

Inclusion of Hydraulic Controls in Rehabilitation Models of Drainage Networks to Control Floods

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Supplementary Material

In the manuscript referred above, a case study was used to present the validity of the method described. It is the aim of the authors to allow any researcher to be able to reproduce the results obtained. For this reason, the data and the results are included in this supplementary material.

The network of E-Chicó is presented in the Figure 1 below.

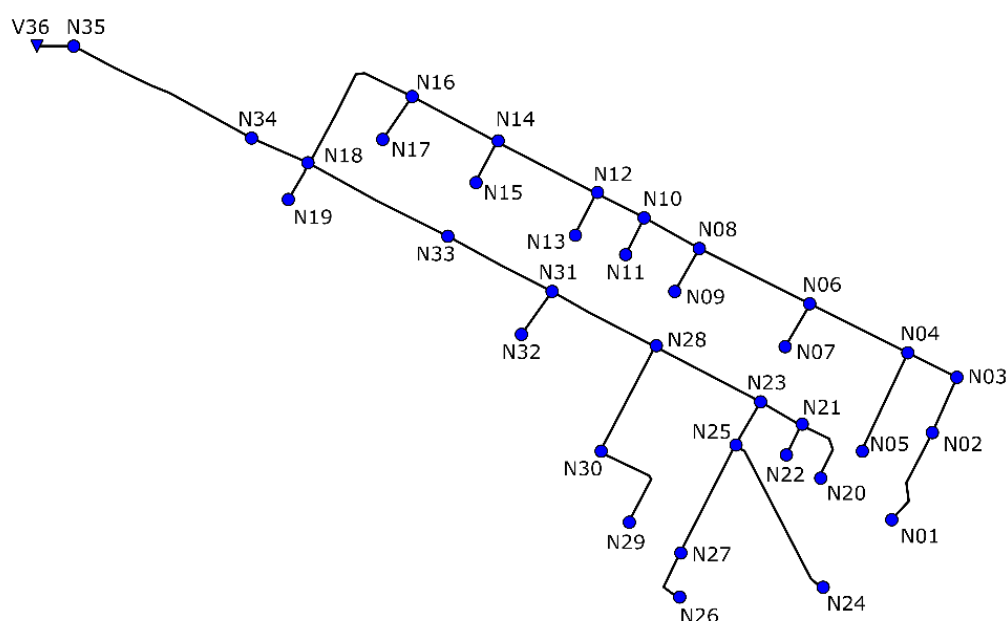


Figure S1. Representation of E-Chicó drainage network.

1. Case Study Data

Table S1. Data for nodes and subcatchments in the network used as a case study.

Node ID	Invert Elevation [m]	Max. Depth [m]	Flooding Area [m ²]	Sub-catchment Area [ha]	Impervious Area [%]	Width [m]	Slope [%]
N01	2585.94	1.40	1380	1.38	73.6	44	16.9
N02	2574.53	2.25	1240	1.24	80.9	25	12.3
N03	2573.25	2.25	1080	1.08	29.2	84	27.7
N04	2567.97	1.72	930	0.93	100	46	4.8
N05	2575.26	2.06	1530	1.53	82.8	38	7.0
N06	2563.08	1.83	1890	1.89	100	43	3.1

Node ID	Invert Elevation [m]	Max. Depth [m]	Flooding Area [m ²]	Sub-catchment Area [ha]	Impervious Area [%]	Width [m]	Slope [%]
N07	2563.67	2.45	1250	1.25	100	43	3.9
N08	2558.57	2.49	1930	1.93	100	45	3.1
N09	2560.66	1.32	1130	1.13	100	43	3.8
N10	2556.14	2.19	700	0.70	100	16	2.0
N11	2556.62	3.35	820	0.82	100	42	2.6
N12	2555.55	2.43	1730	1.73	100	42	1.1
N13	2555.97	2.74	1000	1.00	100	45	1.1
N14	2553.85	1.97	1530	1.53	100	40	0.9
N15	2555.04	1.38	1160	1.16	100	42	0.8
N16	2553.02	2.29	1480	1.48	100	28	0.7
N17	2553.31	2.10	1000	1.00	100	45	0.9
N18	2551.24	2.81	2520	2.52	100	27	0.9
N19	2552.88	1.38	470	0.47	100	22	0.8
N20	2575.59	1.25	1450	1.45	52.6	26	7.5
N21	2570.06	1.57	990	0.99	86.2	25	4.7
N22	2572.07	1.90	620	0.62	64.7	29	4.7
N23	2564.59	2.61	450	0.45	100	22	3.4
N24	2587.65	2.60	1280	1.28	61.5	110	24.4
N25	2568.14	2.26	2190	2.19	90.3	44	4.8
N26	2571.98	1.48	1250	1.25	94.8	29	3.3
N27	2571.38	2.42	1120	1.12	85.3	42	4.3
N28	2561.86	2.63	2420	2.42	100	48	3.6
N29	2569.21	1.53	1530	1.53	100	55	3.6
N30	2565.41	1.28	1950	1.95	100	49	3.8
N31	2556.50	3.49	2710	2.71	100	21	2.2
N32	2559.00	0.91	1500	1.50	90.6	25	1.9
N33	2553.39	1.94	3030	3.03	100	24	1.1
N34	2548.97	3.07	3270	3.27	100	44	0.5
N35	2548.43	3.07	1210	1.21	90.6	20	0.7

Table S2. Data for conduits in the network used as a case study.

