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Date 11-11-85 Page 1 of 12

Project Fairfield Estates

Item Detention Area #1

The purpose of Detention Area #1 is to limit the 100-yr. runoff through the Wichita Country Club to the pre-developed Q_{100}.

Per Rock Road Improvement Plans, the existing

Q_{100} = 70 cfs
t_c = 44 min.
I_{100} = 5.03
C = 0.42
HW = 5'
D.A. = 35.1 Ac.

Structure = 3'×2.5'×70' RCB FE = 177.6

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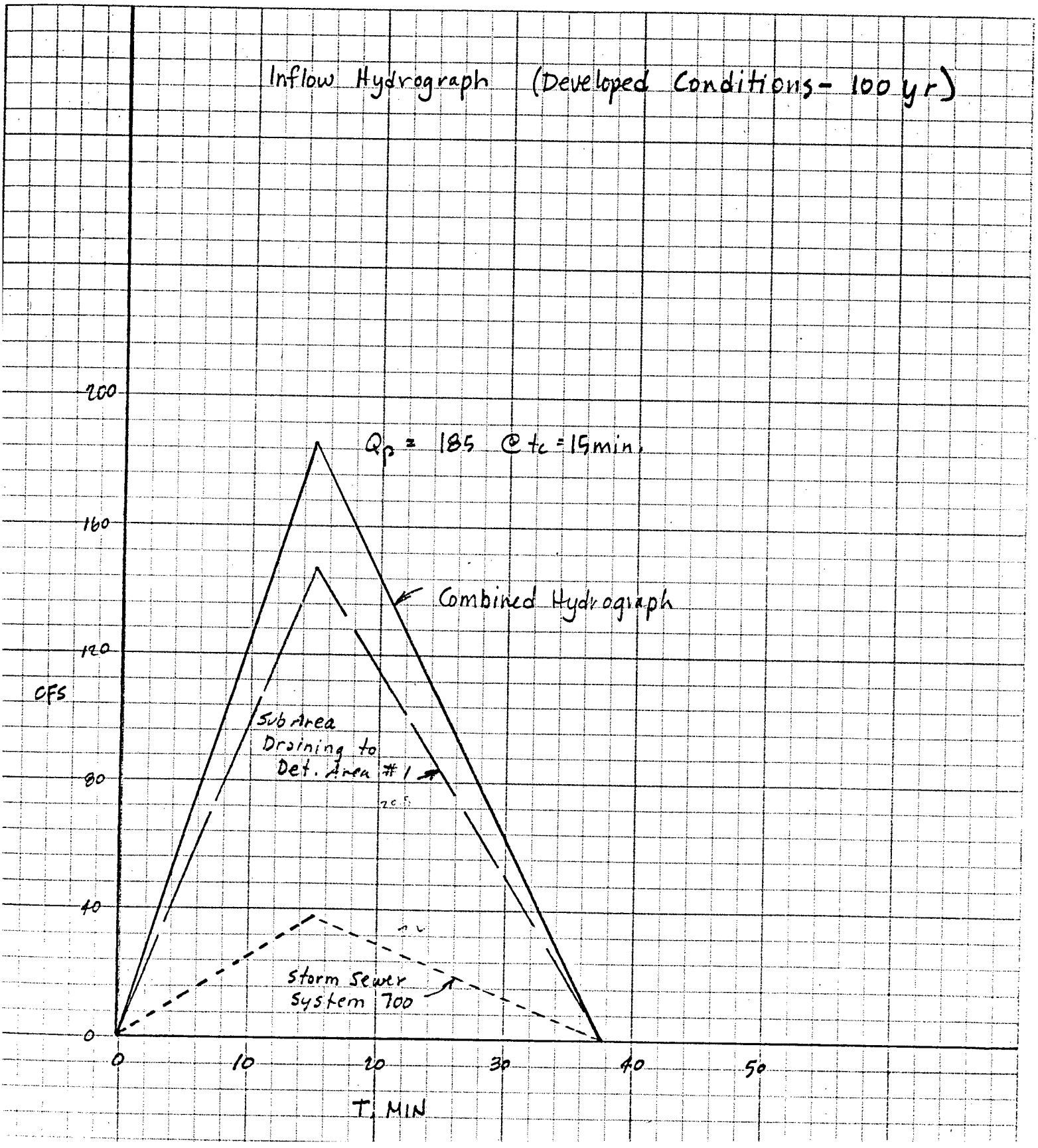
Project Fairfield Estates

Item Detention Area #1



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Project Fairfield Estates

Item Detention Area #1

STAGE - DISCHARGE

ELEV	HW	HW/D	Q/B	Q
178.6	1	0.4	3.0	9.0
179.6	2	0.8	8.5	25.5
180.6	3	1.2	14.5	43.5
181.6	4	1.6	19.0	57.0
182.6	5	2.0	23.0	69.0
183.6	6	2.4	26.0	78.0

