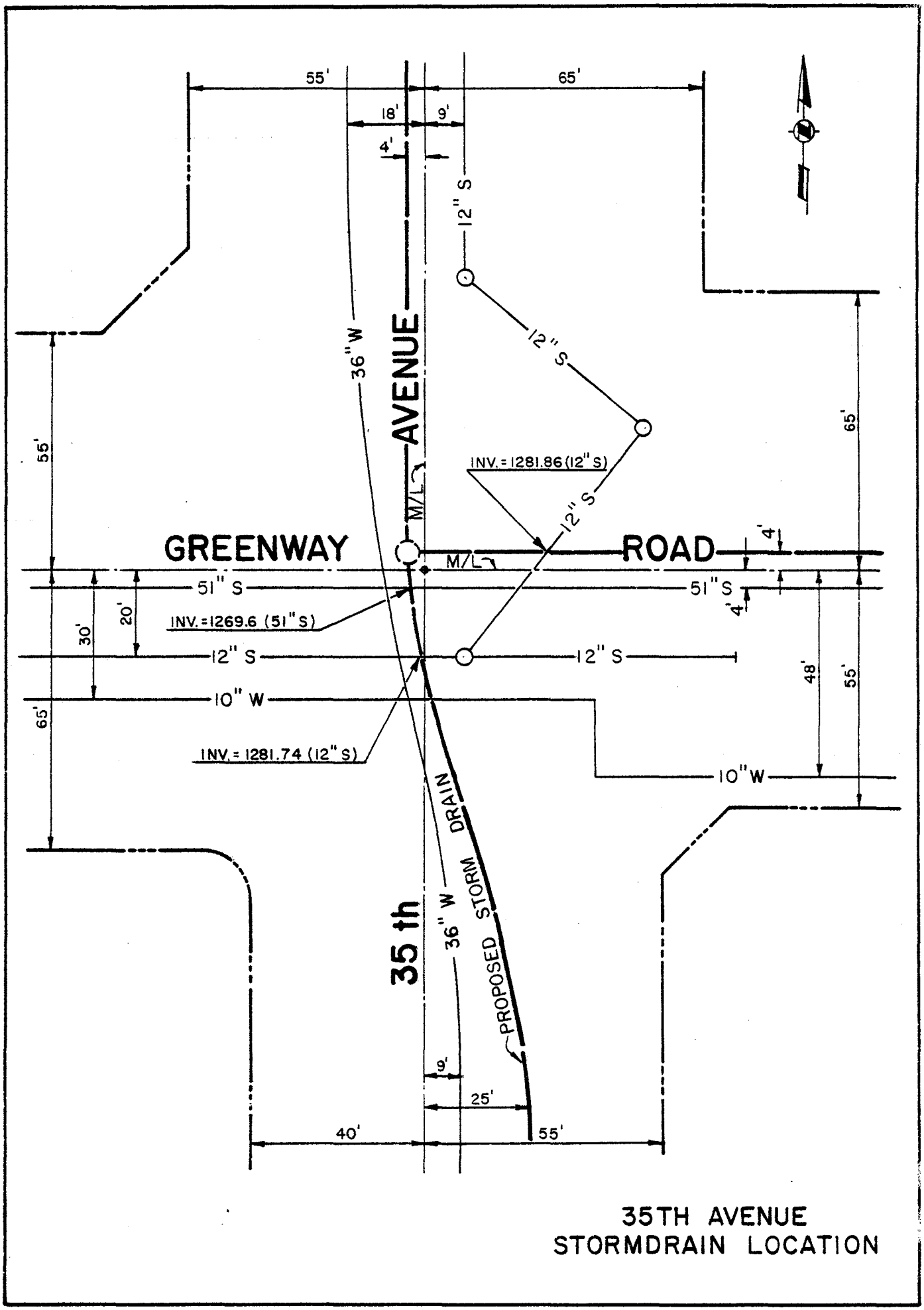
4. Cactus Road (29th Avenue to 35th Avenue) - Because of a 12" sanitary sewer located 10 feet south of the centerline, the stormdrain should be located 20 feet south of the centerline.

5. Peoria Avenue (Black Canyon Freeway to 35th Avenue) - The stormdrain location 52 feet south of Peoria Avenue conforms with an alignment currently under consideration and avoids conflict with a 12" V.C.P. located at 45 feet east of the 35th Avenue centerline as indicated on Figure 4.

For presentation of the master plan, the Illinois Storm Sewer System Simulation Model was used to develop the final routed flows and pipe sizes. These results, grouped according to pipe runs, can be found in Table 5 as well as shown on Plate 1.

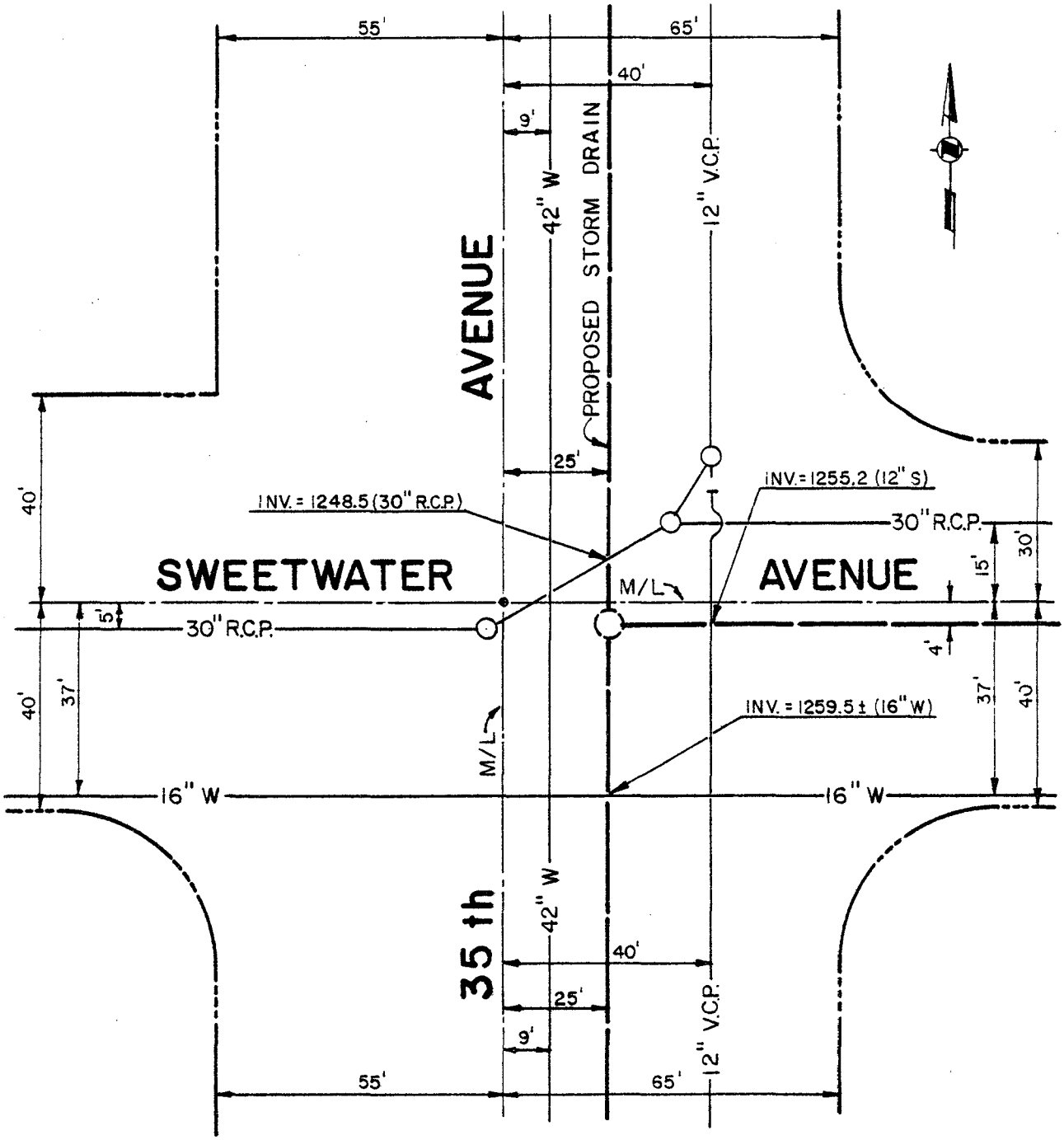
The total estimated cost to construct the approximately 38 miles of pipe within the master plan is $18,200,000. The cost estimate showing major item subtotals can be found in Table 6. This estimate was further refined to show costs associated with individual pipe runs. These runs are identified by referring to the computer node numbers found on Plate 1. The estimated cost for each major pipe run is shown in Table 7.

Cost estimates should be escalated for future construction from January 1, 1977.



