

In collaborazione con:



1506  
UNIVERSITÀ  
DEGLI STUDI  
DI URBINO  
CARLO BO



## Consorzio di Bonifica delle Marche

### STUDIO PER LA MITIGAZIONE DEL RISCHIO IDROGEOLOGICO DELLA REGIONE MARCHE

INDAGINE CONDOTTA SUI BACINI IDROGRAFICI  
DEI FIUMI CONCA, TAVOLLO, FOGLIA,  
ARZILLA, METAURO E CESANO

ANALISI FLUVIALE

#### CONSORZIO DI BONIFICA DELLE MARCHE

IL PRESIDENTE

Avv. Claudio Netti

IL RESPONSABILE DELL'AREA BONIFICA

Dott. Michele Tromboni

#### UNIURB

CONSULENZA SCIENTIFICA

Prof.ssa Olivia Nesci

Prof. Francesco Veneri

Geol. Filippo Piscaglia

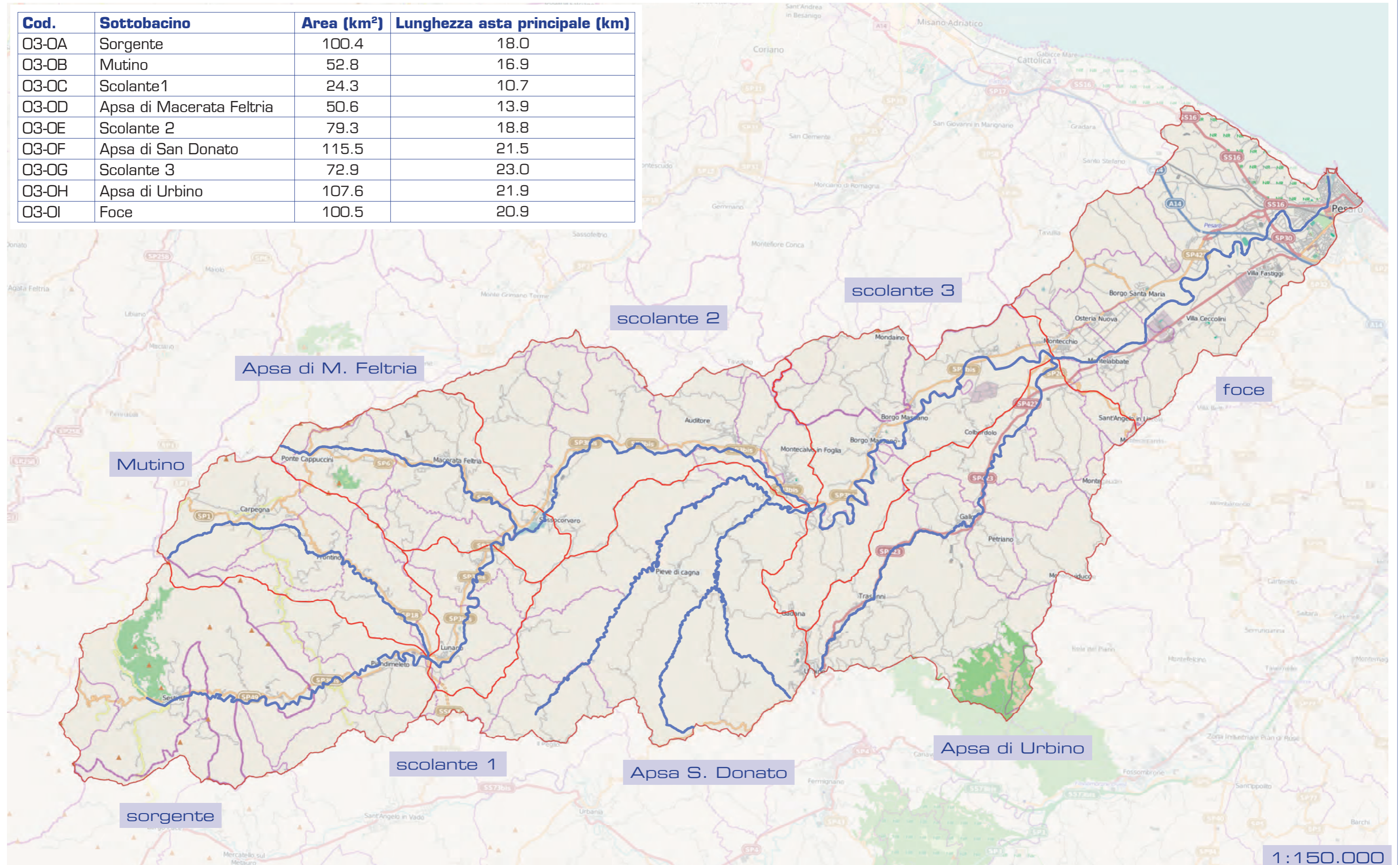
#### COORDINAMENTO SCIENTIFICO UNICAM

Prof. Piero Farabollini

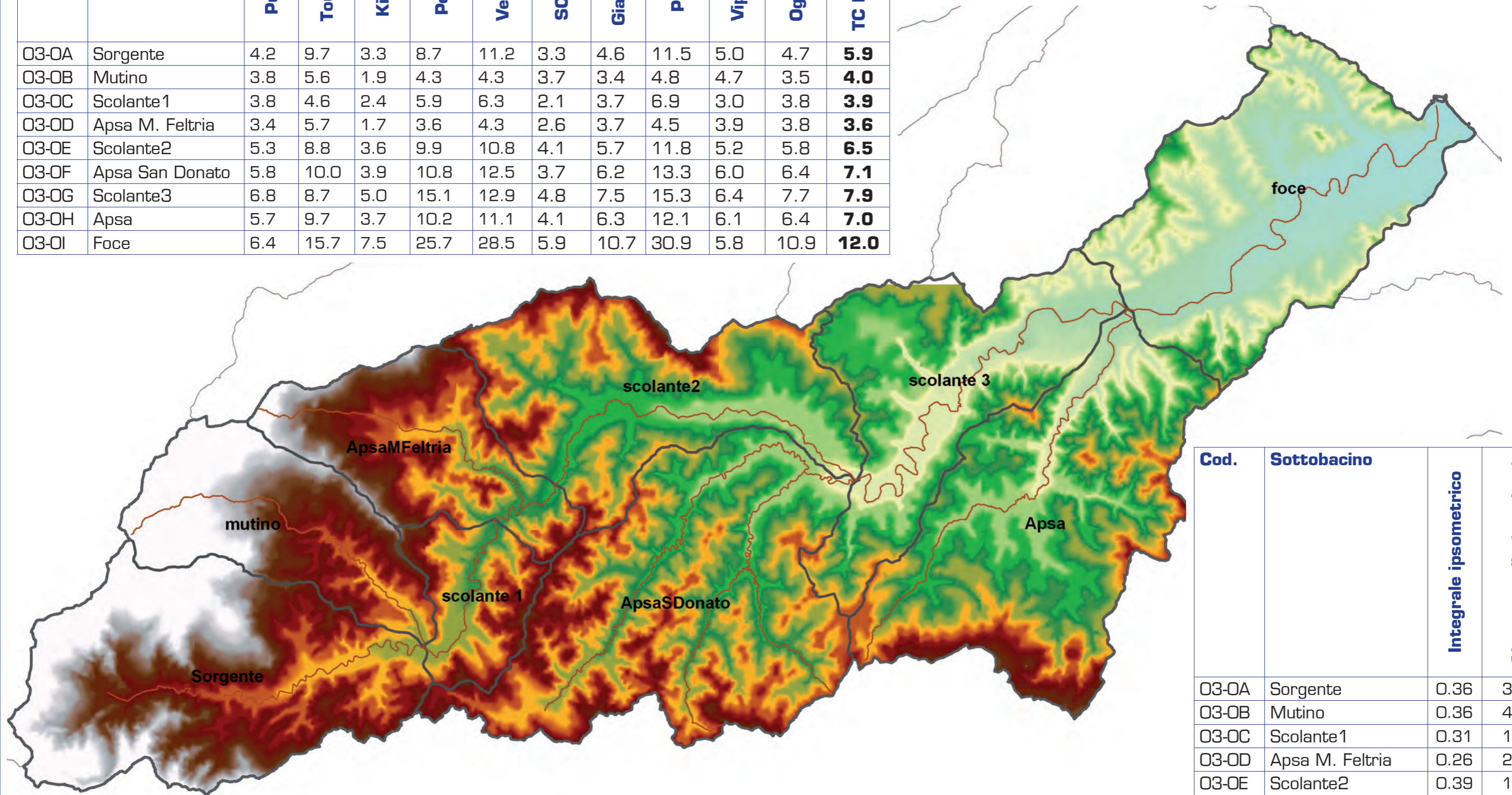
Prof. Massimo Sargolini

Area Bonifica

Cod.	Sottobacino	Area (km <sup>2</sup> )	Lunghezza asta principale (km)
03-OA	Sorgente	100.4	18.0
03-OB	Mutino	52.8	16.9
03-OC	Scolante 1	24.3	10.7
03-OD	Apsa di Macerata Feltria	50.6	13.9
03-OE	Scolante 2	79.3	18.8
03-OF	Apsa di San Donato	115.5	21.5
03-OG	Scolante 3	72.9	23.0
03-OH	Apsa di Urbino	107.6	21.9
03-OI	Foce	100.5	20.9