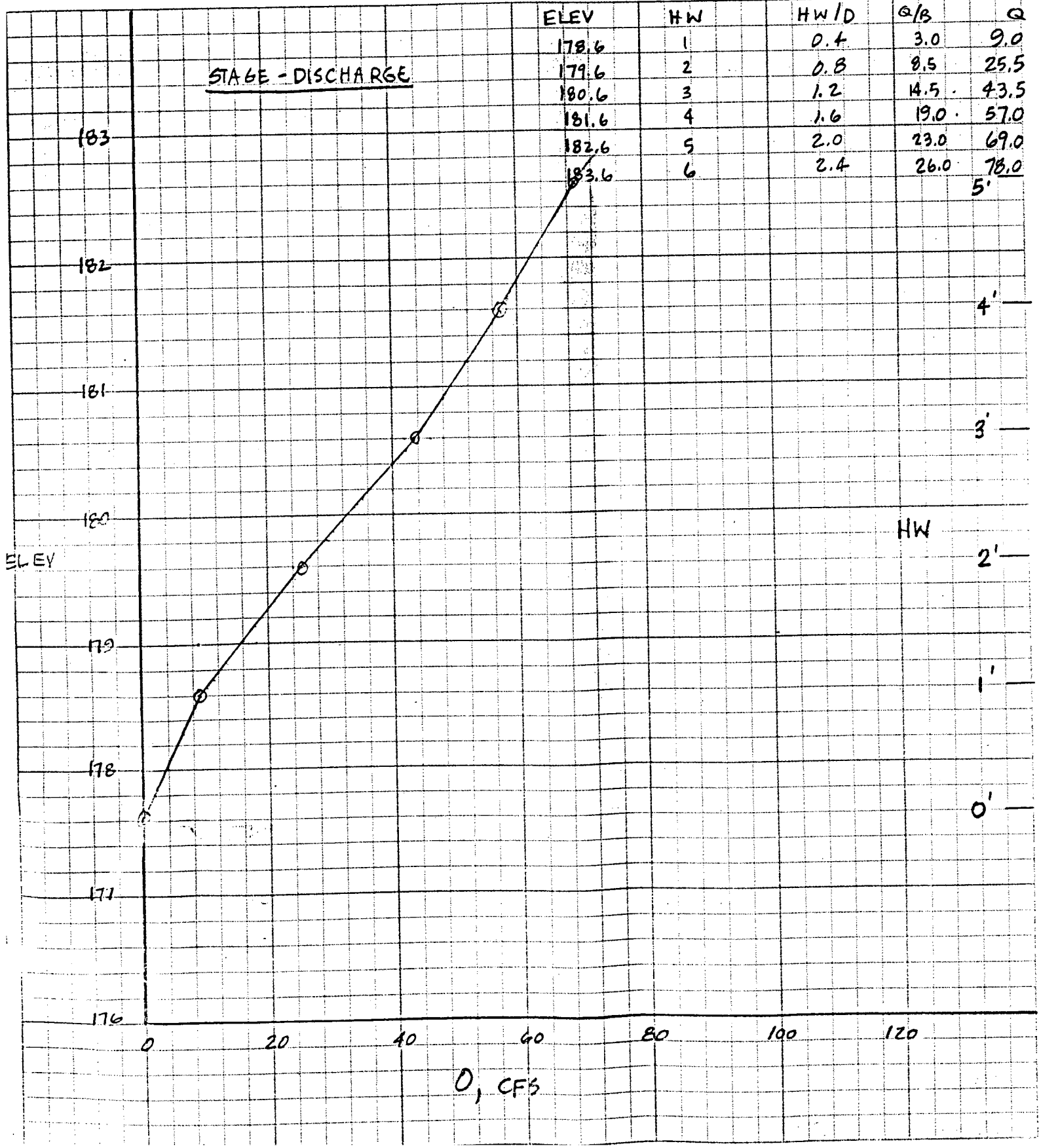

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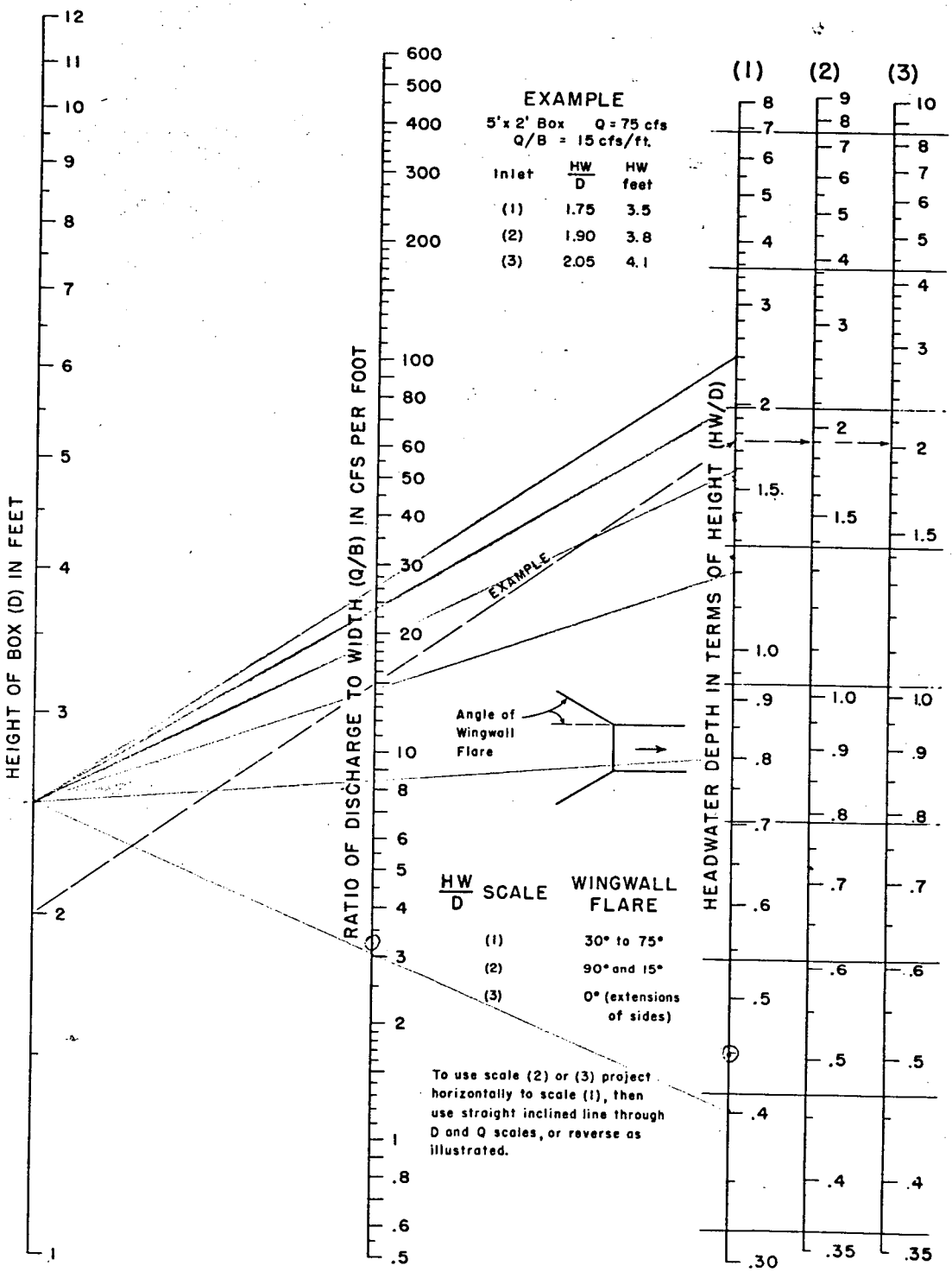
CHART I



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

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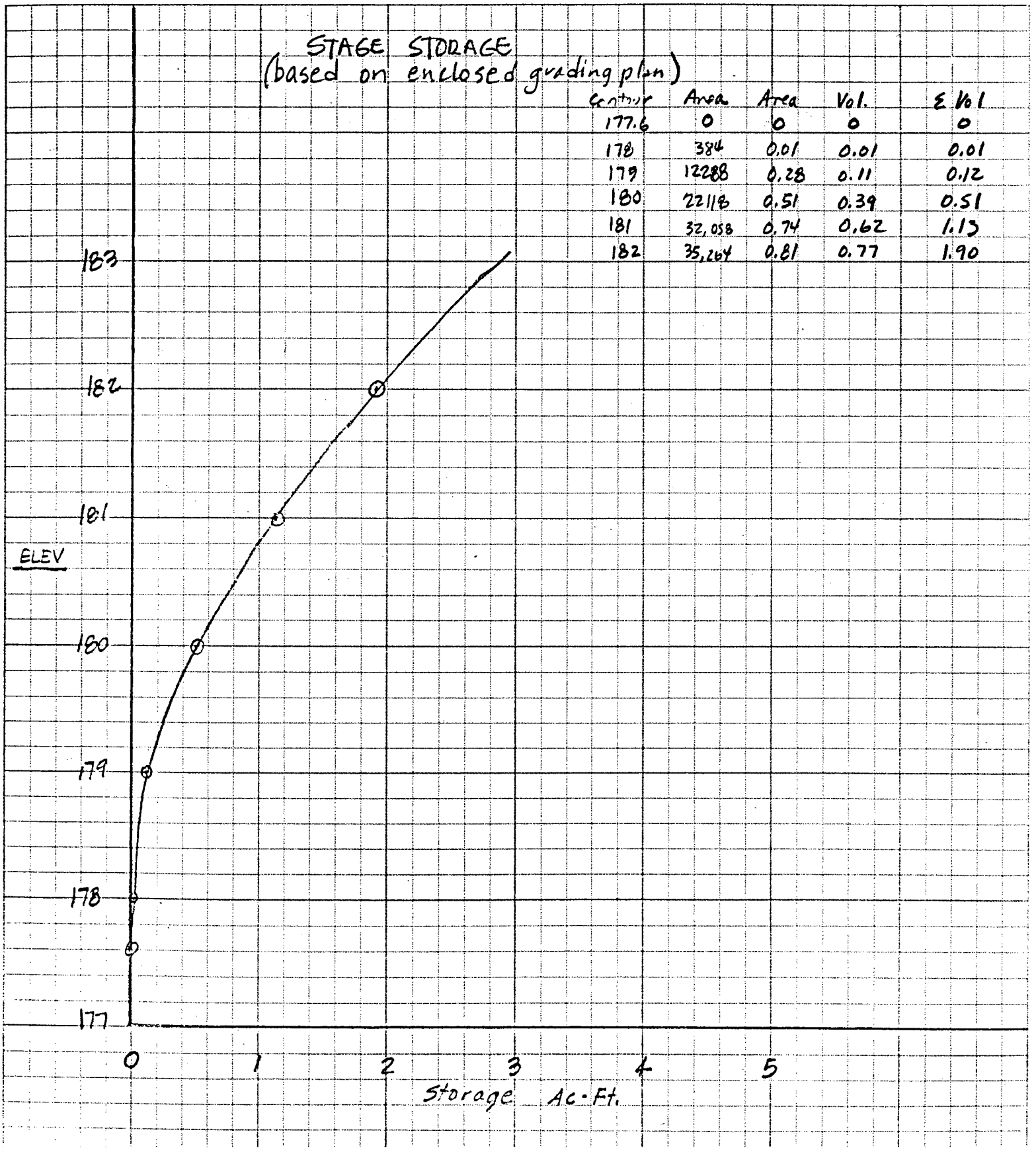
Project Fairfield Estates

Item Detention Area #1

STAGE STORAGE
(based on enclosed grading plan)

Contour	Area	Area	Vol.	Σ Vol
177.6	0	0	0	0
178	384	0.01	0.01	0.01
179	12288	0.28	0.11	0.12
180	22118	0.51	0.39	0.51
181	32,058	0.74	0.62	1.13
182	35,264	0.81	0.77	1.90



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Project Fairfield Estates

Item Detention Area, #1

Stage	Elev.	Storage S (ac-Ft)	Storage S (ac·in)	Outflow O cfs	2S	2S/Δt	2S/Δt + O
0'	177.6	0	0	0	0	0	0
1'	178.6	0.08	0.96	9	1.92	23.1	32
2'	179.6	0.36	4.32	26	8.64	104.1	130
3'	180.6	0.76	9.12	44	18.24	219.8	263
4'	181.6	1.43	17.16	57	34.32	413.5	470
5'	182.6	2.60	31.20	69	62.40	751.8	821

$\Delta t = 5 min = 0.083$ hr.