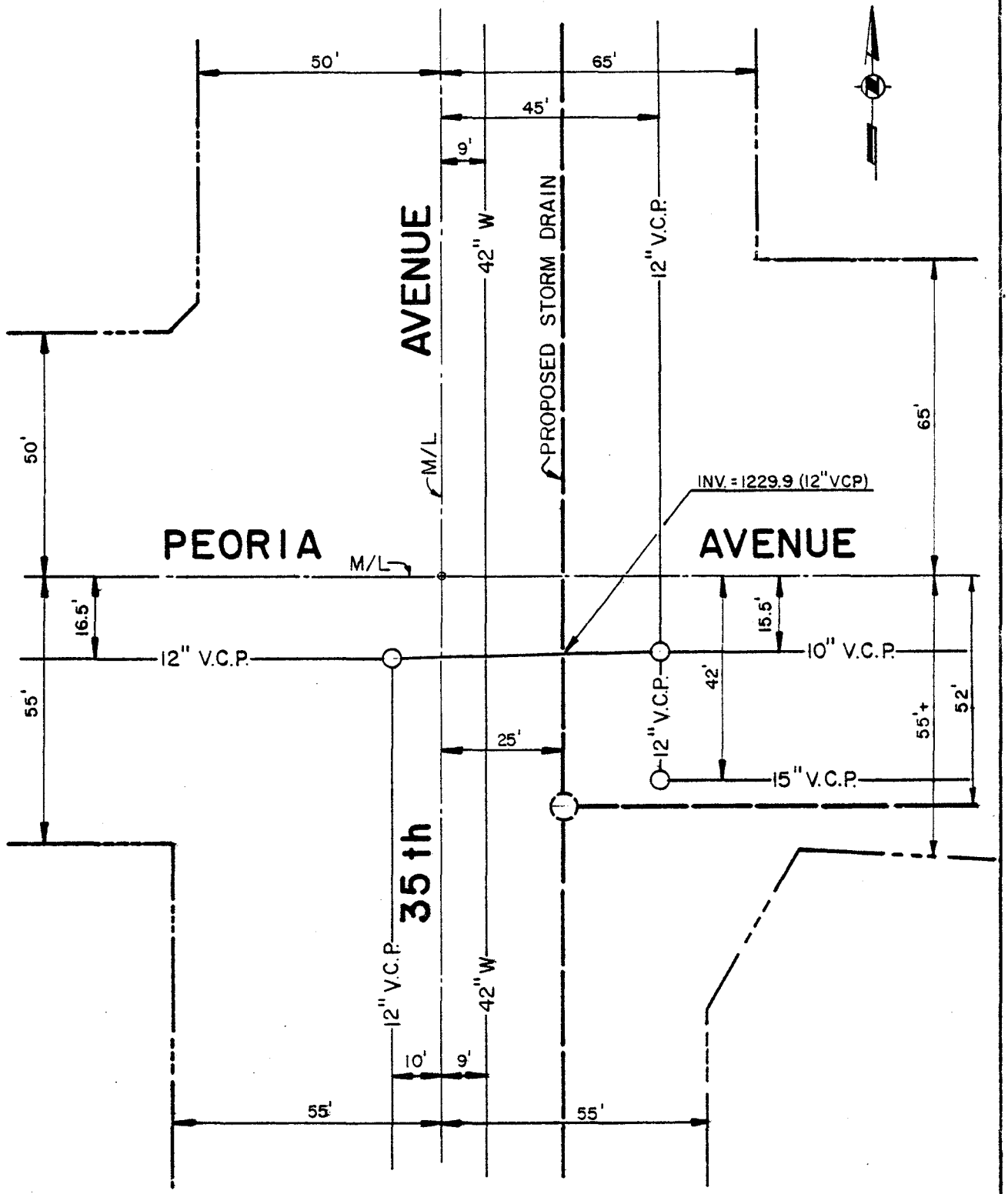
35TH AVENUE
STORMDRAIN LOCATION

FIGURE 3



35TH AVENUE
STORMDRAIN LOCATION

FIGURE 4



35TH AVENUE
STORMDRAIN LOCATION

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FROM NODE	TO NODE	SLOPE (ft/ft)	RUNOFF (c.f.s.)	PIPE SIZE
170	30	0.0069	26	27"
30	130	0.0062	208	60"
130	146	0.0062	208	60"
31	137	0.0064	71	39"
137	149	0.0064	96	48"
141	151	0.0076	17	24"
171	32	0.0055	16	24"
32	139	0.0055	46	36"
139	140	0.0052	77	42"
140	150	0.0045	91	48"
142	143	0.0042	31	33"
143	144	0.0029	52	42"
33	89	0.0052	48	36"
89	90	0.0054	73	48"
90	91	0.0040	99	54"
91	92	0.0042	102	54"
92	93	0.0037	105	54"
93	152	0.0037	105	54"
34	82	0.0050	53	39"
82	83	0.0050	66	42"
83	84	0.0037	104	54"
84	85	0.0037	118	54"
85	86	0.0037	132	60"
86	87	0.0037	144	60"
87	166	0.0037	156	60"
80	95	0.0036	32	33"
95	70	0.0025	32	36"
69	70	0.0027	35	36"
70	64	0.0056	95	48"
63	64	0.0030	19	27"
64	58	0.0033	144	66"
57	58	0.0040	19	27"
58	52	0.0033	176	66"

MASTER PLAN SUMMARY
OF RUNOFF AND PIPE SIZES

FROM NODE	TO NODE	SLOPE (ft/ft)	RUNOFF (c.f.s.)	PIPE SIZE
51	52	0.0045	35	33"
52	46	0.0021	232	78"
45	46	0.0040	31	33"
46	113	0.0021	272	78"
112	549	0.0050	31	33"
549	113	0.0021	31	36"
113	155	0.0021	310	84"
78	79	0.0047	32	33"
79	75	0.0046	62	42"
74	75	0.0055	32	30"
75	68	0.0017	121	60"
67	68	0.0053	32	30"
68	62	0.0028	161	66"
61	62	0.0043	16	24"
62	56	0.0035	193	72"
55	56	0.0035	35	33"
56	50	0.0035	235	78"
49	50	0.0028	31	33"
50	44	0.0038	283	78"
43	44	0.0027	31	33"
44	111	0.0028	329	84"
110	111	0.0036	37	36"
111	107	0.0028	373	84"
106	107	0.0028	35	36"
107	154	0.0028	417	90"
101	102	0.0036	32	36"
117	77	0.0033	54	39"
77	73	0.0040	77	48"
72	73	0.0042	27	30"
73	66	0.0037	140	60"
118	521	0.0044	60	42"
521	66	0.0027	60	42"
66	60	0.0037	210	72"

MASTER PLAN SUMMARY
OF RUNOFF AND PIPE SIZES

FROM NODE	TO NODE	SLOPE (ft/ft)	RUNOFF (c.f.s.)	PIPE SIZE
38	59	0.0040	39	36"
59	60	0.0025	53	42"
60	54	0.0046	270	72"
54	48	0.0046	301	78"
119	47	0.0030	41	36"
40	47	0.0038	14	27"
47	48	0.0038	78	54"
48	115	0.0046	396	84"
114	115	0.0040	44	36"
115	109	0.0016	449	108"
41	108	0.0046	23	30"
108	109	0.0046	63	42"
109	105	0.0016	514	108"
105	100	0.0016	526	108"
104	103	0.0030	15	24"
103	99	0.0030	24	30"
42	99	0.0023	8	21"
99	100	0.0023	51	48"
100	153	0.0037	563	108"

MASTER PLAN SUMMARY
OF RUNOFF AND PIPE SIZES

TABLE 6

DESCRIPTION	QUANTITY	COST
"A" Pavement Replacement (yd^2) @ $20/$yd^2$	2,463	$ 49,260
"B" Pavement Replacement (yd^2) @ $10/$yd^2$	173,487	1,734,870
Manholes: Std. Details 260 & 263 @ $1000/unit	272	272,000
Manholes: Std. Details 260 & 264 @ $1200/unit	113	135,600
Special Manholes larger than 96" @ $2000/unit	17	34,000
Installed Pipe including excavation	--	11,290,505
Detention Basin Costs	--	--
Catch Basins with Connector Pipes @ $33,600/mile	--	1,276,800
10% Contingencies & Engineering & Inspection @ $50,000/mile	--	3,379,304
TOTAL COST (R/0)		$18,200,000

MASTER PLAN
COST ESTIMATE

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FROM NODE	TO NODE	ESTIMATED COST
170	30	$ 29,400
30 130	130 146	283,600
31	137	163,400
137	149	109,400
141	151	80,200
171	32	9,700
32	139	168,300
139	140	187,100
140	150	156,400
142	143	167,200
143	144	168,900
33	89	168,300
89	90	205,300
90	91	237,600
91	92	232,300
92	93	234,100
93	152	173,800
34	82	175,900
82	83	187,100
83	84	234,900
84	85	234,900
85	86	259,600
86	87	245,200
87	166	353,400
80	95	177,500
95	70	155,500
69	70	165,500
70	64	203,700
63	64	137,800
64	58	275,800

INDIVIDUAL PIPE RUN
COST ESTIMATE

FROM NODE	TO NODE	ESTIMATED COST
57	58	$ 139,300
58	52	275,800
51	52	158,000
52	46	339,900
45	46	161,600
46	113	333,600
112	549	32,000
549	113	133,000
113	155	5,700
78	79	159,300
79	75	206,600
74	75	153,300
75	68	250,900
67	68	152,700
68	62	273,700
61	62	136,500
62	56	307,300
55	56	158,600
56	50	336,100
49	50	158,600
50	44	336,100
43	44	157,500
44	111	384,700
110	111	167,900
111	107	384,700
106	107	166,700
107	154	369,300
101	102	138,500
117	77	176,200
77	73	219,600
72	73	158,200

INDIVIDUAL PIPE RUN
COST ESTIMATE

FROM NODE	TO NODE	ESTIMATED COST
73	66	$ 253,900
118	521	117,900
521	66	70,900
66	60	309,700
38	59	111,800
59	60	187,100
60	54	304,000
54	48	339,900
119	47	178,700
40	47	140,800
47	48	232,000
48	115	387,600
114	115	168,300
115	109	613,300
41	108	96,700
108	109	186,400
109	105	622,500
105	100	611,000
104	103	58,700
103	99	97,800
42	99	36,800
99	100	185,700
100	153	774,800
TOTAL COST		$18,200,000