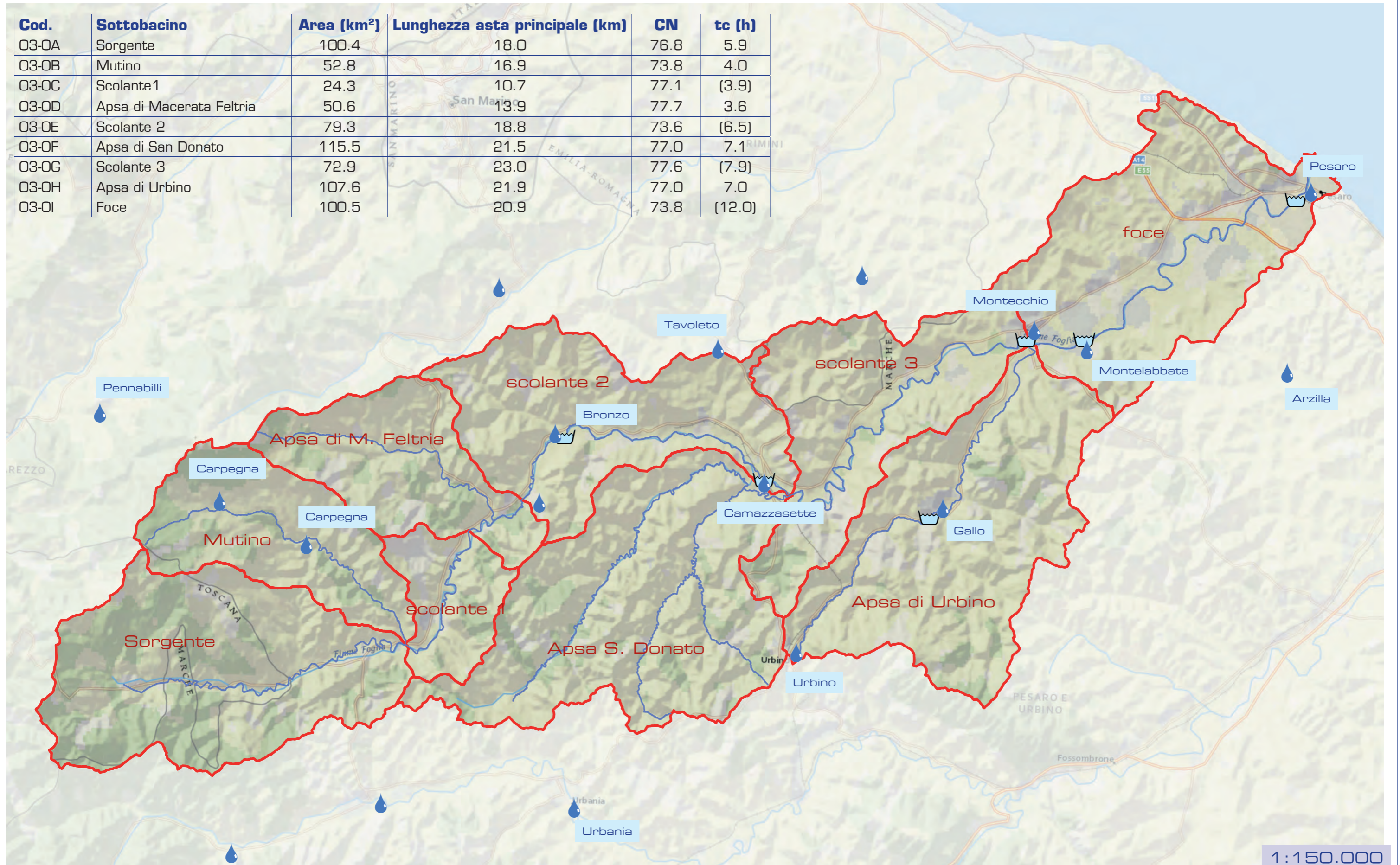


Cod.	Sottobacino	Puglisi	Tournon	Kirpich	Pezzoli	Ventura	SCS-CN	Giandotti	Pasini	Viparelli	Ogrosky	TC MEDIO
03-OA	Sorgente	4.2	9.7	3.3	8.7	11.2	3.3	4.6	11.5	5.0	4.7	<b>5.9</b>
03-OB	Mutino	3.8	5.6	1.9	4.3	4.3	3.7	3.4	4.8	4.7	3.5	<b>4.0</b>
03-OC	Scolante1	3.8	4.6	2.4	5.9	6.3	2.1	3.7	6.9	3.0	3.8	<b>3.9</b>
03-OD	Apsa M. Feltria	3.4	5.7	1.7	3.6	4.3	2.6	3.7	4.5	3.9	3.8	<b>3.6</b>
03-OE	Scolante2	5.3	8.8	3.6	9.9	10.8	4.1	5.7	11.8	5.2	5.8	<b>6.5</b>
03-OF	Apsa San Donato	5.8	10.0	3.9	10.8	12.5	3.7	6.2	13.3	6.0	6.4	<b>7.1</b>
03-OG	Scolante3	6.8	8.7	5.0	15.1	12.9	4.8	7.5	15.3	6.4	7.7	<b>7.9</b>
03-OH	Apsa	5.7	9.7	3.7	10.2	11.1	4.1	6.3	12.1	6.1	6.4	<b>7.0</b>
03-OI	Foce	6.4	15.7	7.5	25.7	28.5	5.9	10.7	30.9	5.8	10.9	<b>12.0</b>



Cod.	Sottobacino	Integrale ipsometrico	Altezza media (m s.l.m.)
03-OA	Sorgente	0.36	334
03-OB	Mutino	0.36	401
03-OC	Scolante1	0.31	144
03-OD	Apsa M. Feltria	0.26	271
03-OE	Scolante2	0.39	199
03-OF	Apsa San Donato	0.45	226
03-OG	Scolante3	0.36	130
03-OH	Apsa	0.38	218
03-OI	Foce	0.20	70

Cod.	Sottobacino	Area (km <sup>2</sup> )	Lunghezza asta principale (km)	CN	tc (h)
03-OA	Sorgente	100.4	18.0	76.8	5.9
03-OB	Mutino	52.8	16.9	73.8	4.0
03-OC	Scolante1	24.3	10.7	77.1	(3.9)
03-OD	Apsa di Macerata Feltria	50.6	13.9	77.7	3.6
03-OE	Scolante 2	79.3	18.8	73.6	(6.5)
03-OF	Apsa di San Donato	115.5	21.5	77.0	7.1
03-OG	Scolante 3	72.9	23.0	77.6	(7.9)
03-OH	Apsa di Urbino	107.6	21.9	77.0	7.0
03-OI	Foce	100.5	20.9	73.8	(12.0)

