AM

Far Hills 1986 27-May-1986

Haneis v. Far Hills

Expert Report detailing the impact of drainage upon off-site properties with attached calculations.

pgs = 16

Note: Calculations contain hand-written notes

316

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AM000316E

Keller & Kirkpatrick

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May 27, 1986

Members of The Far Hills Planning Board
P. O. Box 477
Prospect Street
Far Hills, NJ 07931

RE: The Polo Club
Site Plan Application - Our File No. 850304

Dear Members of The Board:

As discussed during the last public meeting pertaining to the above referenced project, we have assessed the impact (upon off-site properties) associated with the drainage alternative presently under consideration; namely, diverting flow currently tributary to Sunnybranch Road eastward, across Route 202, into a tributary of Mine Brook. This letter/report summarizes our findings.

First, it should be noted that an existing drainage system was recently discovered along what appears to be an abandoned driveway running from the southeast corner of the site diagonally northwesterly. This system is illustrated on the accompanying schematic plan. This system potentially diverts on the order of ten acres of land originally believed tributary to the railroad culvert near the southwest corner of the site. We use the term "potentially diverts" because the existing culvert under Route 202 (required to convey the flow beneath the highway) has inadequate capacity, resulting in flow inundating the pavement (as reported to us) and becoming tributary to the ditch along the railroad track which flows westwardly. For the purpose of this analysis, which assesses the impact east of Route 202, we have conservatively not considered any contribution from this area under existing conditions.

The proposal is to pipe the stormwater tributary to Sunnybranch Road across Route 202. Thirty-five acres of tributary land north of Sunnybranch Road will be diverted in this manner. The pipe will be designed for a storm having a 25 year return period. Consequently, all peak rates discussed herein and provided on the attached schematic plan reflect 25-year storm values. The pipe will discharge into an open channel to be constructed easterly to a tributary of Mine Brook. Additionally, by modifying the originally proposed storm sewer design, approximately ten acres of the site will be directed to the existing culvert crossing Route 202 near the railroad grade crossing. This results in a total of 45 acres west of Route 202 in the 70 acre sub-watershed becoming tributary to the Mine Brook system. All of this flow will become tributary to an existing railroad culvert located about 600 feet east of Route 202. Approximately 397 acres are tributary to this culvert at the present time, producing an estimated peak runoff rate of 416 cubic feet per second (cfs). The addition of the 45 acres of diverted flow will increase this peak rate to approximately 451 cfs (or by 8%). The discharged stormwater will flow in the existing watercourse, continuing to have on the order of a 8% impact upon peak rate, across Lot 1, Block 24, through the culvert under Far Hills road to the confluence with Mine Brook. At this point, an additional 4,554 acres are tributary with a peak flow of 4,393 cfs. The total flow at the confluence under existing conditions is estimated to be 4,730 cfs (from 4,950 acres) and the peak flow after the proposed discharge from Sunnybranch Road and the ten acres of the project site is 4,750 cfs (from 4,995 acres). The impact at the confluence is less than one half of one percent.

In terms of evaluating the above calculated impacts, certainly a negilible impact occurs downstream of the above referenced confluence. The 8% impact from the discharge point of Sunnybranch flow to the confluence is considered minimal, if not inconsequential. It should be noted that, due to the differences in the sizes and associated hydrologic lag times of the sub-watersheds involved, providing stormwater detention for the Sunnybranch or on-site tributary flow would have an adverse impact because the peak emanating from Sunnybranch would be detained until it became co-incident with the peak in the larger brook. This is graphically illustrated on the enclosed figure.

In conclusion, the piping of storm flows tributary to Sunnybranch Road is considered a viable alternative that should not adversely affect the downstream properties.