INDIVIDUAL PIPE RUN
COST ESTIMATE

PLATES

NORTHWEST STORM DRAINAGE STUDY

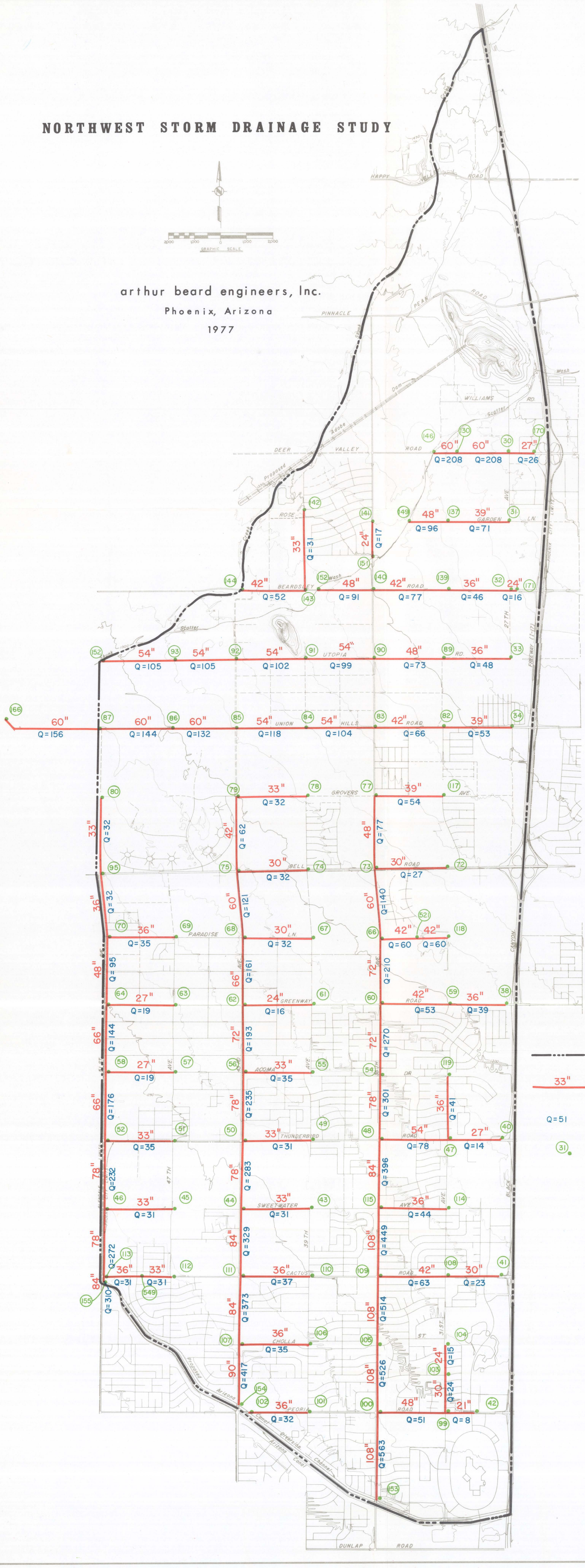
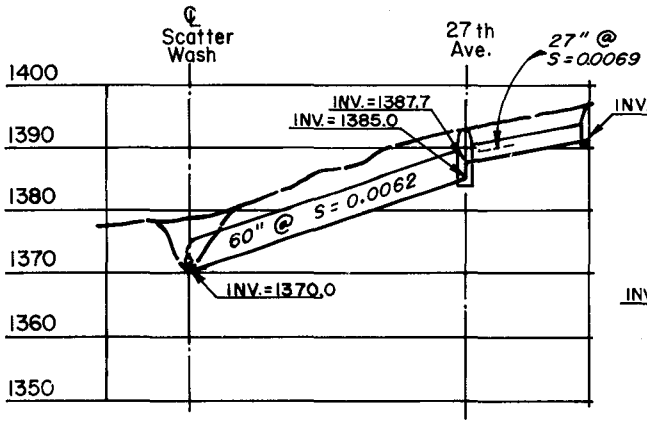
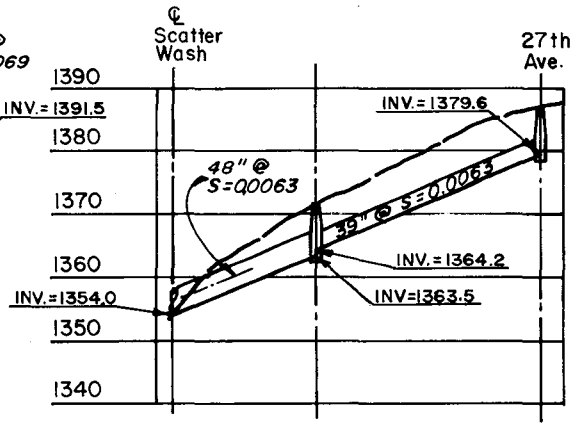


PLATE 1

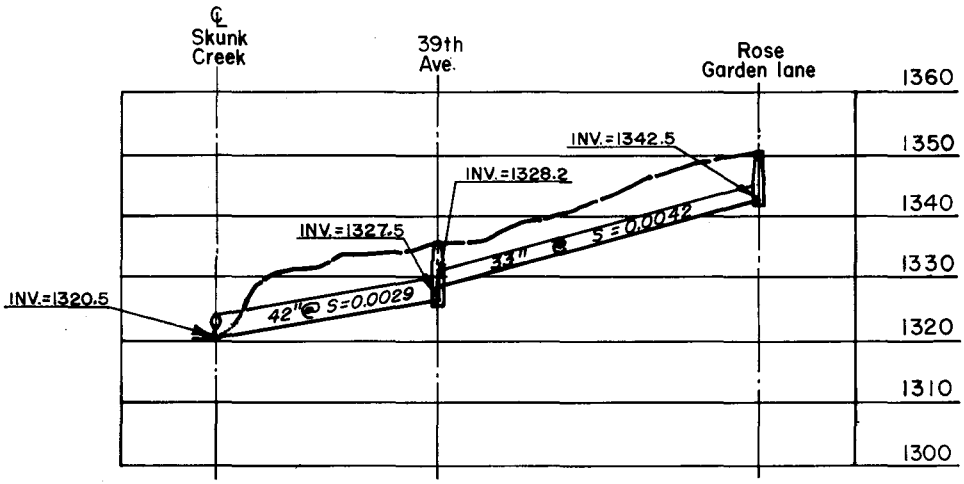
MASTER PLAN



DEER VALLEY ROAD



ROSE GARDEN LANE



BEARDSLEY ROAD & 39th AVENUE

MASTER PLAN DRAINAGE PROFILES

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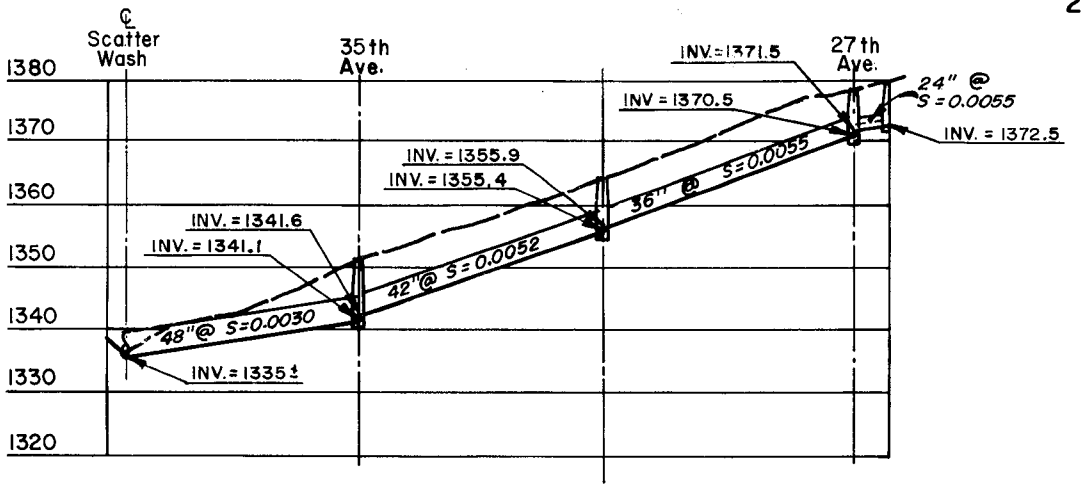
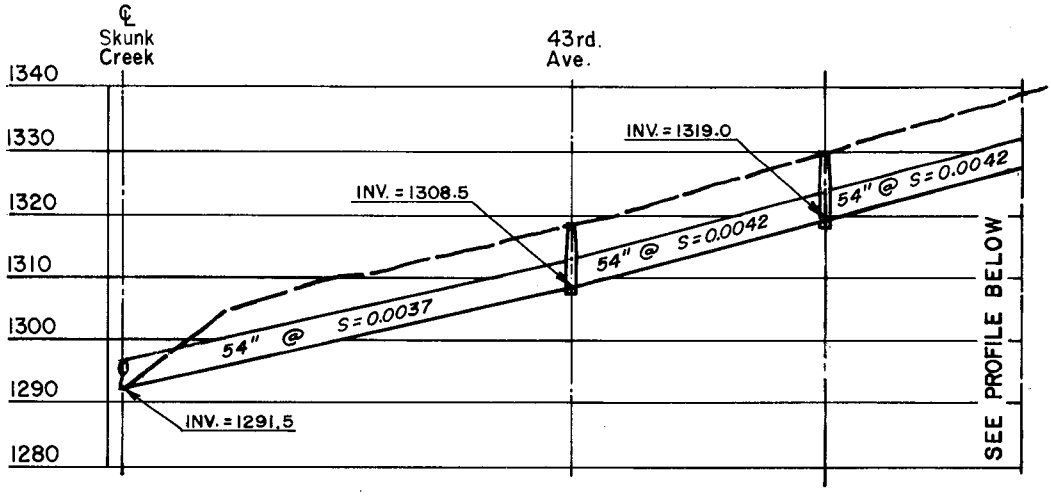
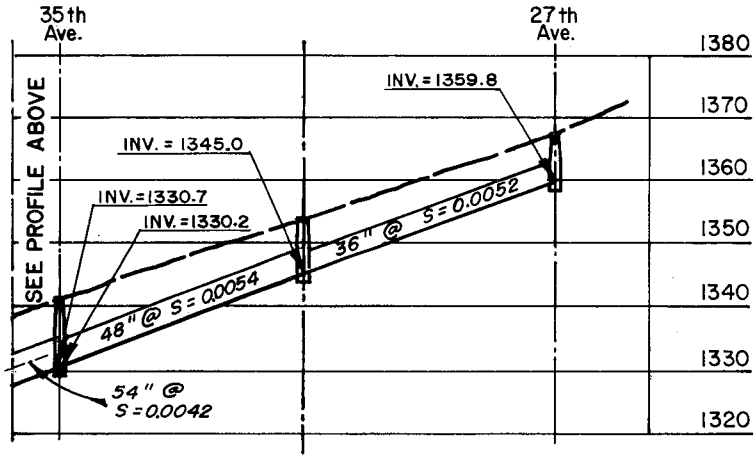