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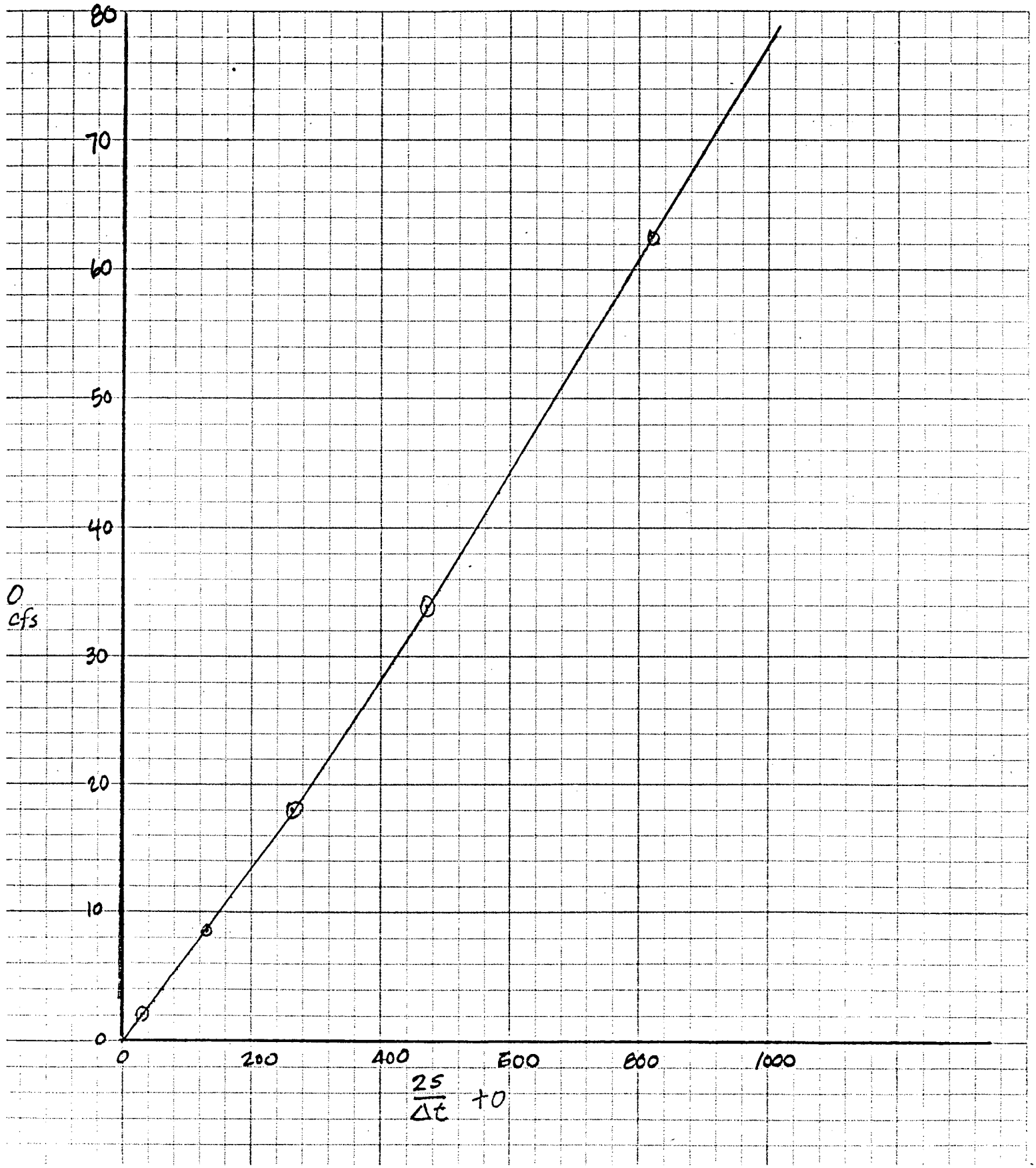
Project Fairfield Estates

Item Detention Area #1



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Project Fairfield Estates

Item Detention Area #1

Outflow Hydrograph Calcs

Time (hr)	I_n (cfs)	$I_n + I_{n+1}$ (cfs)	$2S/\Delta t - O$	$\frac{2S}{\Delta t} + O$	O	HW	Elev.
0	0	62	0	0	0	0	177.6
0.0833	62	186	54	62	4	0.4	178.0
0.1667	124	309	202	240	19	1.6	179.2
0.250	185	329	437	511	37	2.5	180.1
0.333	144	248	650	766	58	4.1	181.7
0.416	104	167	760	898	69	5.0	182.6
0.500	63	65	785	927	71	5.1	182.7
0.583	22	22	736	870	67	4.8	182.4
0.666	0	0	644	758	57	4.1	181.7
0.750	0	0	568	644	48	3.3	180.9
0.833	0	0	486	568	41	2.9	180.5
0.916	0	0	416	486	35	2.5	180.1
1.000	0	0	358	416	29	2.2	179.8
1.083	0	0	308	358	25	2.0	179.6
1.166	0	0	266	308	21	1.7	179.3
1.250	0	0	230	266	18	1.5	179.1
1.333	0	0	198	230	16	1.4	179.0
1.416	0	0	172	198	13	1.2	178.8
1.500	0	0	150	172	11	1.1	178.7
1.583	0	0	130	150	10	1.0	178.6

graph stage discharge

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Project Fairfield Estates

Item Detention Area #1

Time (hr)	I_n (cfs)	$I_n + I_{n+1}$ (cfs)	$\frac{2S}{\Delta t} - O$	$\frac{2S}{\Delta t} + O$	O	HW	Elev
1.666	0	0	112	130	9	1.0	178.6
1.750	0	0	98	112	7	0.8	178.4
1.833	0	0	84	98	7	0.8	178.4
1.916	0	0	72	84	6	0.7	178.3
2.00	0	0	62	72	5	0.7	178.3
2.083	0	0	54	62	4	0.5	178.1
2.167	0	0	48	54	3	0.4	178.0
2.250	0	0	42	48	3	0.4	178.0
2.333	0	0	36	42	3	0.4	178.0
2.416	0	0	32	36	2	0.2	177.8
2.500	0	0	28	32	2	0.2	177.8
2.583	0	0	24	28	2	0.2	177.8
2.666	0	0	20	24	2	0.2	177.8
2.750	0	0	18	20	1	0.1	177.7
2.833	0	0	16	18	1	0.1	177.7
2.916	0	0	14	16	1	0.1	177.7
3.000	0	0	12	14	1	0.1	177.7
3.083	0	0	10	12	1	0.1	177.7
3.167	0	0	8	10	1	0.1	177.7
3.250	0	0	6	8	1	0.1	177.7
3.333	0	0	4	6	1	0.1	177.7

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Project Fairfield Estates

Item Detention Area #1

3.416	0	0	2	4	1	0.1	177.7
3.500	0	0	0	2	1	0.1	177.7
3.583	0	0	0	0	0	0.0	177.6

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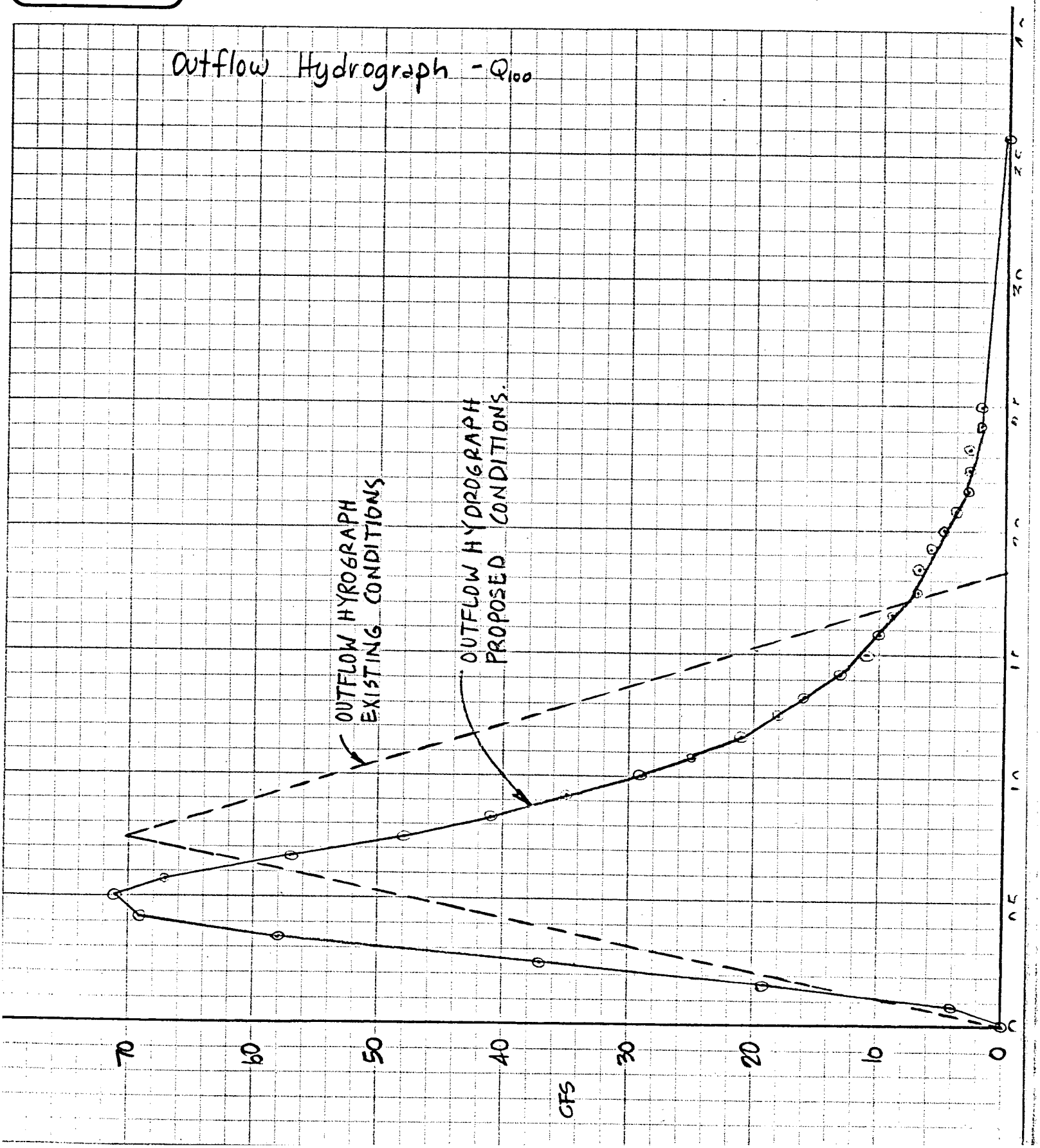
Project Fairfield Estates