Very truly yours,

KELLER & KIRKPATRICK

James R. Woods, P.E.
Director of Engineering

JRW:js
enclosure

CALCULATIONS

```
---SCS HYDROGRAPH PROCEDURE ---


HYDROGRAPH NUMBER ? TR1

A = 397
CN = 62

A = 0

TOTAL AREA = 397.00 ACRES

WEIGHTED CN =  62.00

COMPUTED LAG(L), GIVEN LAG(G), OR TC(T) ? G
LAG TIME ? 0.45

PEAK = 416.11151 CFS

TOTAL RAINFALL DEPTH =     5.700 INCHES
TOTAL RUNOFF DEPTH =     1.888 INCHES

TOTAL VOLUME =2692411.50 CU FT  OR     61.809 AC-FT

TYPE 1 IF OUTPUT NOT WANTED -


PROCEDURE ? TR2
INVALID PROCEDURE !


PROCEDURE ? HYD


---SCS HYDROGRAPH PROCEDURE ---


HYDROGRAPH NUMBER ? TR2

A = 4554
CN = 64

A = 0

TOTAL AREA = 4554.0 ACRES

WEIGHTED CN =  64.00

COMPUTED LAG(L), GIVEN LAG(G), OR TC(T) ? G
LAG TIME ? 0.61

PEAK =4393.53320 CFS

TOTAL RAINFALL DEPTH =     5.696 INCHES
TOTAL RUNOFF DEPTH =     2.049 INCHES

TOTAL VOLUME =********** CU FT  OR     769.695 AC-FT

TYPE 1 IF OUTPUT NOT WANTED -
```

CURRENT FLOW TRIBUTARY OF MINE BROOK

CURRENT FLOW MINE BROOK ABOVE CONFLUENCE WITH TRIBUTARY

```
PROCEDURE ? ADD

---ADD PROCEDURE---

ENTER TWO HYDROGRAPHS :
HYDROGRAPH NUMBER 1 ? TR1
HYDROGRAPH NUMBER 2 ? TR2
SUM HYDROGRAPH NUMBER ? TRT

PEAK =     4729.819

TYPE 1 IF OUTPUT FILE NOT WANTED -

PROCEDURE ? HYD

---SCS HYDROGRAPH PROCEDURE ---

HYDROGRAPH NUMBER ? DIV

A = 35
CN = 60

A = 0

TOTAL AREA =  35.00 ACRES

WEIGHTED CN =  60.00

COMPUTED LAG(L), GIVEN LAG(G), OR TC(T) ? T
TIME OF CONCENTRATION (MIN) = 18

LAG TIME=0.18

PEAK =  52.55565 CFS

TOTAL RAINFALL DEPTH =     5.698 INCHES
TOTAL RUNOFF DEPTH =     1.727 INCHES

TOTAL VOLUME =217168.453 CU FT  OR      4.986 AC-FT

TYPE 1 IF OUTPUT NOT WANTED -

PROCEDURE ?
```

CURRENT FLOW MINE BRANCH BELOW TRIBUTARY

Flow discharged by proposed Sunny branch storm sewer

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                HYD

---SCS HYDROGRAPH PROCEDURE ---


HYDROGRAPH NUMBER ? A202

A = 10
CN = 81

A = 0

TOTAL AREA =  10.00 ACRES

WEIGHTED CN =  81.00

COMPUTED LAG(L), GIVEN LAG(G), OR TC(T) ? T
TIME OF CONCENTRATION (MIN) = 9

LAG TIME=0.09

PEAK =  46.73277 CFS

TOTAL RAINFALL DEPTH =     5.700 INCHES
TOTAL RUNOFF DEPTH =     3.611 INCHES

TOTAL VOLUME =129744.141 CU FT  OR      2.979 AC-FT

TYPE 1 IF OUTPUT NOT WANTED -


PROCEDURE ? ADD


---ADD PROCEDURE---

ENTER TWO HYDROGRAPHS :
HYDROGRAPH NUMBER 1 ? DIV
HYDROGRAPH NUMBER 2 ? TR1
SUM HYDROGRAPH NUMBER ? TRIB

PEAK =      439.640

TYPE 1 IF OUTPUT FILE NOT WANTED -


PROCEDURE ? ADD


---ADD PROCEDURE---

ENTER TWO HYDROGRAPHS :
HYDROGRAPH NUMBER 1 ? TRIB
HYDROGRAPH NUMBER 2 ? A202
SUM HYDROGRAPH NUMBER ? AFT

PEAK =      451.308

TYPE 1 IF OUTPUT FILE NOT WANTED -
```

Flow from 10 Ac. of Site Drainage to cross Rt 202 in SE corner (Replace exist culvert)

Proposed flow below Sunny branch discharge

Total Proposed flow in Tributary at Railroad Crossing