Link ID	Node 1	Node 2	Length [m]	Manning Roughness	Diameter [m]
P01	N01	N02	172.65	0.011	0.40
P02	N02	N03	90.99	0.011	0.40
P03	N03	N04	93.17	0.011	0.40
P04	N04	N06	187.94	0.011	0.55
P05	N05	N04	180.27	0.011	0.40
P06	N06	N08	203.82	0.011	0.60
P07	N07	N06	85.55	0.011	0.40
P08	N08	N10	113.02	0.011	0.75
P09	N09	N08	85.62	0.011	0.40
P10	N10	N12	81.80	0.011	0.75
P11	N11	N10	68.24	0.011	0.30
P12	N12	N14	187.31	0.011	0.90
P13	N13	N12	80.08	0.011	0.40
P14	N14	N16	169.06	0.011	1.10
P15	N15	N14	79.98	0.011	0.50

P16	N16	N18	270.92	0.011	1.20
P17	N17	N16	84.81	0.011	0.40
P18	N18	N34	90.38	0.011	1.30
P19	N19	N18	66.74	0.011	0.40
P20	N20	N21	124.22	0.011	0.45
P21	N21	N23	79.16	0.011	0.45
P22	N22	N21	52.91	0.011	0.30
P23	N23	N28	194.54	0.011	0.60
P24	N24	N25	270.94	0.011	0.56
P25	N25	N23	85.78	0.011	0.60
P26	N26	N27	91.21	0.011	0.40
P27	N27	N25	203.14	0.011	0.55
P28	N28	N31	201.07	0.011	0.75
P29	N29	N30	180.09	0.011	0.50
P30	N30	N28	197.82	0.011	0.60
P31	N31	N33	187.12	0.011	0.85
P32	N32	N31	88.46	0.011	0.40
P33	N33	N18	273.72	0.011	1.00
P34	N34	N35	337.56	0.011	1.40
P35	N35	V36	33.19	0.011	1.40

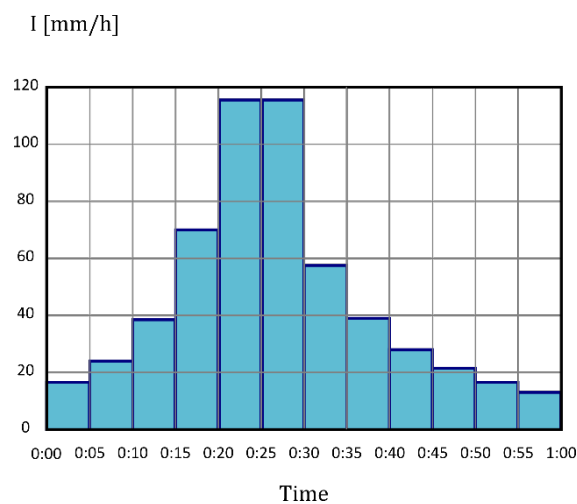


Figure S2. Design storm based on the Alternating Blocks Method.

Table S3. Time series for the design storm used in the case study.

Time	Value
0:00	16.73
0:05	24.4
0:10	38.78
0:15	70.61
0:20	118
0:25	118
0:30	57.48
0:35	39.12
0:40	28.3
0:45	21.39
0:50	16.73

Table S4. Series of suitable diameters and their associated for the case study.

Diameter [m]	Unit Cost [€/m]	Diameter [m]	Unit Cost [€/m]
0.30	30.93	1.30	404.51
0.35	39.73	1.40	464.76
0.40	49.56	1.50	529.16
0.45	60.44	1.60	597.73
0.50	72.36	1.80	747.35
0.60	99.31	1.90	828.40
0.70	130.43	2.00	913.61
0.80	165.71	2.20	1096.52
0.90	205.15	2.40	1296.07
1.00	248.75	2.60	1512.27
1.10	296.51	2.80	1745.11
1.20	348.43	3.00	1994.60

Table S5. Series of valve travel and head loss coefficients.

Value	$t = A/A0$	k (Eqn. 2)
0 ^(*)	100.00%	0.00
1	100.00%	0.27
2	71.69%	0.61
3	51.39%	1.35
4	36.84%	2.99
5	26.41%	6.64
6	18.93%	14.73
7	13.57%	32.69
8	9.73%	72.55
9	6.97%	161.01
10	5.00%	357.34

^(*) Corresponding to not install hydraulic control.