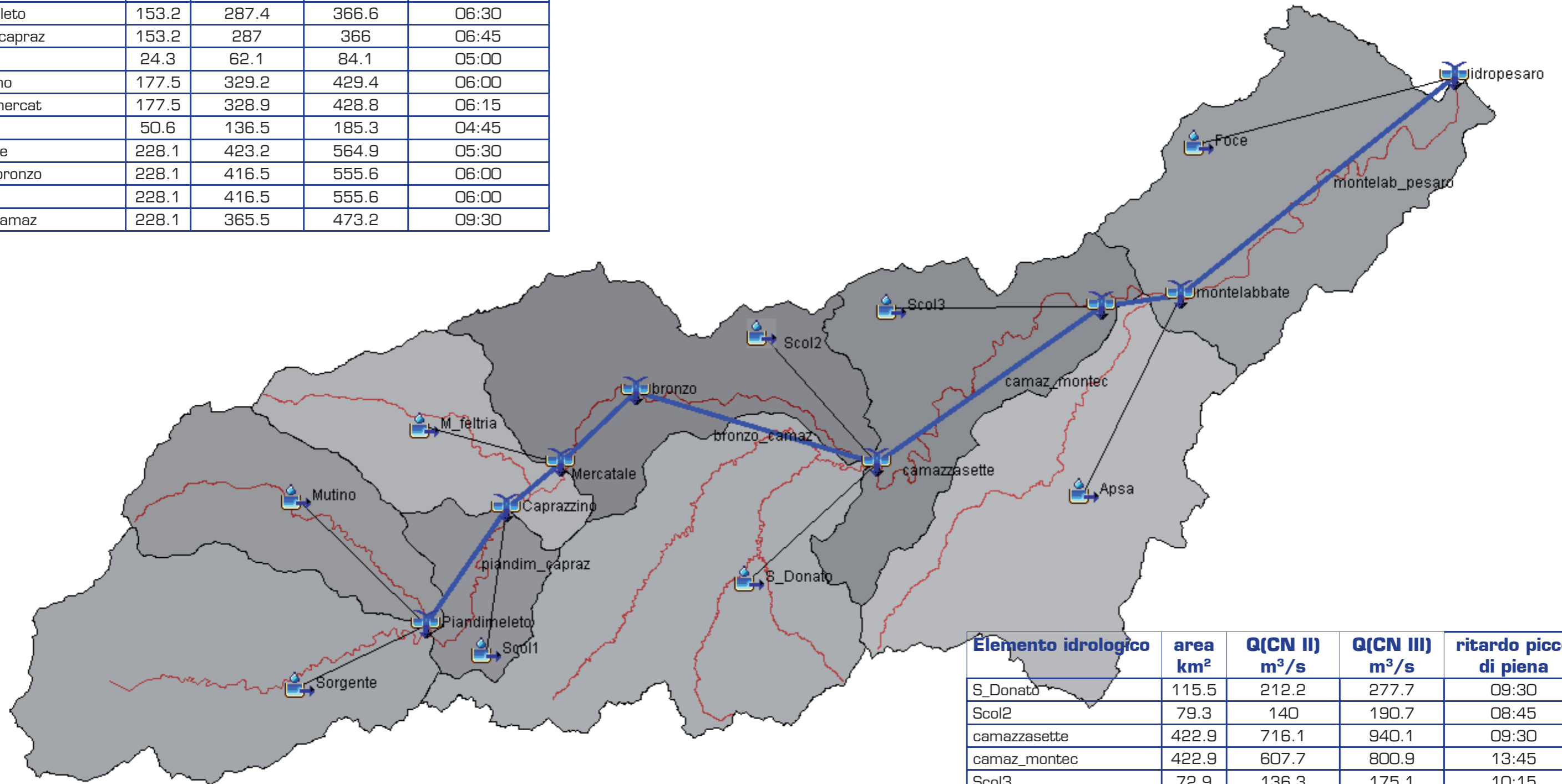


1:150.000

Schematizzazione della rete drenante e portate attese con  $T_r=200$  anni

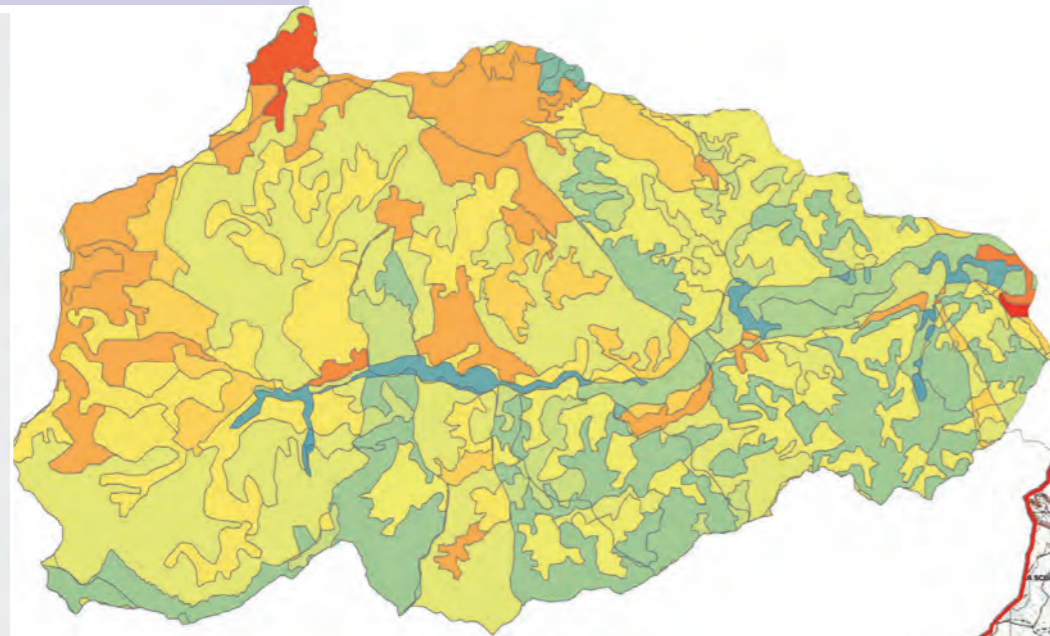
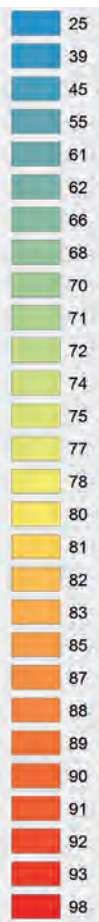
Elemento idrologico	area km <sup>2</sup>	Q(CN II) m <sup>3</sup> /s	Q(CN III) m <sup>3</sup> /s	ritardo picco di piena
Sorgente	100.4	221.3	264.5	07:45
Mutino	52.8	131.3	182.1	05:15
Piandimeleto	153.2	287.4	366.6	06:30
piandim_capraz	153.2	287	366	06:45
Scol1	24.3	62.1	84.1	05:00
Caprazzino	177.5	329.2	429.4	06:00
capraz_mercat	177.5	328.9	428.8	06:15
M_feltria	50.6	136.5	185.3	04:45
Mercatale	228.1	423.2	564.9	05:30
mercat_bronzo	228.1	416.5	555.6	06:00
bronzo	228.1	416.5	555.6	06:00
bronzo_camaz	228.1	365.5	473.2	09:30