```
PROCEDURE ? ADD

---ADD PROCEDURE---

ENTER TWO HYDROGRAPHS :
HYDROGRAPH NUMBER 1 ? AFT
HYDROGRAPH NUMBER 2 ? TR2
SUM HYDROGRAPH NUMBER ? AMB

PEAK =     4749.197

TYPE 1 IF OUTPUT FILE NOT WANTED -

PROCEDURE ?
```

Total Flow Mine Brook Below Confluence Proposed Conditions

HYDROGRAPH PRINT ROUTINE

FILE NAME : SY0:FHA202.HYD 28-MAY-86

BEGINNING TIME = 5 : 56. PEAK = 46.73

5	30	0.000	0.000	0.000	0.000	0.000	0.000
6	0	0.004	0.011	0.018	0.026	0.035	0.043
6	30	0.052	0.060	0.069	0.078	0.088	0.097
7	0	0.107	0.117	0.128	0.138	0.149	0.160
7	30	0.172	0.184	0.196	0.209	0.222	0.235
8	0	0.249	0.263	0.278	0.294	0.309	0.326
8	30	0.343	0.361	0.380	0.399	0.419	0.440
9	0	0.462	0.485	0.509	0.535	0.561	0.590
9	30	0.619	0.651	0.684	0.720	0.757	0.798
10	0	0.841	0.887	0.937	0.991	1.050	1.113
10	30	1.183	1.260	1.345	1.440	1.546	1.667
11	0	1.804	1.963	2.148	2.369	2.636	2.967
11	30	3.498	6.034	8.598	10.702	13.638	21.949
12	0	45.293	35.942	23.126	17.396	14.488	11.852
12	30	7.523	5.593	4.771	4.287	3.939	3.666
13	0	3.434	3.235	3.061	2.909	2.773	2.652
13	30	2.543	2.444	2.354	2.271	2.195	2.125
14	0	2.060	2.000	1.944	1.891	1.842	1.795
14	30	1.752	1.710	1.672	1.635	1.600	1.566
15	0	1.535	1.505	1.476	1.448	1.422	1.397
15	30	1.373	1.350	1.328	1.306	1.286	1.266
16	0	1.247	1.228	1.211	1.193	1.177	1.161
16	30	1.145	1.130	1.116	1.102	1.088	1.074
17	0	1.062	1.049	1.037	1.025	1.013	1.002
17	30	0.991	0.981	0.970	0.960	0.950	0.940
18	0	0.931	0.922	0.913	0.904	0.896	0.887
18	30	0.879	0.871	0.863	0.855	0.848	0.841
19	0	0.833	0.826	0.819	0.813	0.806	0.799
19	30	0.793	0.787	0.781	0.775	0.769	0.763
20	0	0.757	0.752	0.746	0.741	0.735	0.730
20	30	0.725	0.720	0.715	0.710	0.705	0.700
21	0	0.696	0.691	0.687	0.682	0.678	0.674
21	30	0.669	0.665	0.661	0.657	0.653	0.649
22	0	0.645	0.641	0.637	0.634	0.630	0.626
22	30	0.623	0.619	0.616	0.612	0.609	0.606
23	0	0.602	0.599	0.596	0.593	0.590	0.587
23	30	0.583	0.580	0.578	0.575	0.572	0.568
24	0	0.377	0.101	0.025	0.006	0.001	0.000
24	30	0.000	0.000	0.000	0.000	0.000	0.000

HYDROGRAPH PRINT ROUTINE

FILE NAME : SYO:FHDIV.HYDD 28-MAY-86

BEGINNING TIME = 10 : 54. PEAK = 52.56