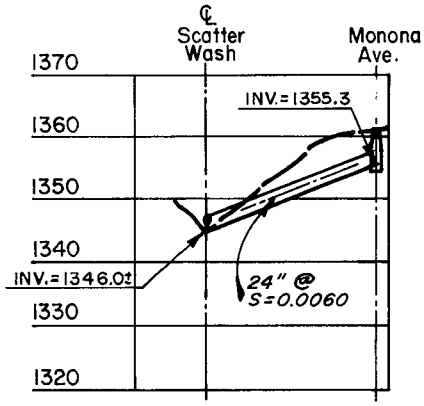
BEARDSLEY ROAD



OLD BLACK CANYON ROAD

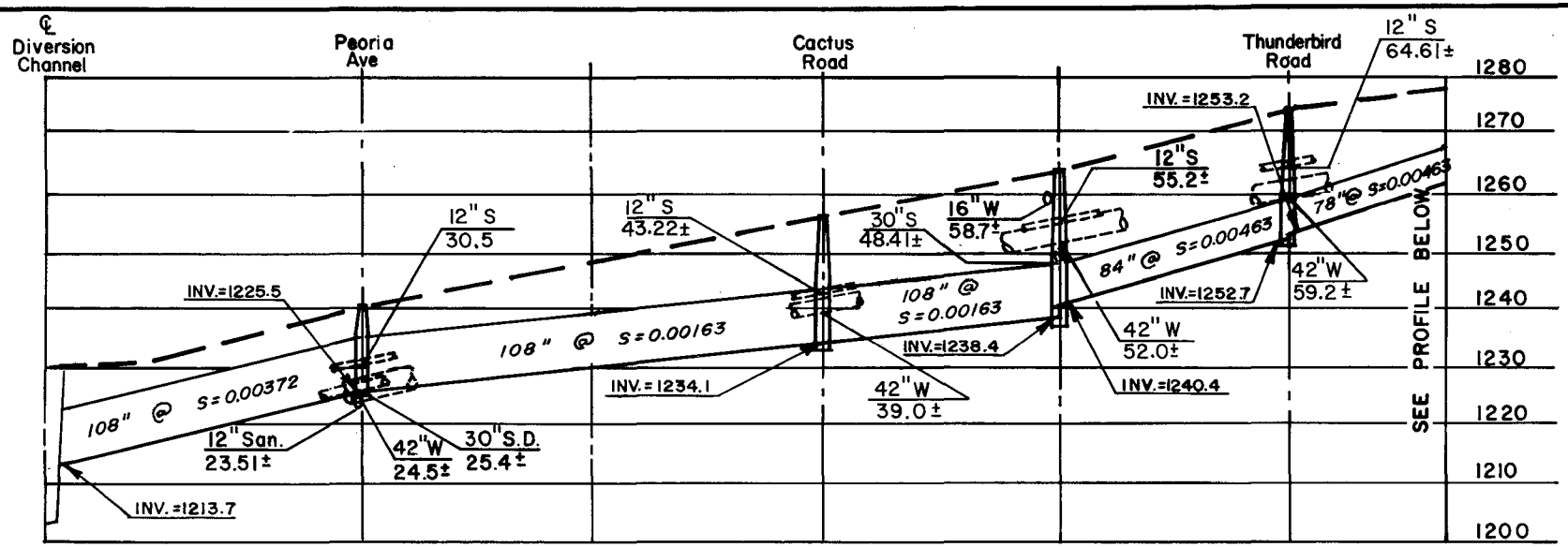


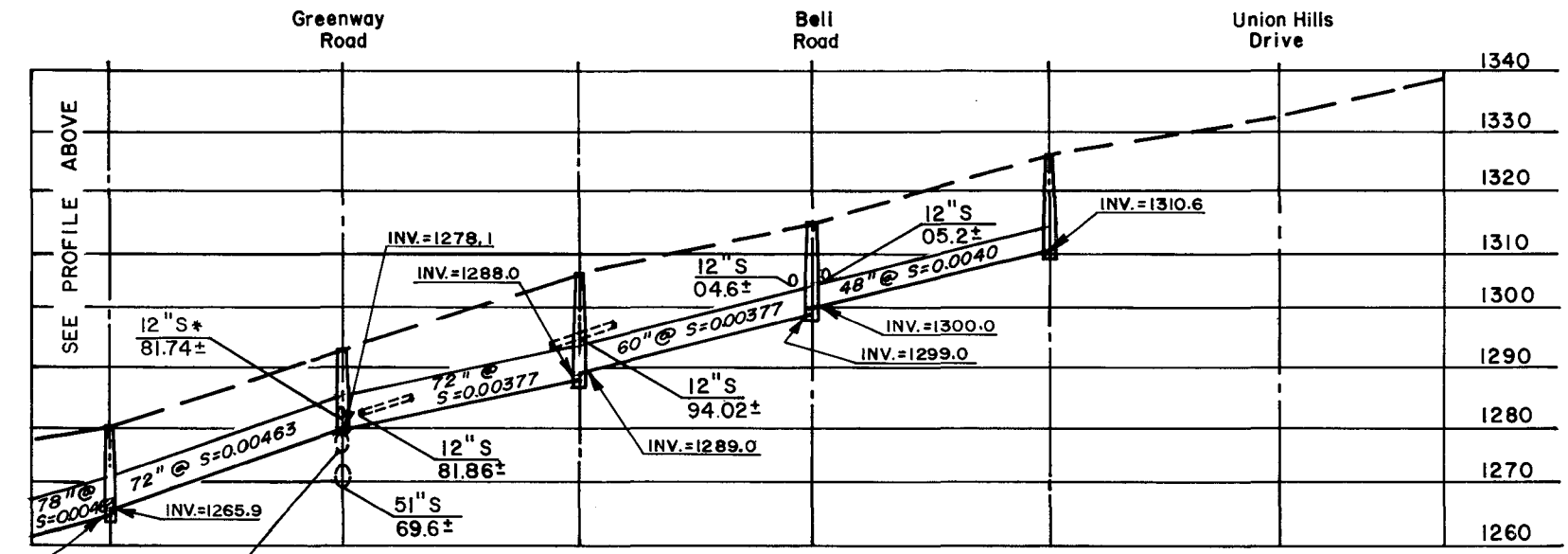
OLD BLACK CANYON ROAD



35th AVE

MASTER PLAN DRAINAGE PROFILES





* To be plugged & removed. Being connected to 51" S underdesign.