Item Detention Area #1



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Project Fairfield Estates

Item Detention Area #1

SUMMARY

	Exist Condition	Proposed Condition
Drainage Area (Acres)	33.5	27.7
$Q_{P_{100}}$ (cfs)	70	71
t_p (min)	44	15
DWS	182.7	182.7
Total Time of Discharge (min.)	110	215

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Project Fairfield Estates

Item Detention Area No. 2

The purpose of Detention Area No. 2 is to limit the 100-yr. runoff through the Wichita Country Club to the pre-developed Q.

Per Rock Road Improvement plans, the existing $Q_{100} = 31$ cfs.

$$Q_{100\ \text{country club}} = Q_{100\ \text{node 801}} + Q_{\text{pipe}} + Q_{\text{out Det. Area \#2}}$$

where: $Q_{100\ \text{countryclub}}$ = pre developed conditions
= 31 cfs

$Q_{100\ \text{node 801}}$ = direct flow through country club undetained
= 7.5 cfs

Q_{pipe} = flow in Fairfield Club Apartments private storm sewer. Will approx. = Q_2 (undetained)
= 11 cfs

$Q_{\text{out Det Area \#2}}$ = Max. Discharge of Detention Area #2

$$31 = 7.5 + 11 + Q_{\text{Det. Area \#2}}$$

$$Q_{\text{out Det. Area \#2}} = 12.5 \text{ cfs}$$

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Project Fairfield Estates

Item Detention Area #2

Since the development plan of Lot 17 is unknown, the exact stage-storage-discharge relationships cannot be determined.

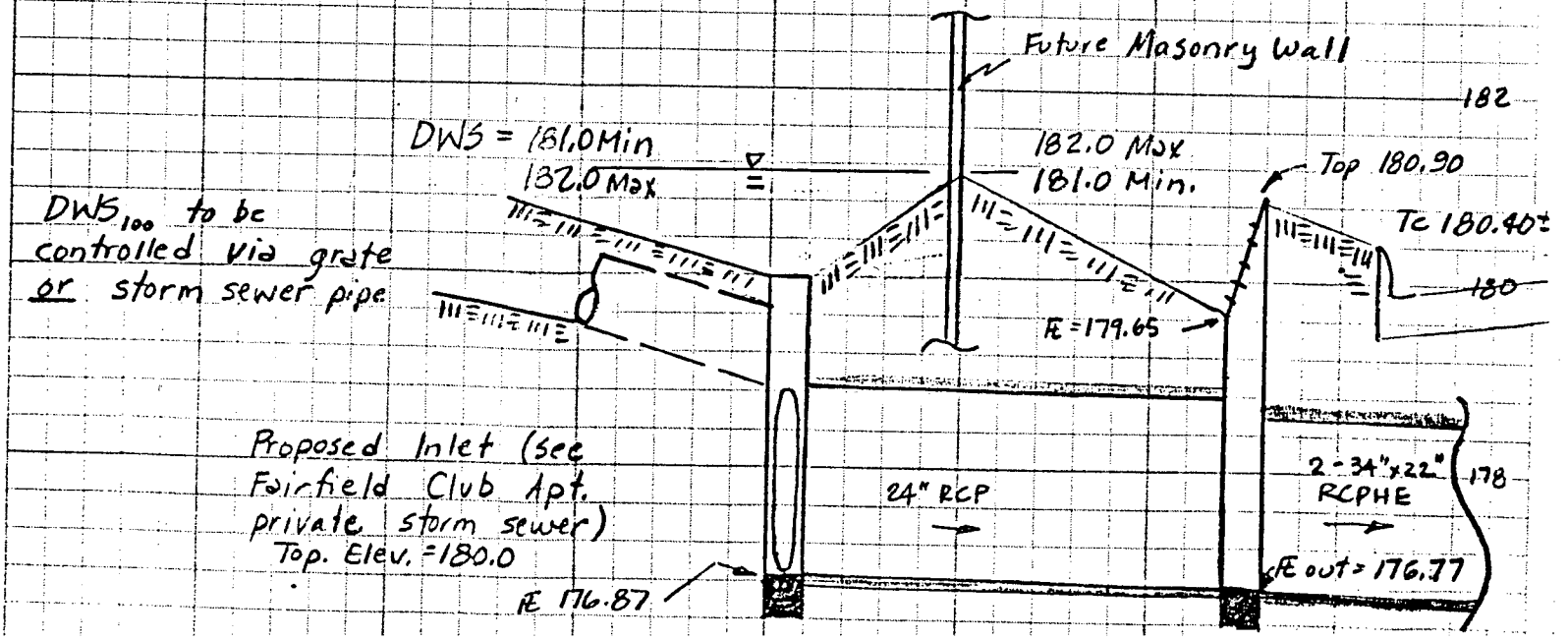
Criteria for this Detention Area design is as follows:

Q_{100} inflow from subareas 802 + 803 (see System 800 calcs) = 37 cfs

Q_{100} maximum outflow out of Det. Area #2 = 12.5 cfs.

Approx. Volume of Storage Required (see Page 3, this section) = 0.60 Ac-Ft.

DWS_{100} = 181.0 Min
182.0 Max.



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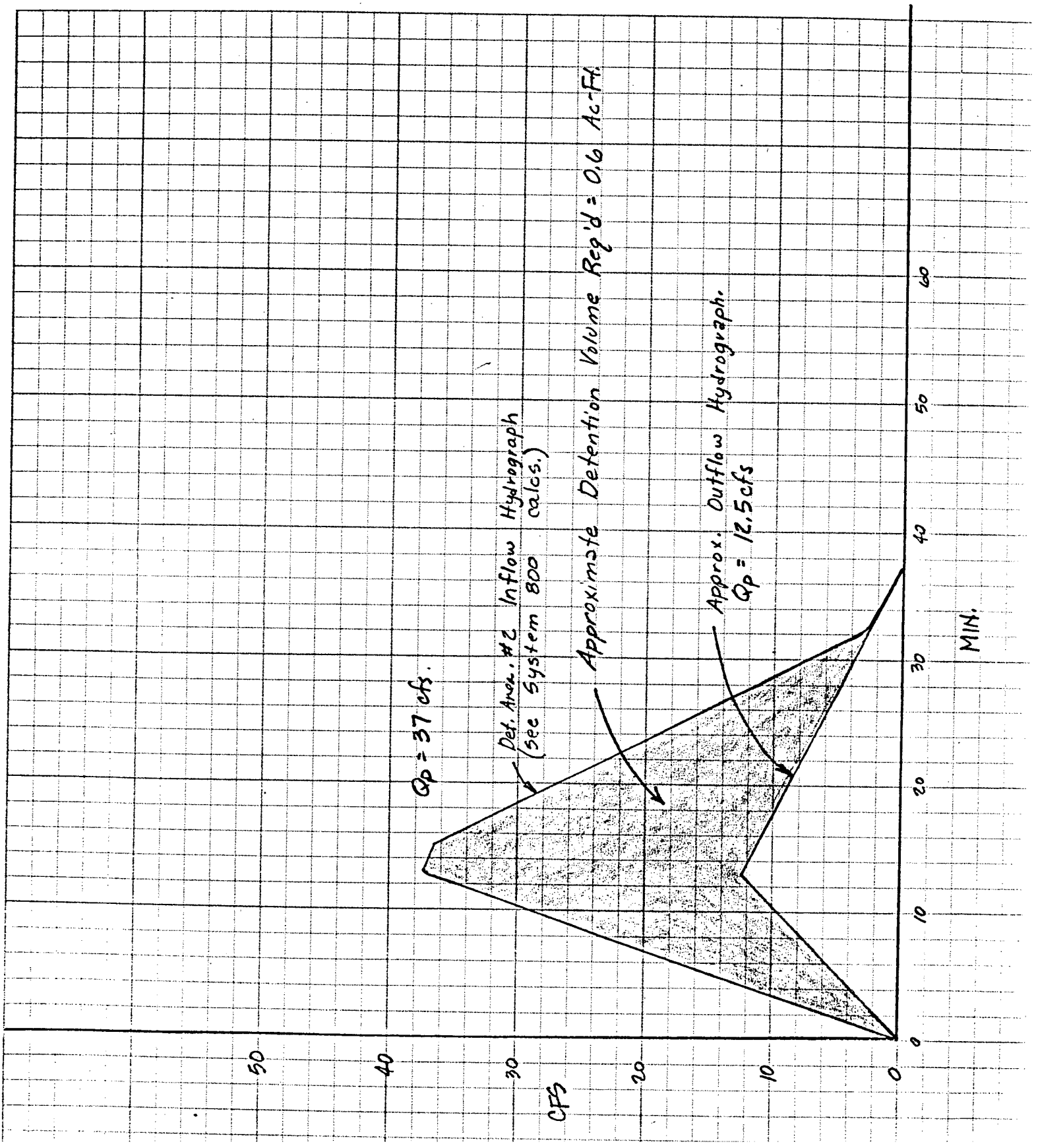
Project Fairfield Estates