10	30	0.000	0.000	0.000	0.000	0.000	0.000
11	0	0.004	0.034	0.104	0.220	0.373	0.568
11	30	0.814	1.149	1.897	3.455	5.746	8.818
12	0	14.978	30.876	48.887	51.586	43.414	36.447
12	30	31.052	25.260	19.117	14.608	11.945	10.231
13	0	9.072	8.280	7.673	7.189	6.787	6.451
13	30	6.159	5.899	5.665	5.453	5.261	5.084
14	0	4.923	4.773	4.635	4.506	4.387	4.274
14	30	4.169	4.070	3.977	3.889	3.806	3.728
15	0	3.653	3.582	3.514	3.449	3.388	3.329
15	30	3.272	3.218	3.167	3.117	3.069	3.023
16	0	2.979	2.936	2.895	2.855	2.816	2.779
16	30	2.743	2.709	2.675	2.642	2.611	2.580
17	0	2.550	2.521	2.493	2.466	2.439	2.413
17	30	2.388	2.363	2.339	2.316	2.293	2.271
18	0	2.249	2.228	2.207	2.187	2.168	2.148
18	30	2.129	2.111	2.093	2.075	2.058	2.041
19	0	2.024	2.008	1.992	1.977	1.961	1.946
19	30	1.932	1.917	1.903	1.889	1.875	1.862
20	0	1.849	1.836	1.823	1.811	1.798	1.786
20	30	1.774	1.763	1.751	1.740	1.729	1.718
21	0	1.707	1.696	1.686	1.676	1.666	1.656
21	30	1.646	1.636	1.627	1.617	1.608	1.599
22	0	1.590	1.581	1.572	1.564	1.555	1.547
22	30	1.539	1.530	1.522	1.514	1.506	1.499
23	0	1.491	1.484	1.476	1.469	1.461	1.454
23	30	1.447	1.440	1.433	1.426	1.420	1.413
24	0	1.395	1.218	0.804	0.416	0.205	0.102
24	30	0.050	0.025	0.012	0.005	0.001	0.000
25	0	0.000	0.000	0.000	0.000	0.000	0.000

HYDROGRAPH PRINT ROUTINE

FILE NAME : SYO:FHTRT.HYDD 28-MAY-86

BEGINNING TIME = 10 : 10. PEAK = 4729.82

10	0	0.000	0.000	0.000	0.016	0.111	0.349
10	30	0.805	1.895	3.689	6.326	9.984	15.429
11	0	22.314	30.757	40.889	53.717	68.737	86.229
11	30	106.522	134.530	173.637	228.880	305.807	439.007
12	0	679.829	1034.413	1504.524	2153.080	2858.339	3545.693
12	30	4151.774	4516.275	4705.187	4729.819	4611.997	4319.779
13	0	3941.488	3537.099	3162.349	2845.307	2551.350	2286.600
13	30	2057.397	1871.534	1708.652	1566.238	1443.125	1341.260
14	0	1249.252	1167.200	1095.436	1036.908	982.633	933.731
14	30	891.046	853.025	818.828	787.582	758.626	732.248
15	0	707.396	683.961	661.920	642.544	625.150	609.286
15	30	594.640	581.439	569.106	557.486	546.479	536.175
16	0	526.336	516.912	507.878	499.344	491.149	483.259
16	30	475.658	468.430	461.462	454.727	448.214	441.991