35th AVENUE

MASTER PLAN DRAINAGE PROFILES

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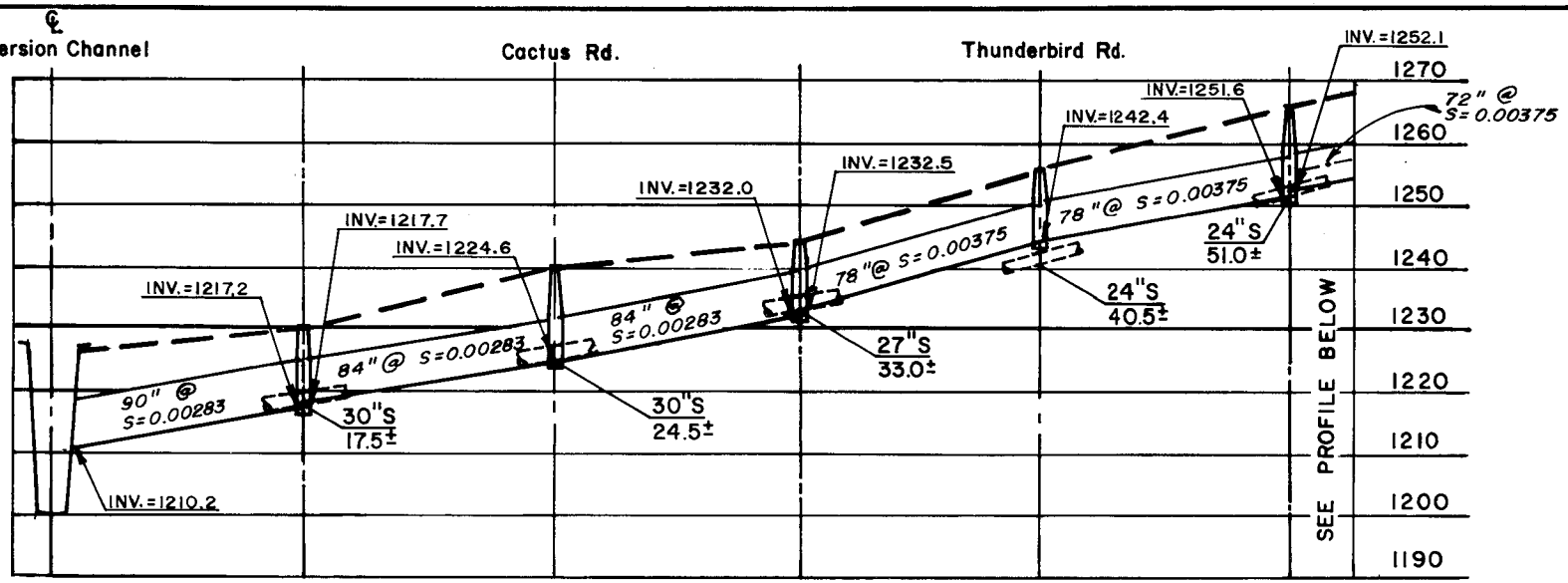
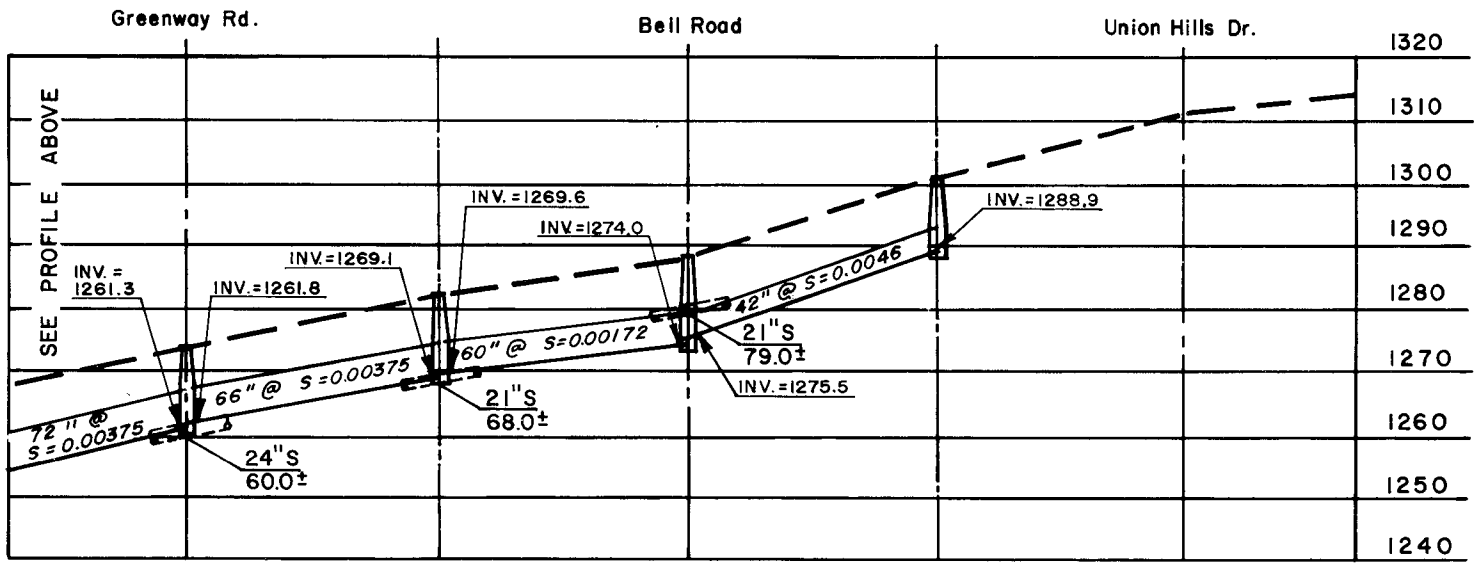
PLATE 2

3 of 11





43rd AVENUE

MASTER PLAN DRAINAGE PROFILES

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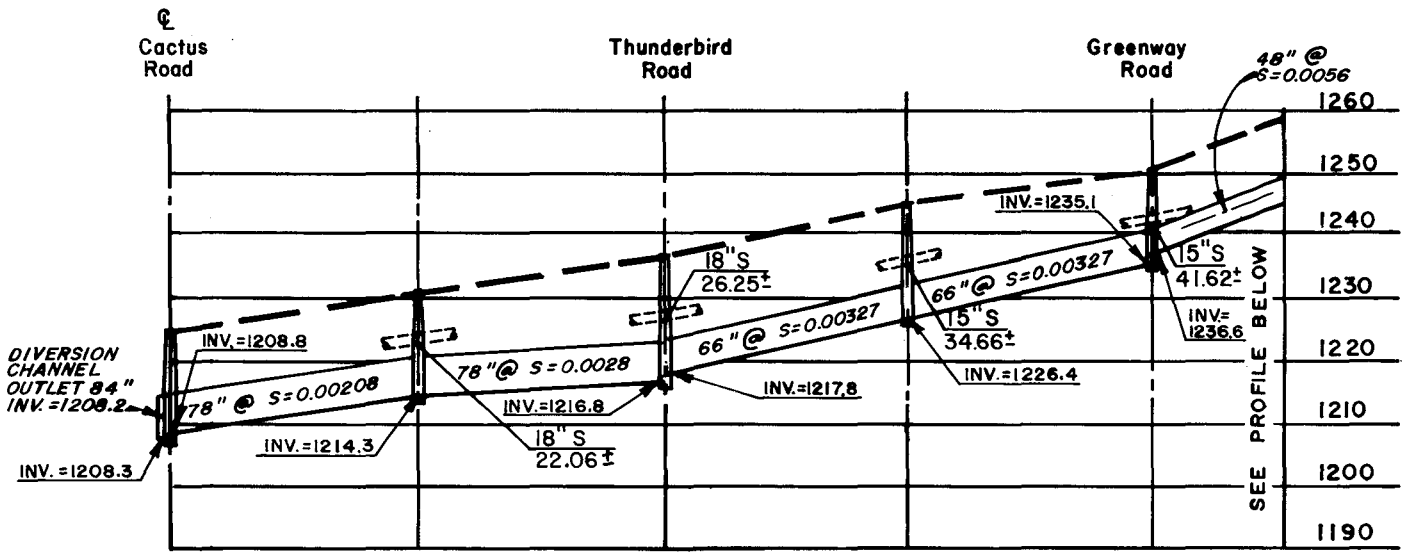
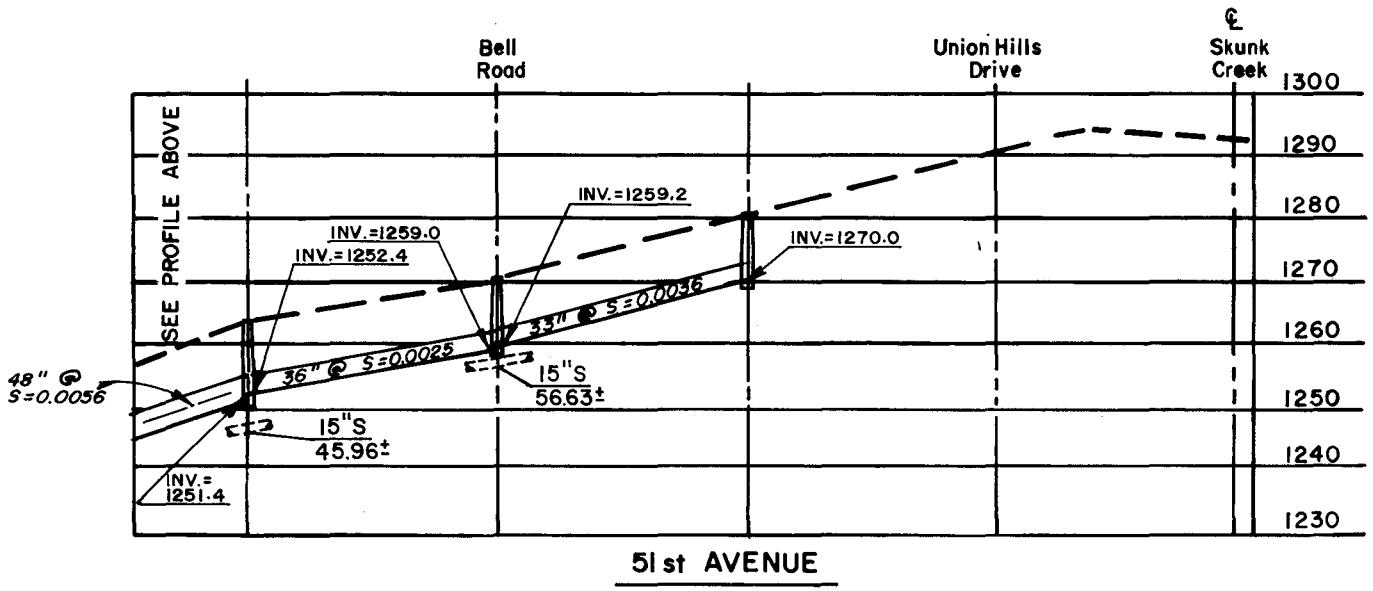
PLATE 2