1:150.000

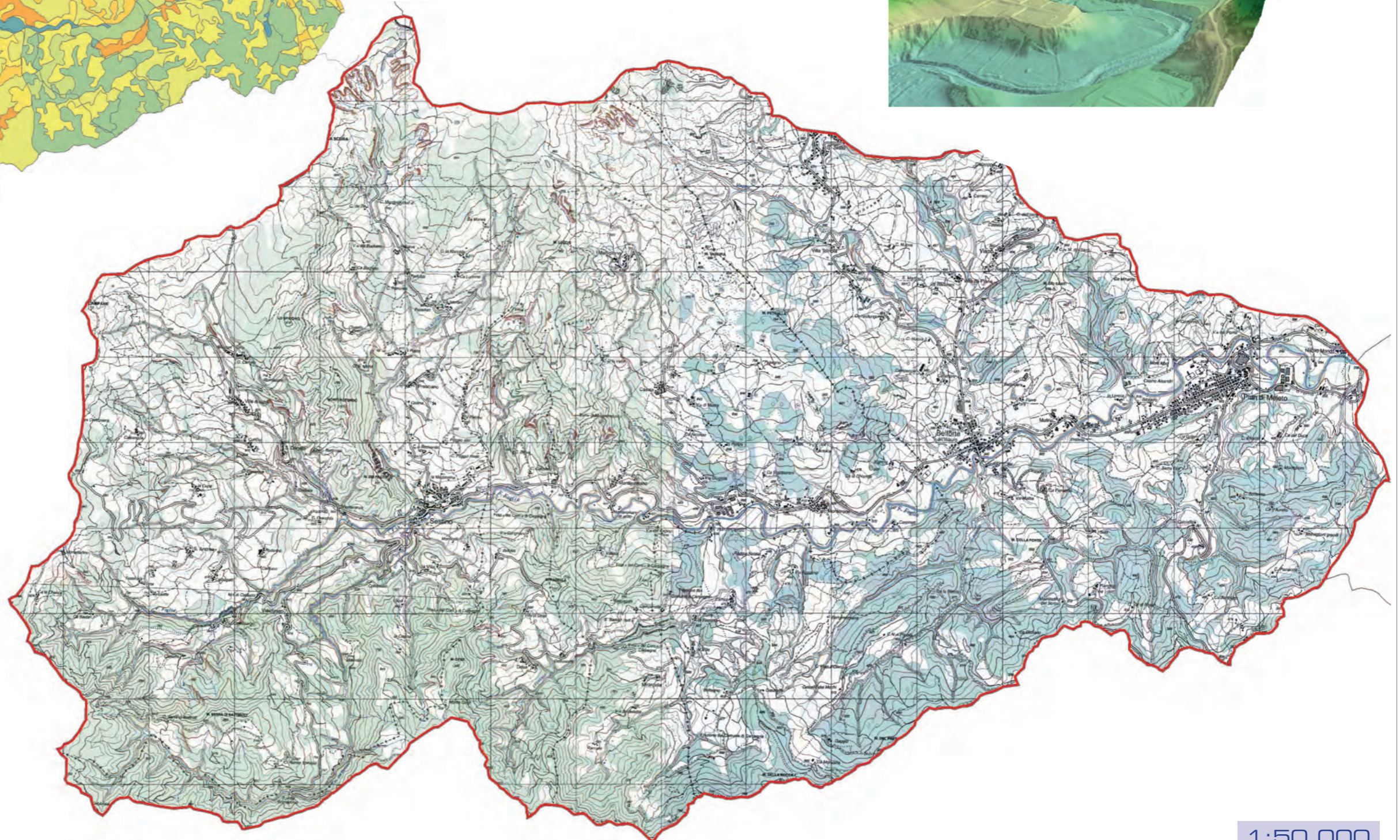
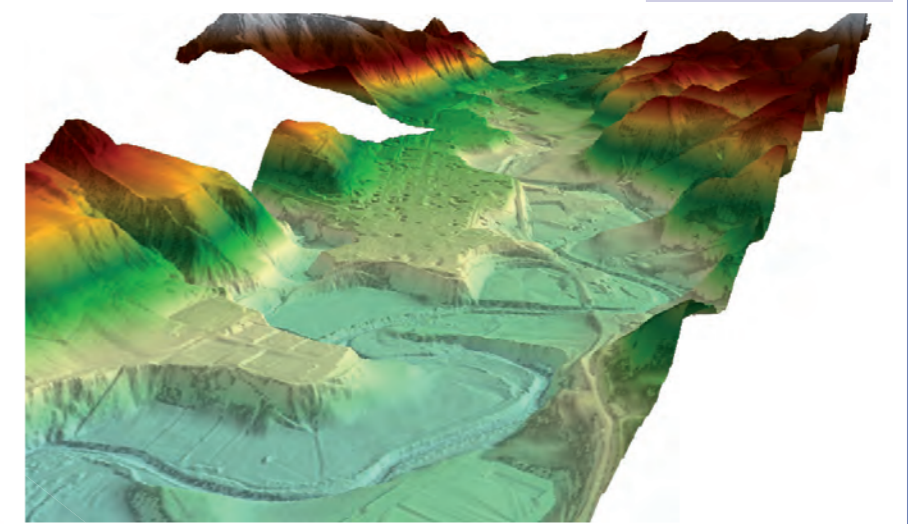


Elemento idrologico	area km <sup>2</sup>	Q(CN II) m <sup>3</sup> /s	Q(CN III) m <sup>3</sup> /s	ritardo picco di piena
S_Donato	115.5	212.2	277.7	09:30
Scol2	79.3	140	190.7	08:45
camazzasette	422.9	716.1	940.1	09:30
camaz_montec	422.9	607.7	800.9	13:45
Scol3	72.9	136.3	175.1	10:15
montecchio	495.8	719.6	944.9	13:15
montec_montelab	495.8	712.4	935.4	14:15
Apsa	107.6	210.6	274.2	09:15
montelabbate	603.4	790.7	1042.1	12:30
montelab_pesaro	603.4	757.8	998.1	15:00
Foce	100.5	138.9	180.5	15:45
idropesaro	703.9	895.4	1177.6	15:30