17	0	435.973	430.137	424.479	419.049	413.783	408.666
17	30	403.691	398.901	394.247	389.714	385.297	381.034
18	0	376.884	372.833	368.881	365.055	361.325	357.680
18	30	354.117	350.662	347.288	343.986	340.755	337.615
19	0	334.545	331.537	328.589	325.721	322.912	320.158
19	30	317.456	314.823	312.243	309.710	307.223	304.796
20	0	302.415	300.076	297.777	295.530	293.325	291.157
20	30	289.024	286.939	284.890	282.874	280.889	278.946
21	0	277.036	275.155	273.302	271.486	269.701	267.941
21	30	266.208	264.507	262.834	261.183	259.556	257.958
22	0	256.385	254.834	253.303	251.799	250.318	248.856
22	30	247.412	245.993	244.595	243.215	241.852	240.512
23	0	239.191	237.885	236.596	235.326	234.074	232.836
23	30	231.613	230.408	229.220	228.045	226.884	225.740
24	0	223.355	219.225	212.763	201.859	186.288	167.566
24	30	146.686	125.226	104.873	86.115	69.354	55.545
25	0	45.088	36.667	29.770	24.134	19.633	15.894
25	30	12.805	10.414	8.503	6.901	5.555	4.468
26	0	3.619	2.922	2.345	1.856	1.480	1.161
26	30	0.884	0.673	0.494	0.341	0.213	0.118
27	0	0.055	0.016	0.000	0.000	0.000	0.000

HYDROGRAPH PRINT ROUTINE

FILE NAME : SYO:FHTR2.HYDD 28-MAY-86

BEGINNING TIME = 10 : 10. PEAK = 4393.53

10	0	0.000	0.000	0.000	0.016	0.111	0.349
10	30	0.805	1.895	3.680	6.285	9.857	15.119
11	0	21.681	29.627	39.058	50.961	64.807	80.847
11	30	99.359	125.008	160.585	210.235	278.195	397.167
12	0	612.135	923.724	1332.446	1905.215	2535.910	3167.466
12	30	3743.370	4101.895	4307.251	4368.307	4292.741	4039.578
13	0	3697.815	3326.197	2979.284	2684.466	2408.121	2157.867
13	30	1940.923	1765.190	1610.471	1475.098	1357.850	1261.141
14	0	1173.495	1095.278	1026.993	971.610	920.212	873.803
14	30	833.255	797.138	764.659	734.966	707.420	682.341
15	0	658.706	636.411	615.443	597.080	580.643	565.685
15	30	551.900	539.518	527.964	517.087	506.790	497.166
16	0	487.977	479.175	470.740	462.781	455.138	447.780
16	30	440.691	433.957	427.466	421.191	415.124	409.332
17	0	403.730	398.298	393.030	387.979	383.081	378.321
17	30	373.692	369.239	364.912	360.698	356.591	352.630
18	0	348.773	345.009	341.336	337.782	334.318	330.931