4 of 11





MASTER PLAN DRAINAGE PROFILES

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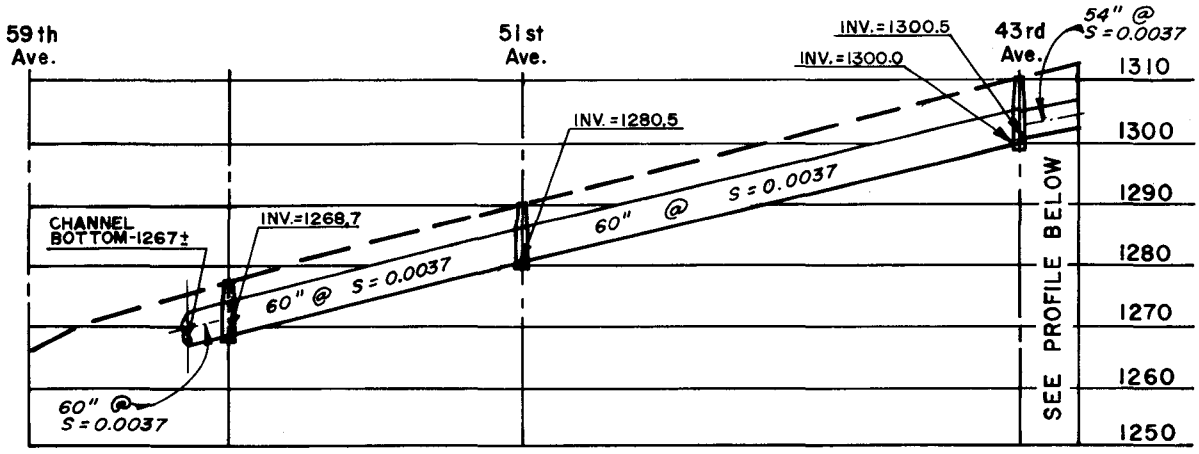
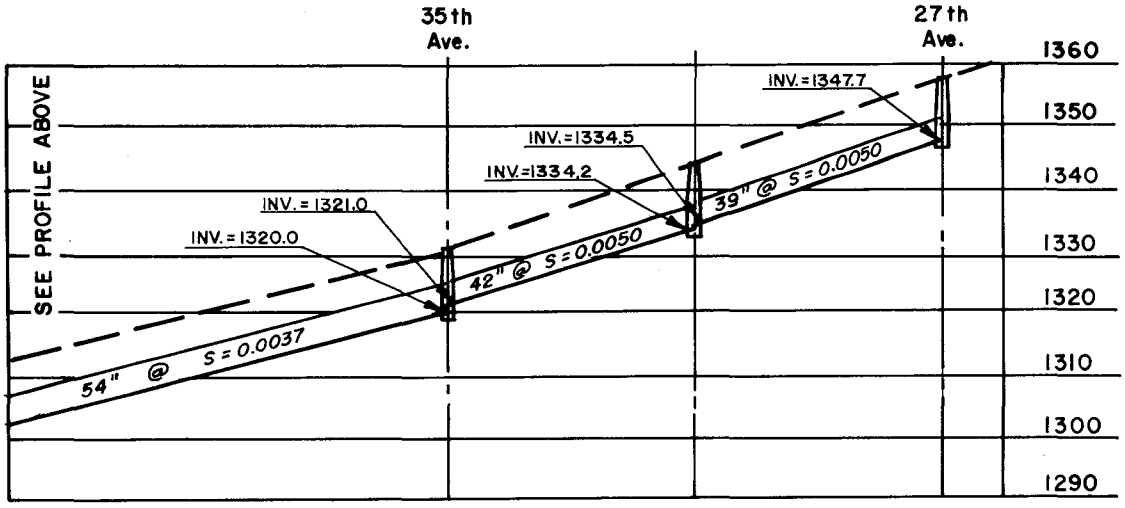
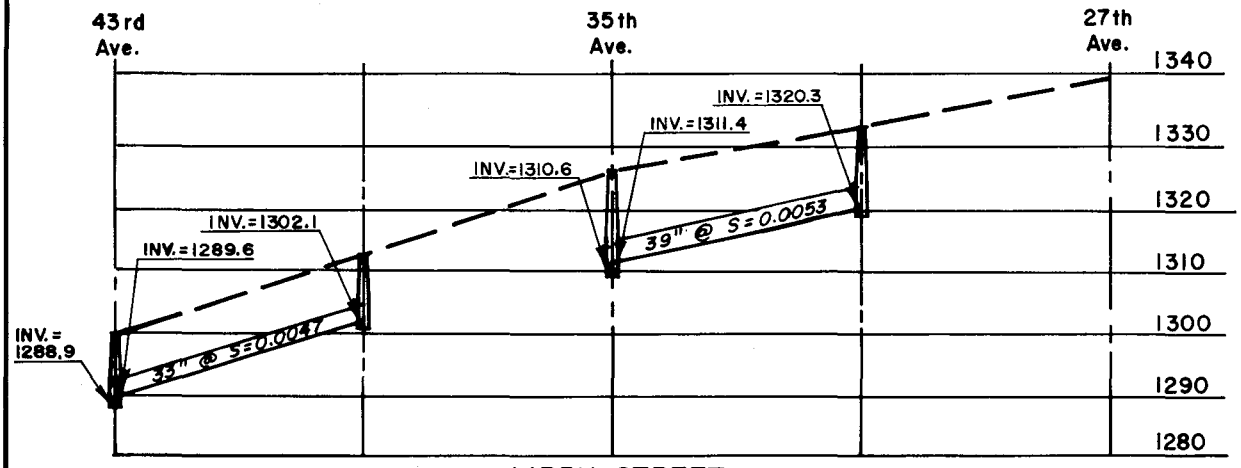
PLATE 2