Item Detention Area #2



Fairfield Estates - Phase I

Detention Pond @ Polo & Rock Rd.

Contour	Units	SF	Ac.	AcFt	ΣAc-Ft
178	42	269	0.01	0.00	0.00
179	2140	13,696	0.31	0.14	0.14
180	4385	28,064	0.64	0.48	0.62
181	4871	31,174	0.72	0.68	1.30
182	5538	35,443	0.81	0.77	2.07
183	6009	38,458	0.88	0.85	2.92

TRIAL # 4

CONFINE TO ESM'T.

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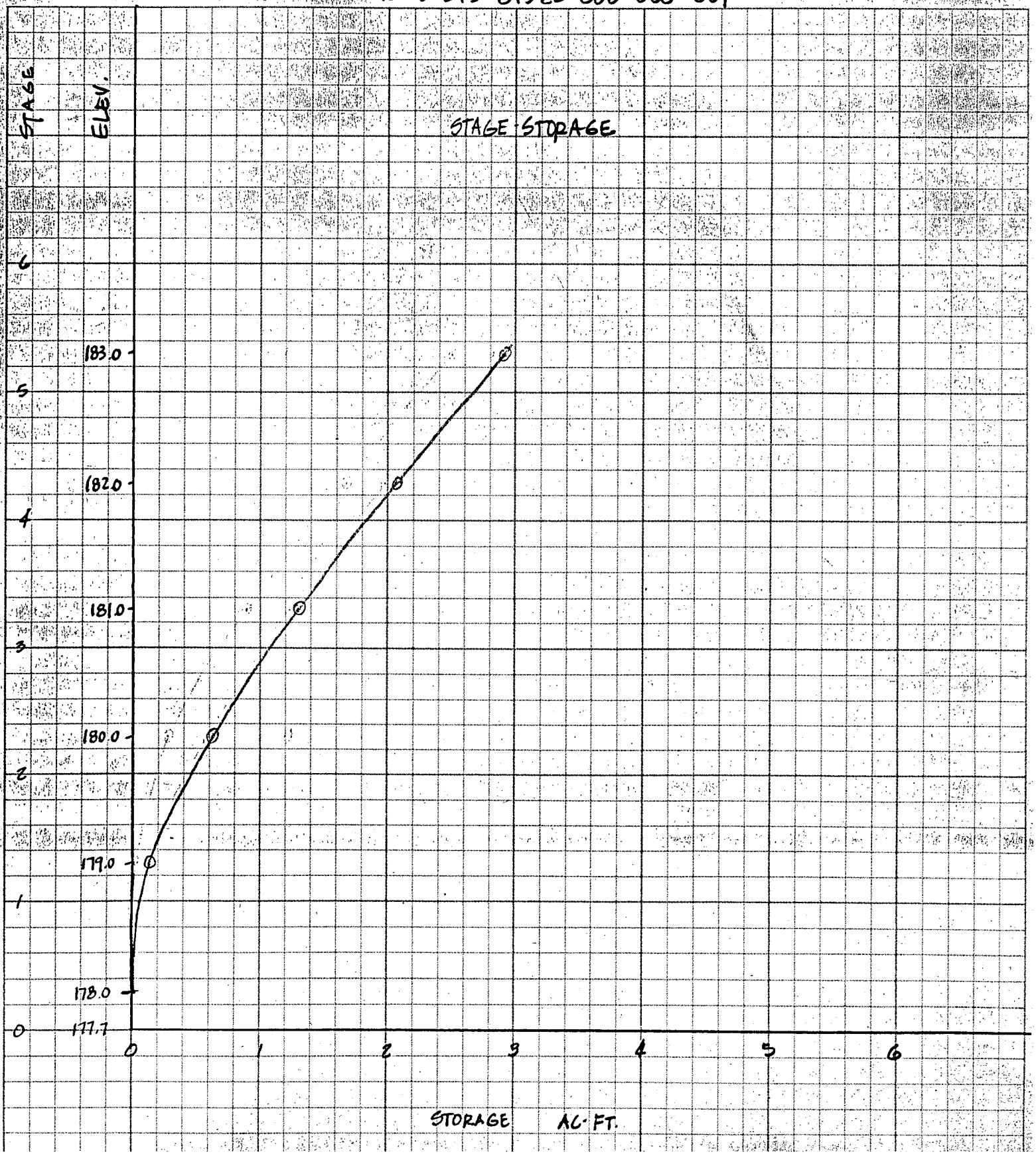
Project Fairfield Phase I St & S.D.

Item Detention Pond @ Polo & Rock

472-76-245-81523-000-000-001



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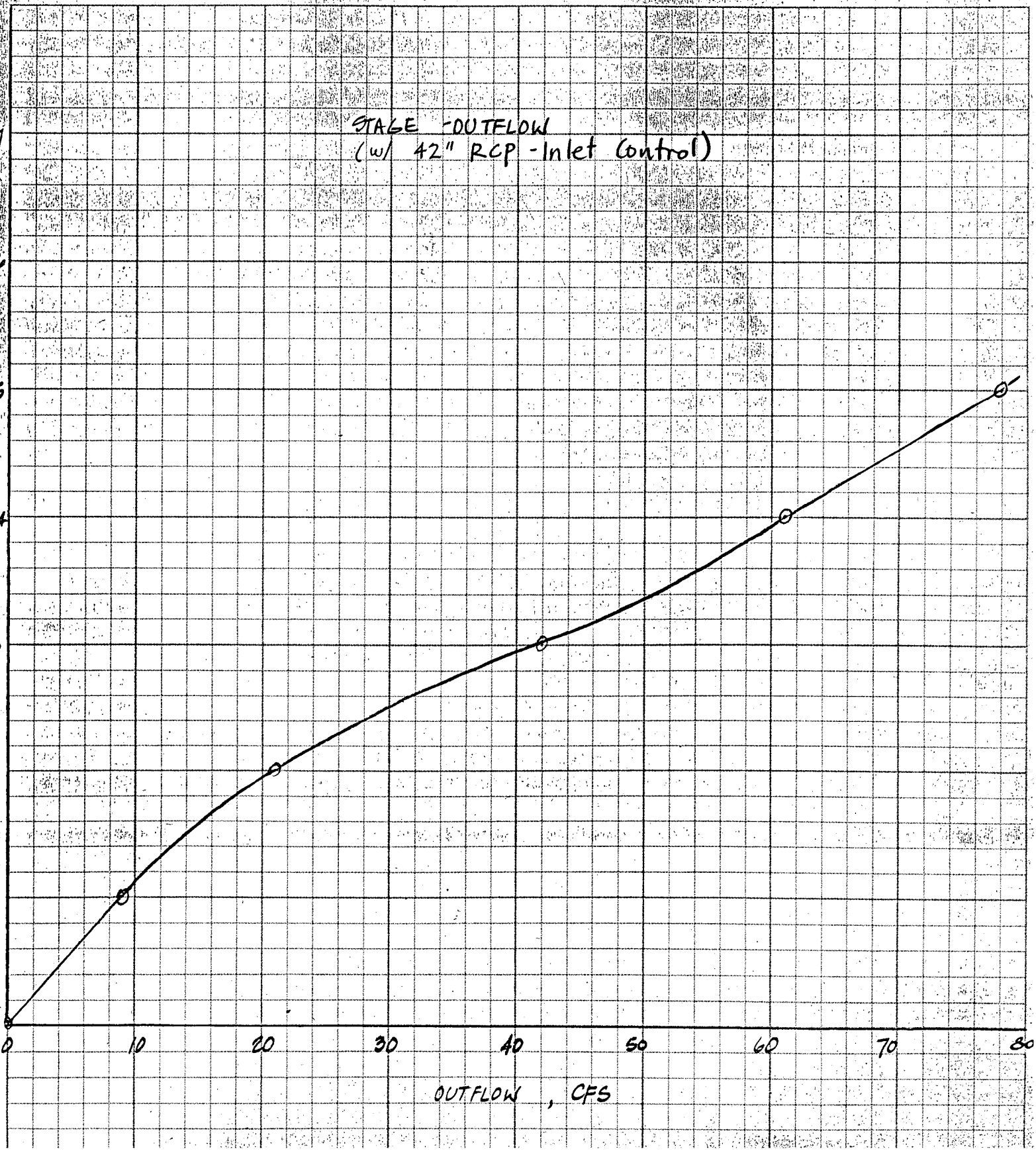
Project Fairfield Estates Phase I St & S.D.