18	30	327.621	324.413	321.281	318.215	315.214	312.300
19	0	309.450	306.658	303.921	301.259	298.653	296.097
19	30	293.589	291.146	288.752	286.402	284.095	281.843
20	0	279.635	277.465	275.332	273.249	271.204	269.193
20	30	267.216	265.282	263.383	261.513	259.673	257.871
21	0	256.101	254.357	252.639	250.956	249.301	247.670
21	30	246.063	244.488	242.937	241.407	239.899	238.418
22	0	236.961	235.523	234.105	232.712	231.339	229.984
22	30	228.647	227.332	226.037	224.759	223.496	222.255
23	0	221.031	219.822	218.627	217.451	216.291	215.145
23	30	214.012	212.896	211.796	210.708	209.633	208.573
24	0	206.276	202.420	196.553	186.763	172.888	156.251
24	30	137.526	118.087	99.491	82.119	66.322	53.237
25	0	43.349	35.356	28.780	23.385	19.066	15.467
25	30	12.487	10.174	8.324	6.770	5.461	4.402
26	0	3.575	2.896	2.331	1.851	1.479	1.161
26	30	0.884	0.673	0.494	0.341	0.213	0.118
27	0	0.055	0.016	0.000	0.000	0.000	0.000

HYDROGRAPH PRINT ROUTINE

FILE NAME : SY0:FHTR1.HYDD 28-MAY-86

BEGINNING TIME = 10 : 34. PEAK = 416.11

10	30	0.000	0.001	0.009	0.041	0.127	0.310
11	0	0.632	1.130	1.831	2.756	3.930	5.382
11	30	7.163	9.522	13.052	18.645	27.612	41.840
12	0	67.694	110.688	172.078	247.865	322.429	378.228
12	30	408.405	414.380	397.936	361.512	319.256	280.202
13	0	243.673	210.902	183.064	160.841	143.229	128.733
13	30	116.474	106.344	98.181	91.140	85.275	80.119
14	0	75.757	71.922	68.442	65.298	62.421	59.928
14	30	57.792	55.886	54.169	52.616	51.206	49.907
15	0	48.691	47.550	46.477	45.464	44.507	43.601
15	30	42.740	41.922	41.142	40.399	39.689	39.010
16	0	38.360	37.736	37.138	36.564	36.011	35.479
16	30	34.967	34.472	33.996	33.535	33.090	32.660
17	0	32.243	31.840	31.449	31.070	30.702	30.345
17	30	29.999	29.662	29.334	29.016	28.706	28.404
18	0	28.110	27.824	27.545	27.273	27.007	26.748
18	30	26.495	26.248	26.007	25.771	25.541	25.315
19	0	25.095	24.879	24.668	24.462	24.259	24.061
19	30	23.867	23.677	23.490	23.308	23.128	22.952
20	0	22.780	22.610	22.444	22.281	22.121	21.963
20	30	21.809	21.657	21.508	21.361	21.216	21.075
21	0	20.935	20.798	20.663	20.530	20.400	20.271
21	30	20.144	20.020	19.897	19.776	19.657	19.540