5 of 11



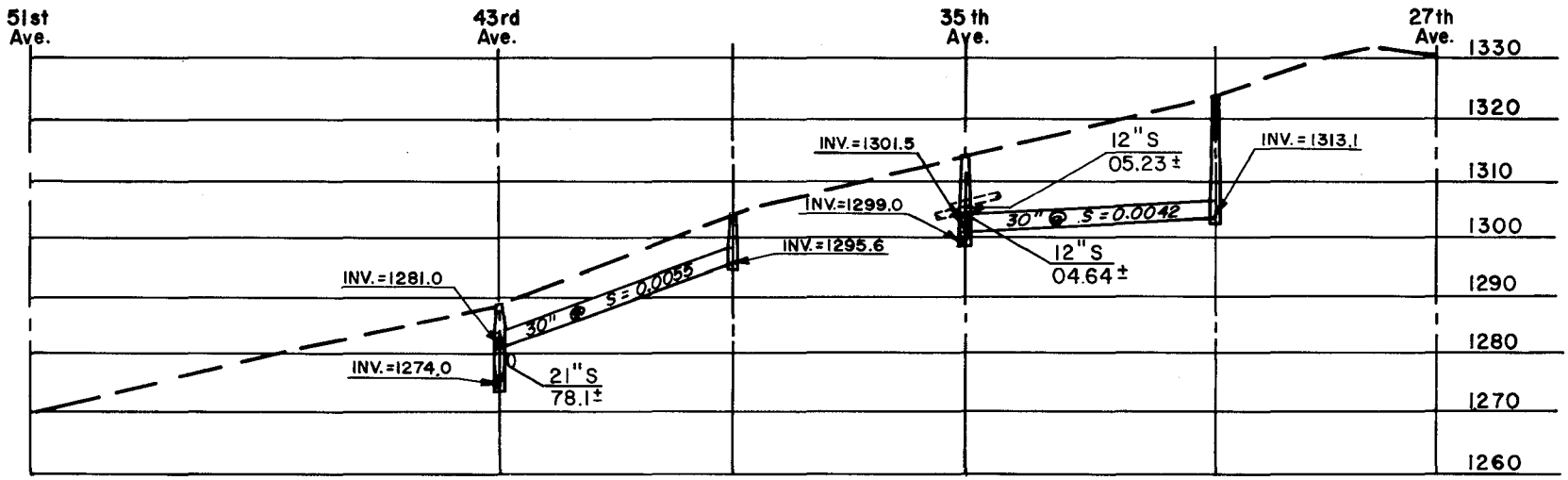


UNION HILLS DRIVE

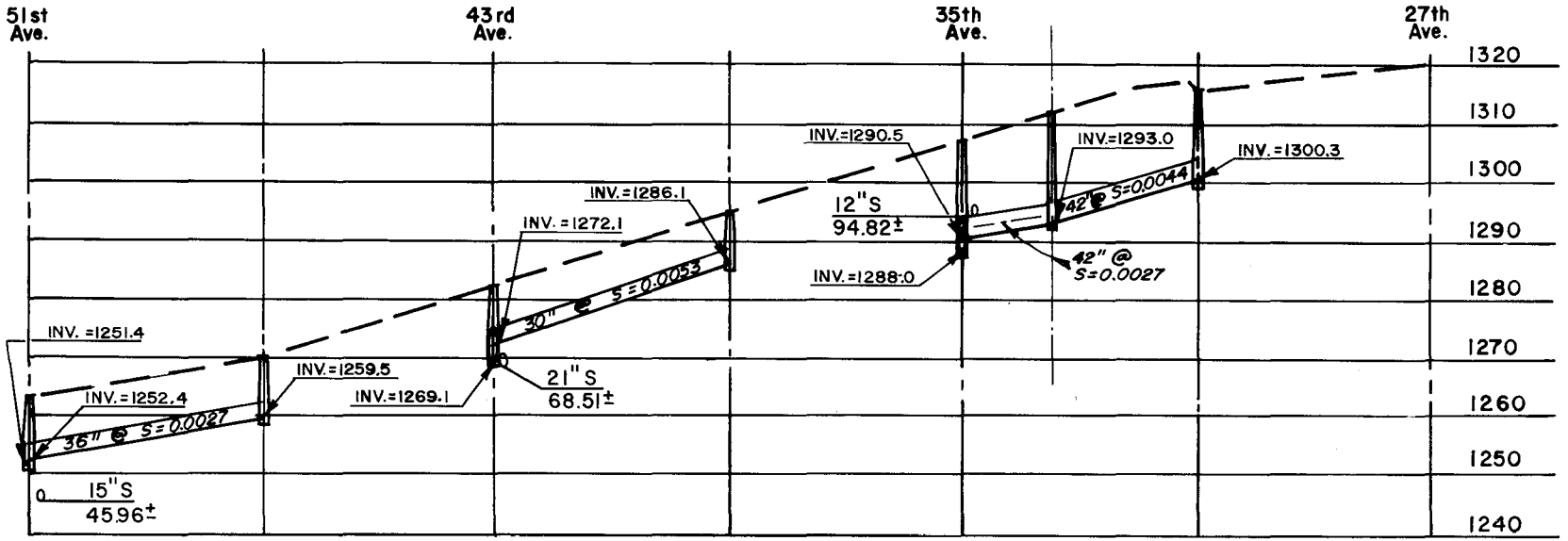


LIBBY STREET

MASTER PLAN DRAINAGE PROFILES



BELL ROAD



PARADISE LANE

MASTER PLAN DRAINAGE PROFILES

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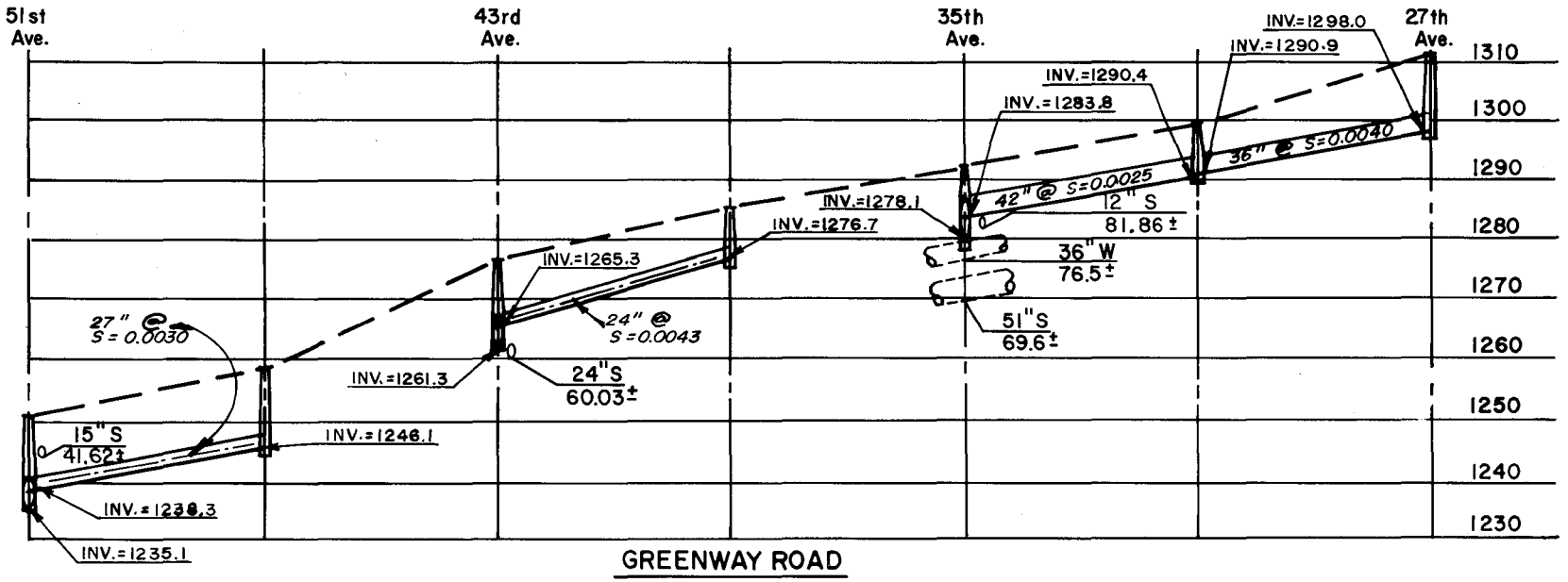
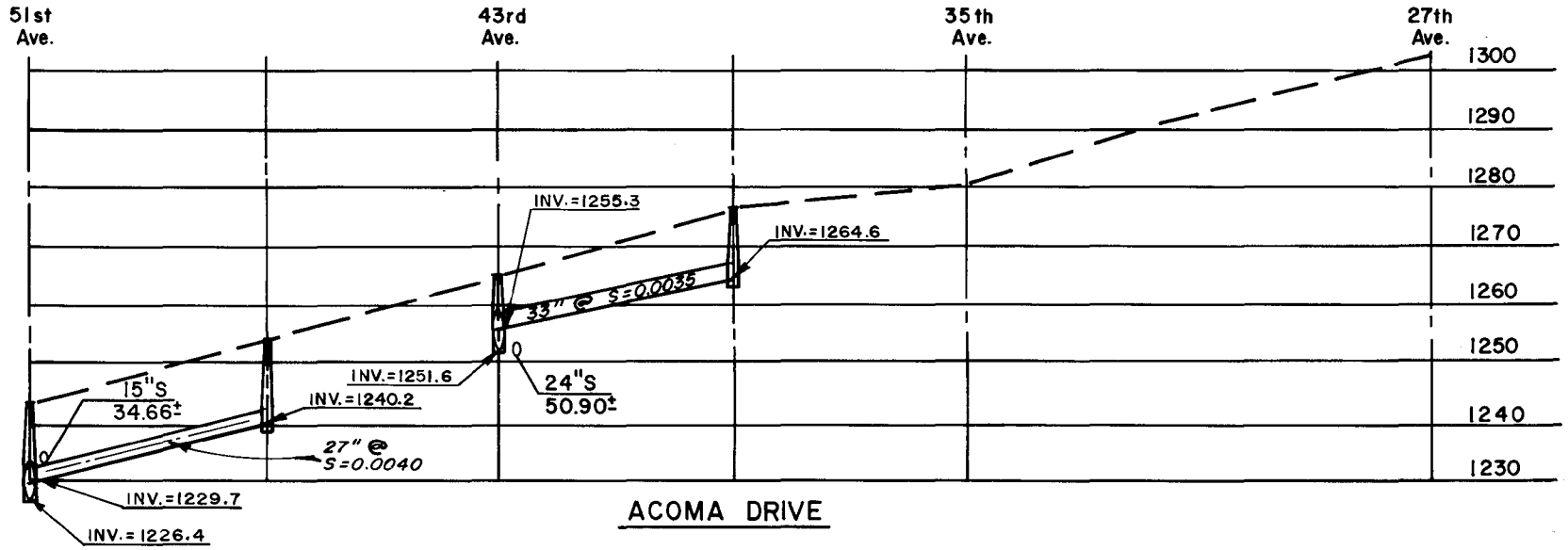
PLATE 2

7 of 11



GREENWAY ROAD



ACOMA DRIVE

MASTER PLAN DRAINAGE PROFILES

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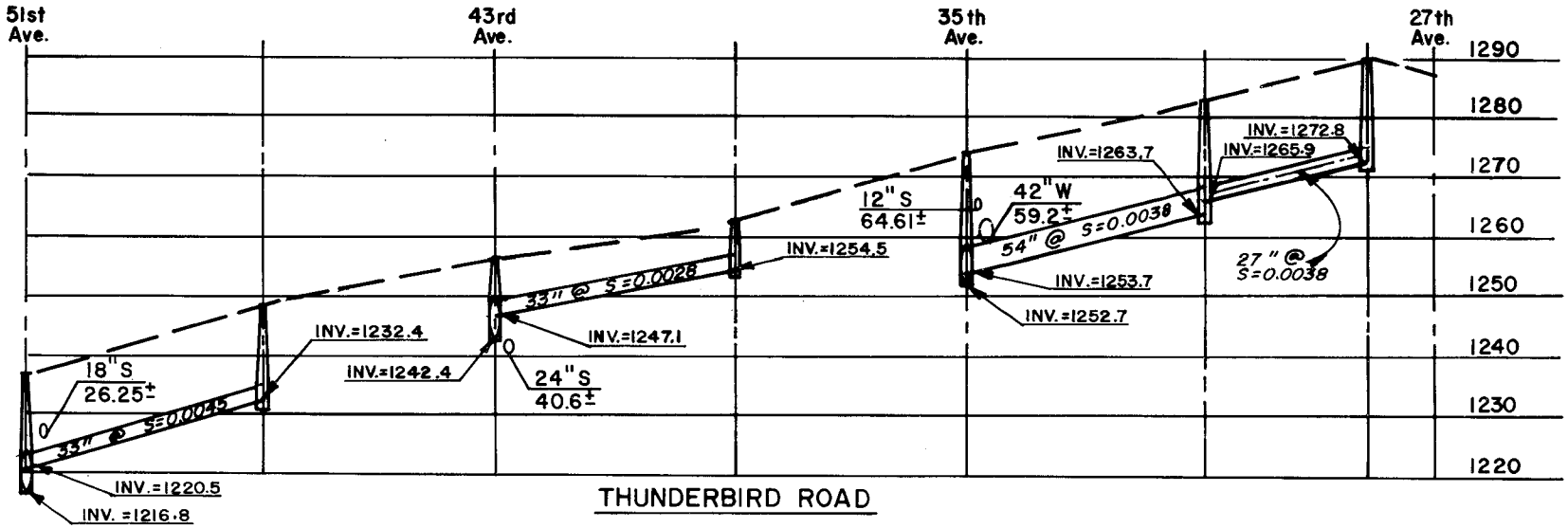
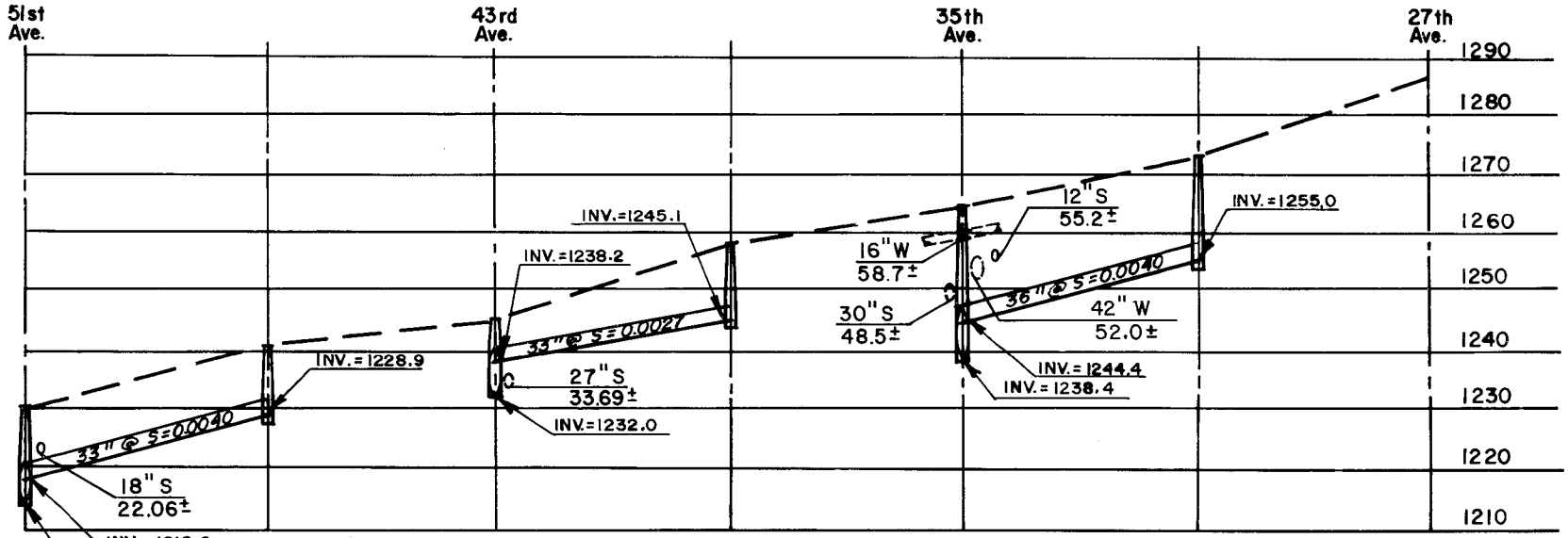
PLATE 2