Item Detention Pond @ Polo & Rock Rd.

472-76-245-81523-000-000-001

STAGE -OUTFLOW
(w/ 42" RCP - Inlet Control)



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Project Fairfield Estates Phase I

Item Detention Pond Polo & Rock Rd

472-76-245-81523-000-000-001

STAGE	ELEV.	STORAGE AC-FT	STORAGE AC-IN (S)	OUTFLOW CFS (O)	2S	$\frac{2S}{\Delta T}$	$\frac{2S}{\Delta T} + O$
0	177.7	0.00	0.00	0.00	0.00	0.00	0.00
1	178.7	0.07	0.84	9.00	1.68	20.24	29.24
2	179.7	0.46	5.52	21.00	11.04	133.01	154.01
3	180.7	1.09	13.08	42.00	26.16	315.18	357.18
4	181.7	1.83	21.96	61.00	43.92	529.16	590.16
5	182.7	2.68	32.16	78.00	64.32	774.94	852.94

ΔT = 5 min = 0.083 hr.

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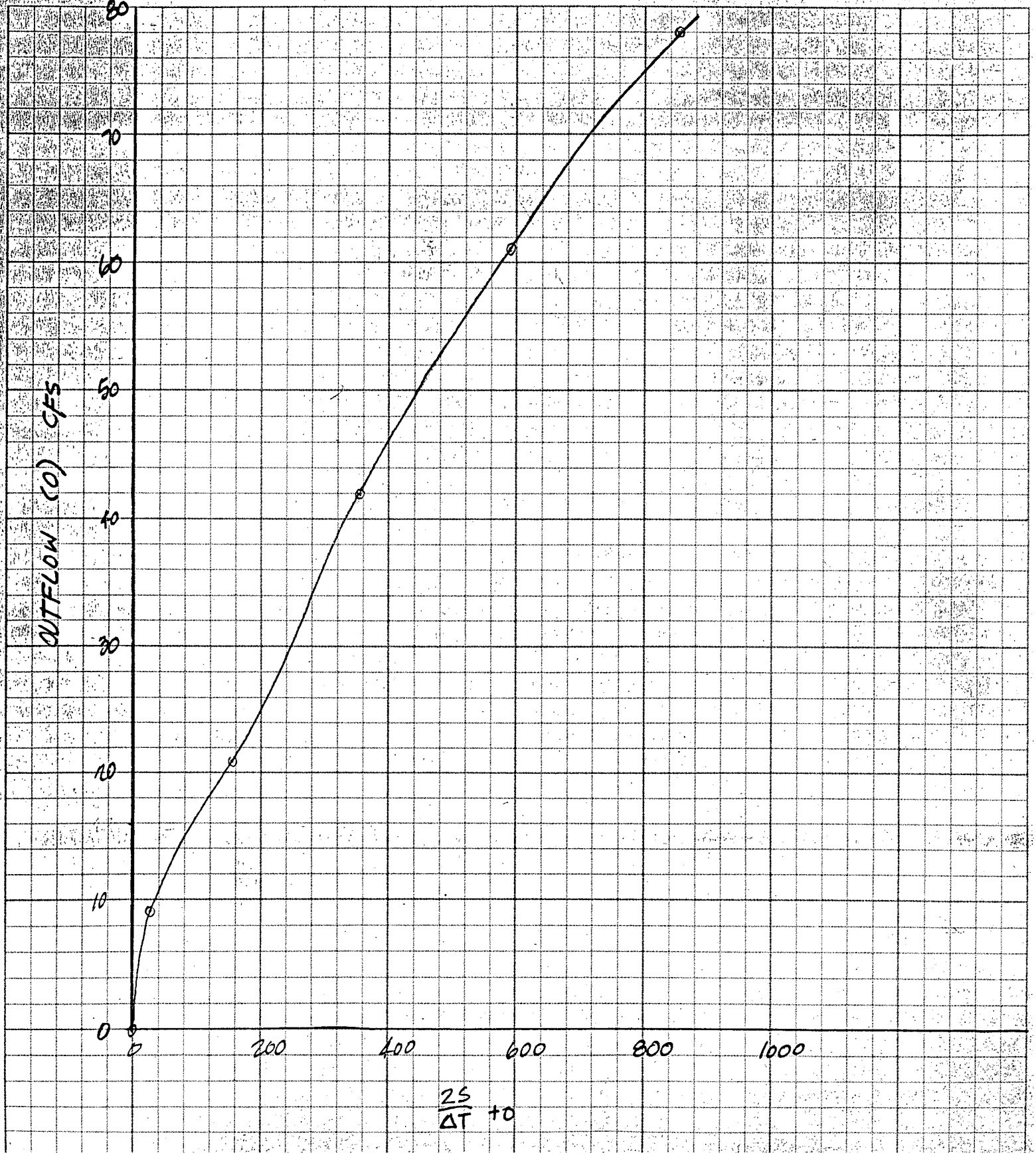
Item Defention Pond @ Polo & Rock Rd.

472-76-245-81523-000-000-001



Date: 02-26-1986
Time: 09:41:08

Input File: field700

fairfield estates drainage plan
storm sewer system no 700
pec file no 36-84610-1540

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
703	702	0.65	2.10	0.00	0.0	31.00	6.63	9.06	31.00	6.63	9.06	9.06	15"	7.38	94.00	0.21	31.21
702	701	0.65	3.20	0.00	0.0	15.00	8.97	18.66	15.00	8.97	18.66	23.02	24"	7.33	67.00	0.15	15.15
701	700	0.70	1.90	0.00	0.0	15.00	8.97	11.93	15.15	8.94	11.89	34.90	24"	11.11	44.00	0.07	15.22

use $Q_p = 35$ cfs @ $t_c = 15$ min.

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Project Fairfield Estates Ph I

Item Detention Pond @ Polo & Rock Rd.

Determine Q_{100} from the remaining portion of system 700. This sub-area will be graded to drain directly into the detention pond via drives, flumes, private storm sewers and/or other approved drainage facilities.

$Q_{100} = CIA$ where $C = 0.8$

$A = 20.5$ ac.

$t_c = 15$ min $\Rightarrow I_{100} = 7.37$ (per Hydro-35)