22	0	19.424	19.310	19.198	19.088	18.979	18.871
22	30	18.766	18.661	18.558	18.456	18.356	18.257
23	0	18.160	18.064	17.969	17.875	17.783	17.691
23	30	17.601	17.512	17.424	17.337	17.251	17.167
24	0	17.079	16.805	16.210	15.096	13.400	11.315
24	30	9.159	7.139	5.382	3.996	3.032	2.308
25	0	1.738	1.312	0.989	0.748	0.567	0.426
25	30	0.318	0.240	0.179	0.131	0.095	0.066
26	0	0.044	0.027	0.014	0.005	0.001	0.000
26	30	0.000	0.000	0.000	0.000	0.000	0.000

by BOCINA

December 18, 1985

Mayor & Borough Council
Borough of Far Hills
Borough Hall
Far Hills, N.J. 07931

Dear Mayor and Council Members:

Enclosed please our Check # 1018 in the amount of $10,272.00 representing our contribution toward a fund of $40,000 for the preliminary design report and discharge allocation application for the expansion of the Bedminister-Far Hills Sewer Plant. We are paying these funds in accordance with the interim settlement order in the matter of Ochs and Haueis v. Far Hills as our pro rata portion of the cost of the expansion. This payment assumes that the entire portion of the expansion allocated to Far Hills will be utilized by our site for the development of townhouses. If other persons in Far Hills utilize any of the expanded capacity of the plant we will expect to be reimbursed for anything in excess of our pro rata share.

Sincerely,

Casper Bocina

CB:lc
Enclosure

289 Mt. Hope Ave. • Rockaway Township • Dover, New Jersey 07801

by BOCINA

December 18, 1985

Mayor & Borough Council
Borough of Far Hills
Borough Hall
Far Hills, N.J. 07931

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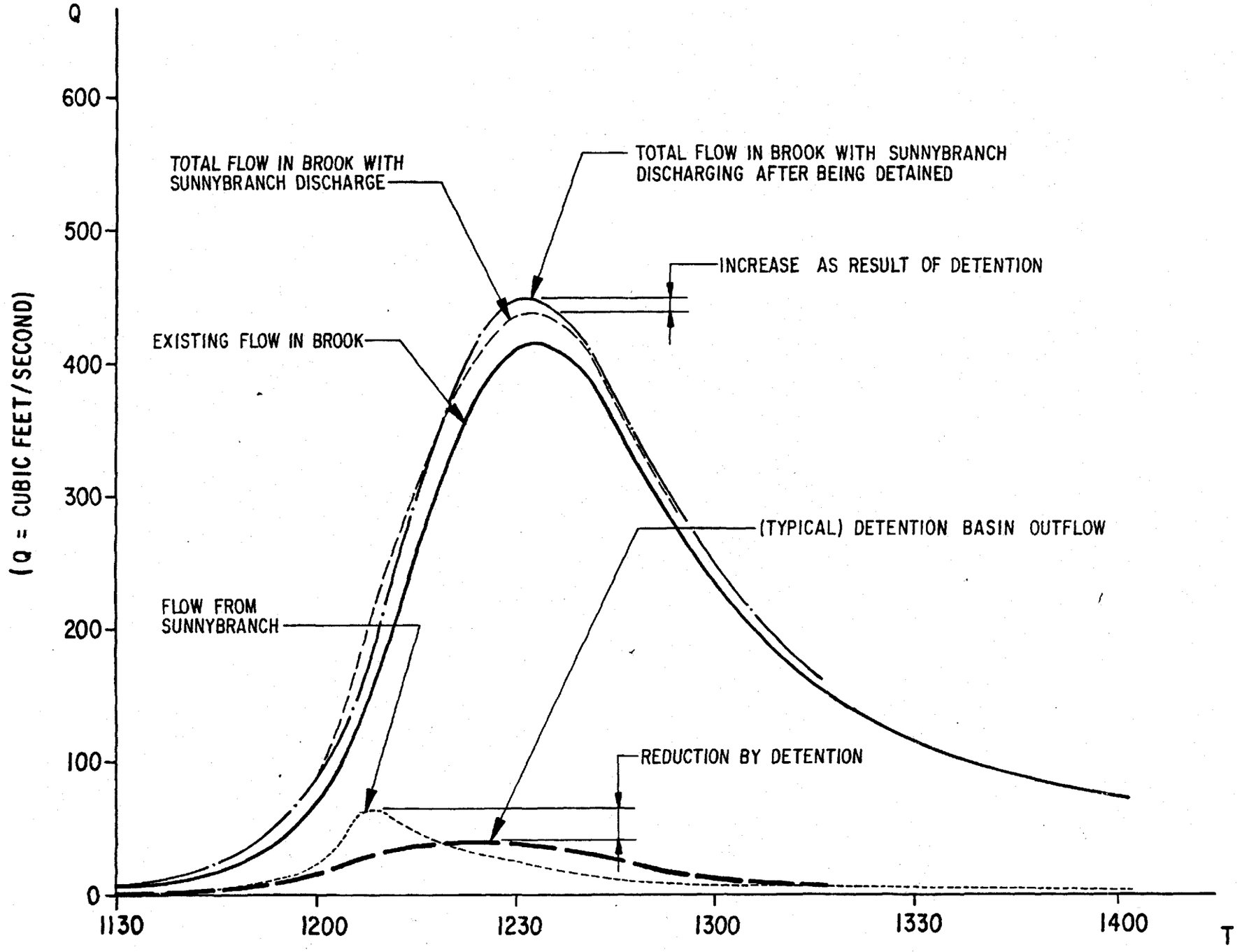

TYPICAL HYDROGRAPH ANALYSIS DEMONSTRATING CONSEQUENCES OF DETAINING FLOW TRIBUTARY TO SUNNYBRANCH ROAD

NOTE: THIS FIGURE PERTAINS TO THE 5/27/86 LETTER TO FAR HILLS PLANNING BOARD; re: THE POLO CLUB

Keller & Kirkpatrick A Division Of K K & A Limited Inc.
FLORHAM PARK, N.J. 07932 SPARTA, N.J. 07871
CONSULTING ENGINEERS LANDSCAPE ARCHITECTS
LAND-SURVEYORS PLANNERS

DAVID B. KELLER LIC.11361
ROBERT C. KIRKPATRICK JR. LIC.11359

JOB NO. 850304	DATE 27 MAY 86
SCALE NONE	CHKD J.R.W. BOOK