THUNDERBIRD ROAD



SWEETWATER ROAD

MASTER PLAN DRAINAGE PROFILES

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PLATE 2

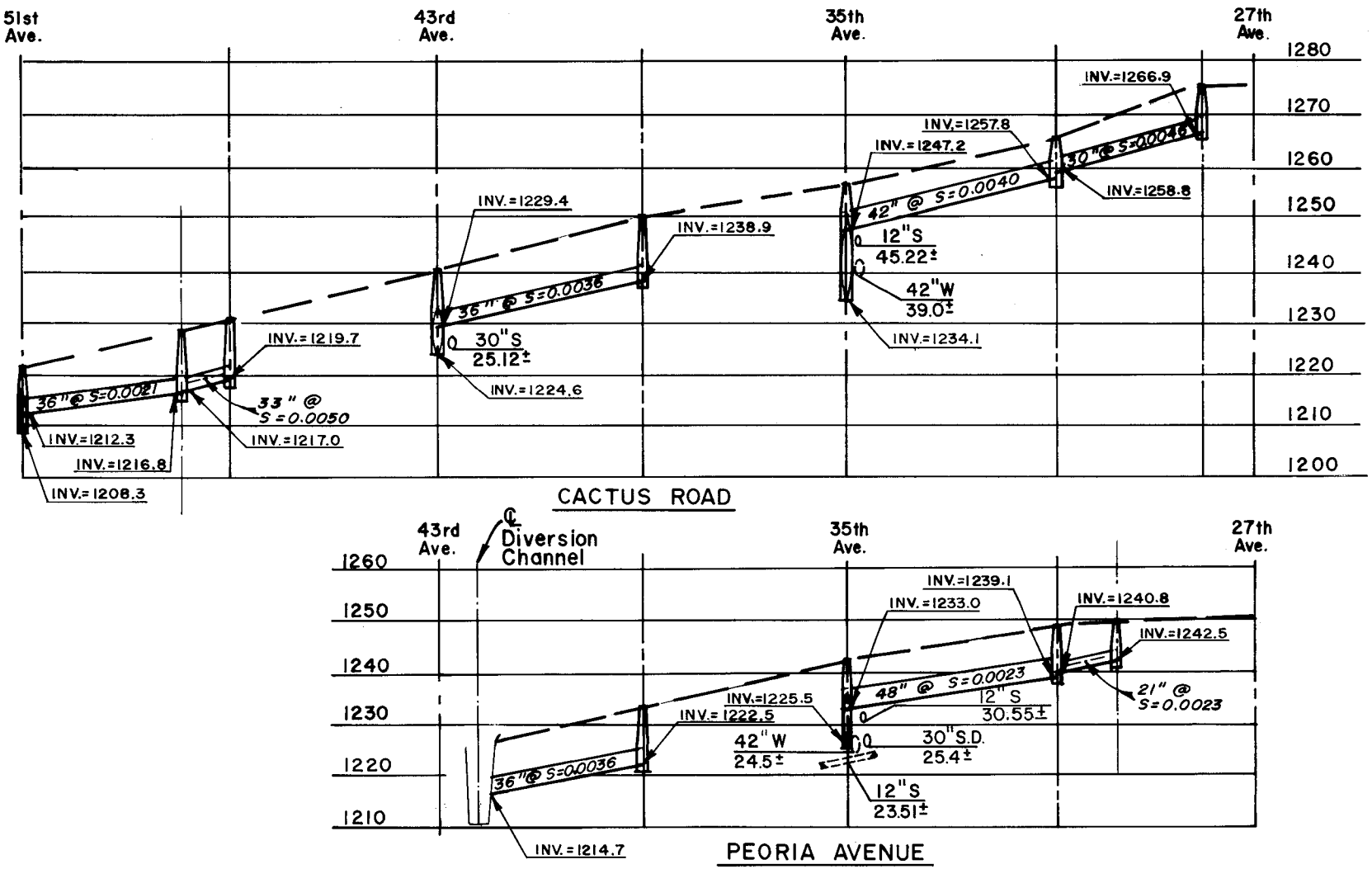

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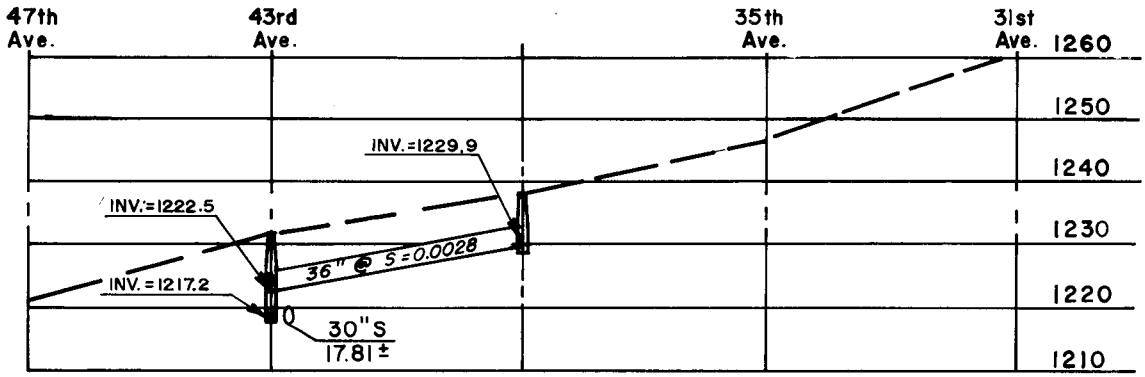
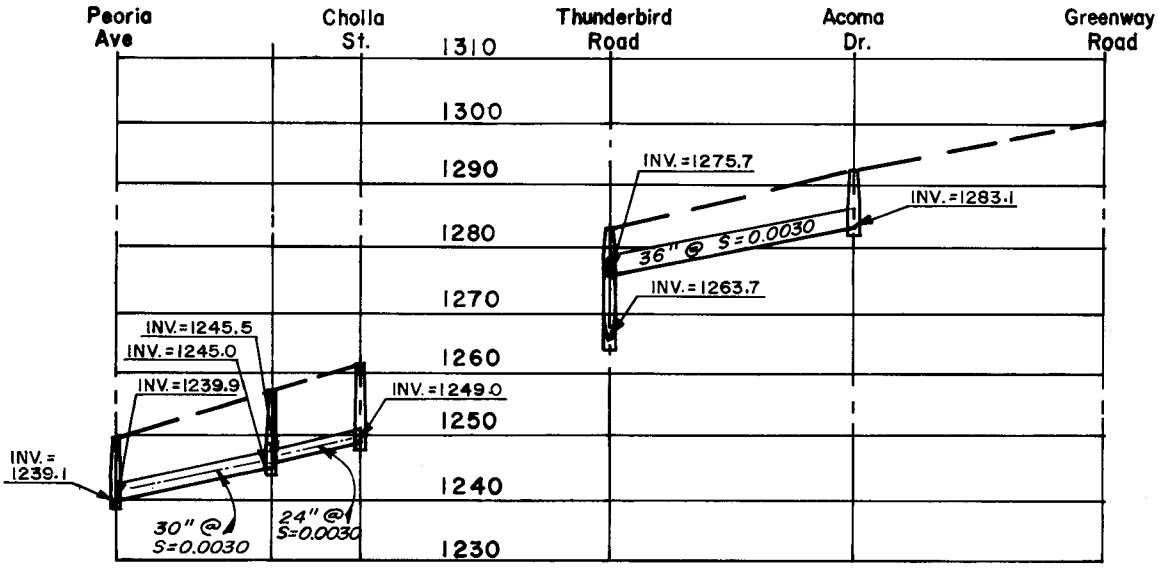
PLATE 2



CHOLLA ST.



31st AVE.

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