$Q_{100} = 0.8 \times 7.37 \times 20.5$

$= 121$ cfs

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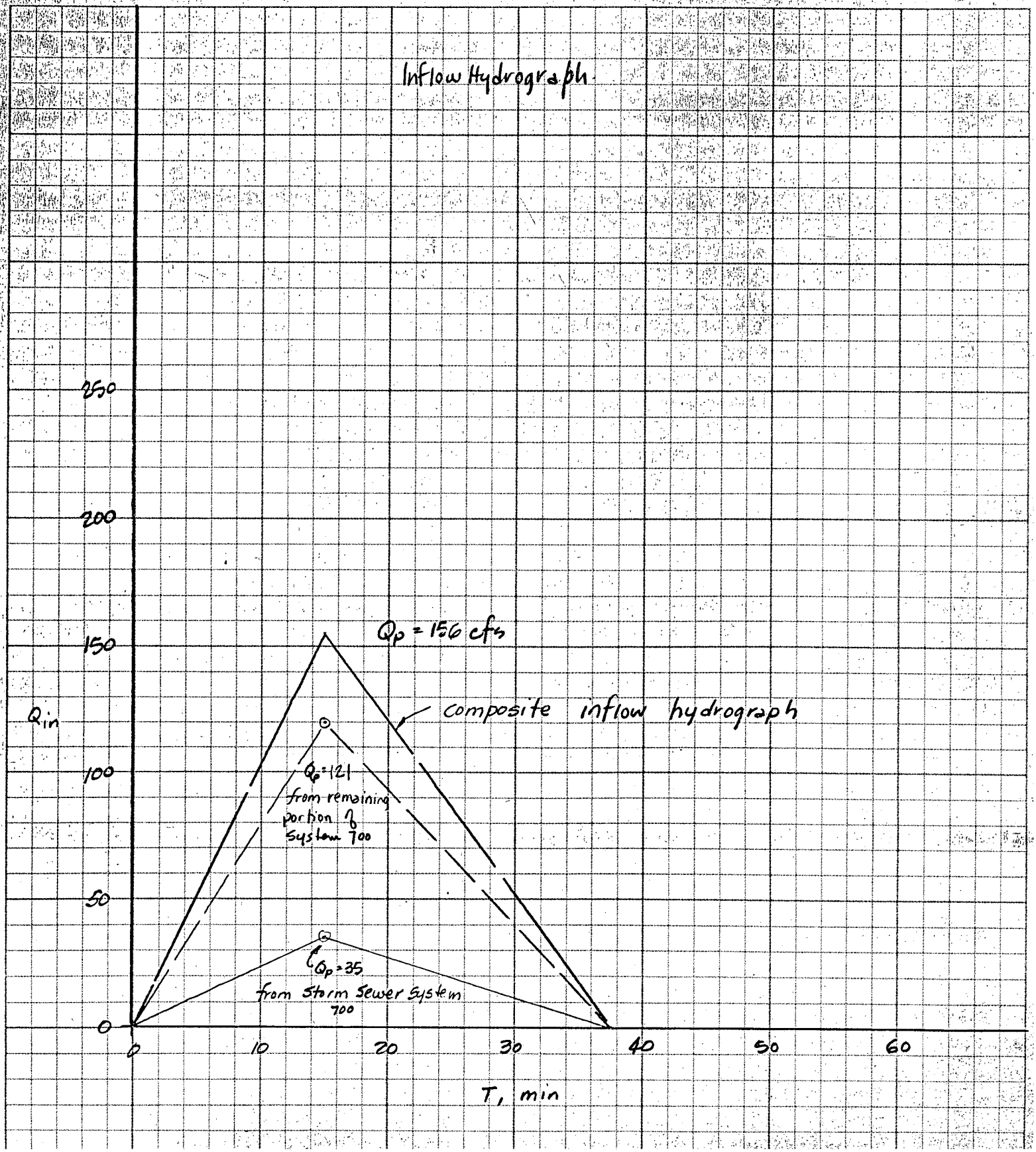
Project Fairfield Estates

Item Detention Pond @ Polo & Rock Rd



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Project Fairfield Estates Phase I St & S.D.

Item Detention Pond @ Polo & Rock Rd.

Time (Min)	Time (HR)	I_n (cfs)	$I_n + I_{n+1}$ (cfs)	$\frac{2S}{\Delta T} - O$	$\frac{2S}{\Delta T} + O$	O	HW	Elev.
0		0	51	0	0	0	0	177.7
5		51	154	27	51	12	1.3	179.0
10		103	259	135	181	23	2.1	179.8
15		156	276	304	394	45	3.1	180.8
20		120	206	460	580	60	3.9	181.6
25		86	138	532	666	67	4.3	182.0
30		52	70	536	670	67	4.3	182.0
35		18	18	480	606	63	4.1	181.8
40		0	0	390	498	54	3.6	181.3
45		0	0	300	390	45	3.1	180.8
50		0	0	228	300	36	2.8	180.5
55		0	0	174	228	27	2.4	180.1
60		0	0	128	174	23	2.1	179.8
65		0	0	90	128	19	1.9	179.6
70		0	0	58	90	16	1.7	179.4
75		0	0	32	58	13	1.4	179.1
80		0	0	12	32	10	1.1	178.8
85		0	0	2	12	5	0.5	178.2
90		0	0	0	2	1	0.1	177.8
95		0	0	0	0	0	0.0	177.7

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Project Fairfield Estates Phase I

Item Detention Pond @ Blo & Rock Rd.

SUMMARY

	EXIST. COND.	PROP. COND
DRAINAGE AREA (Ac.)	53.5	27.7
Qpeak - 100-yr (cfs)	70	156 reduced to 67 via pond
tp (min)	44	15
DWS @ Structure (City Datum)	182.7	182.0

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Project Fairfield Estates

Item

Contour	SF	Ac	Ac-Ft	Σ Ac-Ft
177.7	0	0	0	0
178.0	819	0.02	0	0
179.0	10,188	0.23	0.10	0.10
180.0	33,556	0.77	0.47	0.57
181.0	40,642	0.93	0.85	1.42
182.0	44,734	1.03	0.98	2.40
183.0	48,400	1.11	1.06	3.46

TRIAL #3

Move W. Bank 50 W.

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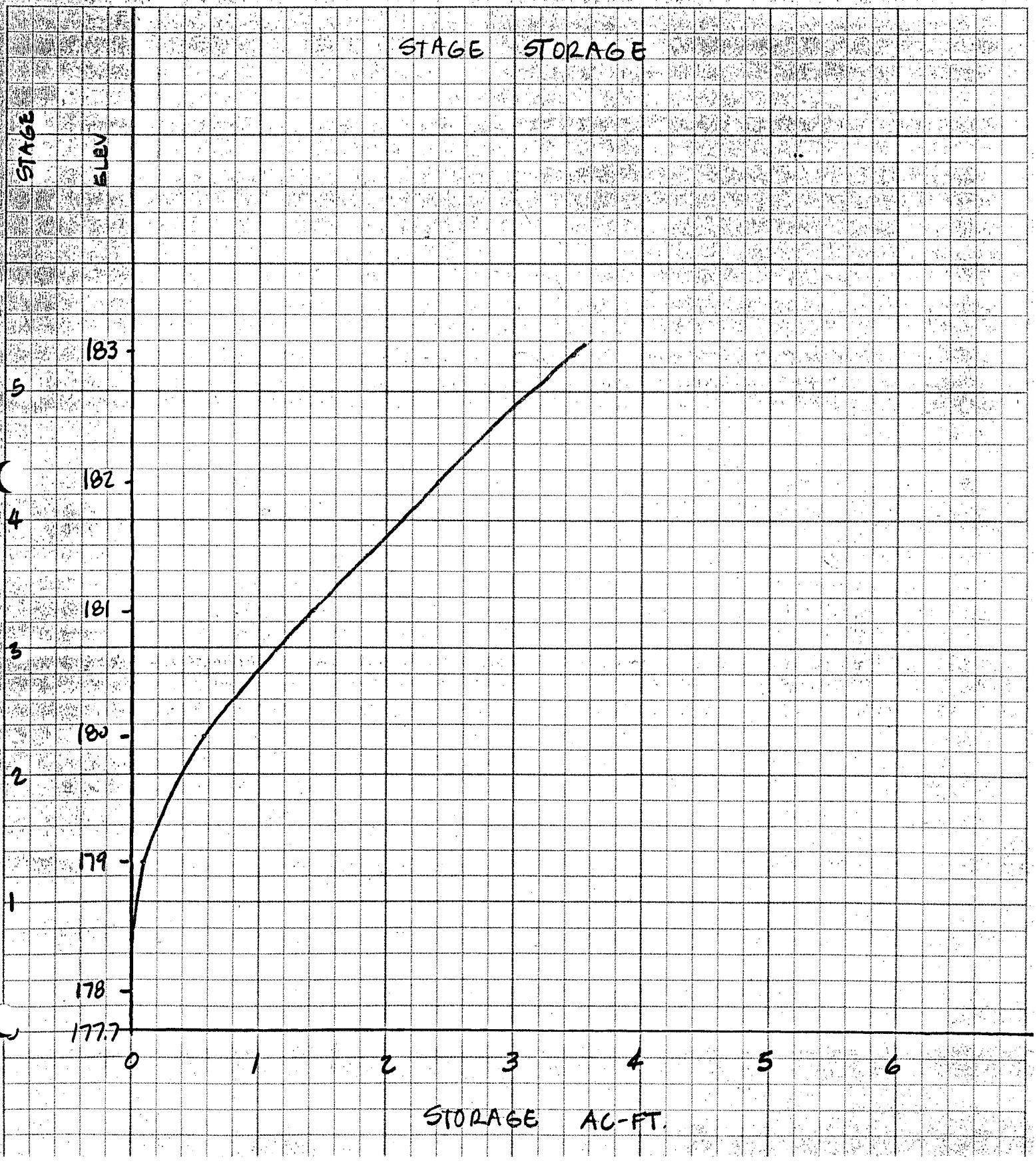

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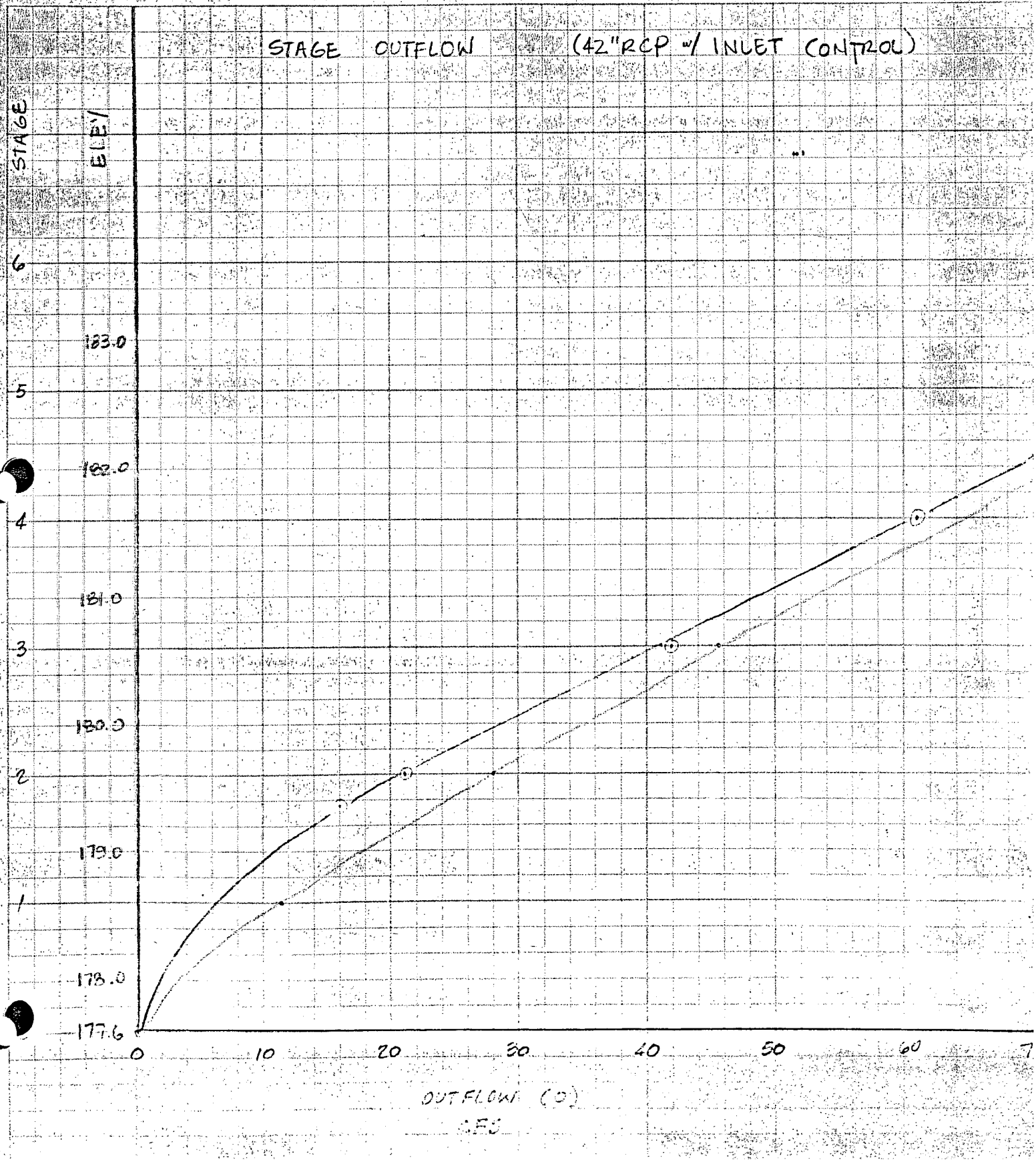
Project Fairfield

Item Detention Area - Rock & Polo



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Item _____

STAGE	ELEV	STOR AC-FT	STOR AC-IN (S)	OUTFLOW CFS (O)	2S	$\frac{2S}{\Delta T}$	$\frac{2S}{\Delta T} + O$
0	177.7	0.00	0	0	0	0	0
1	178.7	0.06	0.72	6	1.44	17.3	23.3
2	179.7	0.40	4.80	21	9.60	115.2	136.2
3	180.7	1.15	13.80	42	27.60	331.3	373.3
4	181.7	2.12	25.44	61	50.88	610.8	671.8
5	182.7	3.12	37.44	78	74.88	898.9	976.9

ΔT = 5 MIN = 0.0833 HR

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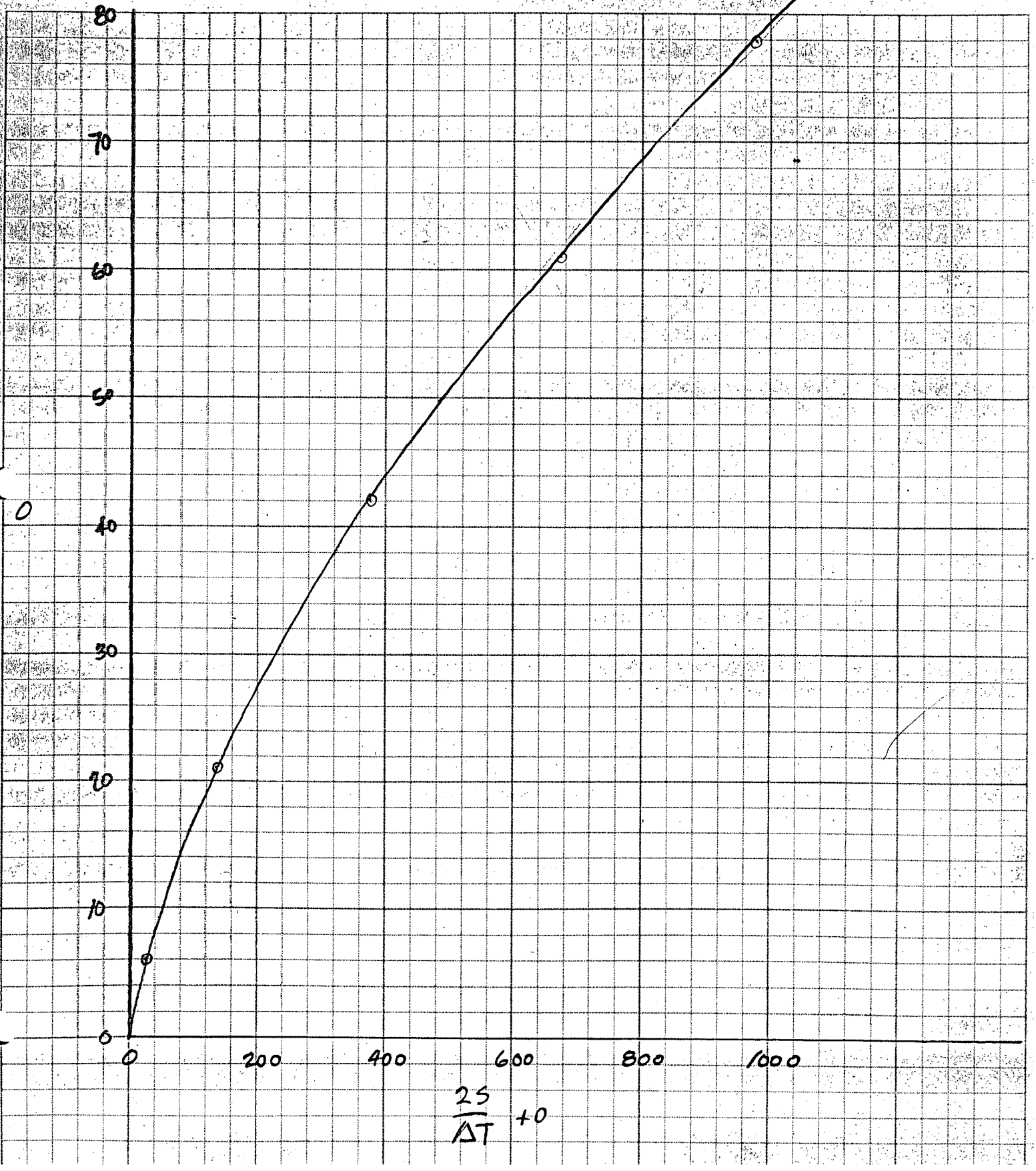

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TIME MIN	HR	In	In+In+1	2S/Δt -O	2S/Δt +O	O	HW	ELEV.
0		0	62	0	0	0	0	177.7
5		62	186	38	62	12	- 1.5	179.2
10		124	309	164	224	30	2.5	180.2
15		185	329	375	473	49	3.4	181.1
20		144	248	578	704	63	4.1	181.8
25		104	167	686	826	70	4.5	182.2
30		63	85	709	853	72	4.6	182.3
35		22	22	658	794	68	4.4	182.1
40		0	0	556	680	62	4.1	181.8
45		0	0	448	556	54	3.7	181.4
50		0	0	354	448	47	3.3	181.0
55		0	0	272	354	41	3.0	180.7
60		0	0	204	272	34	2.7	180.4
65		0	0	148	204	28	2.4	180.1
70		0	0	102	148	23	2.1	179.8
75		0	0	68	102	17	1.8	179.5
80		0	0	42	68	13	1.5	179.2
85		0	0	24	42	9	1.3	179.0
90		0	0	14	24	5	0.9	178.6
95		0	0	8	14	3	0.6	178.3
100		0	0	4	8	2	0.4	178.1