Valore dell'SCS-CN

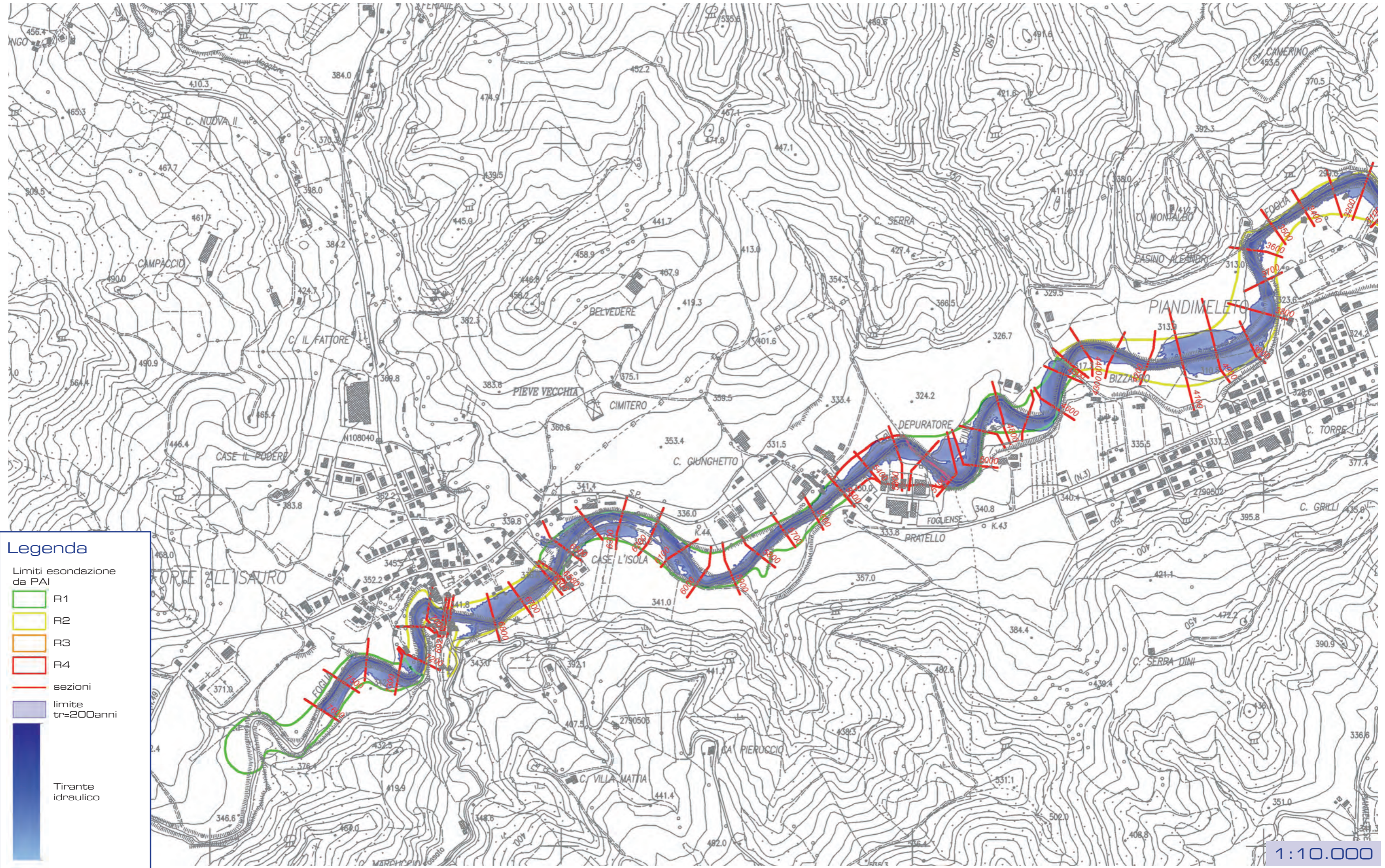


Vista 3D



<b>Cod.</b>	03-0A
<b>Sottobacino</b>	Sorgente
<b>Area (km<sup>2</sup>)</b>	100.4
<b>L. asta (km)</b>	18.0
<b>CN</b>	76.8
<b>tc (h)</b>	5.9
<b>lag time (')</b>	212
<b>la (mm)</b>	7.7
<b>pendenza versanti</b>	12.1
<b>pendenza asta</b>	0.013

1:50.000



**Legenda**

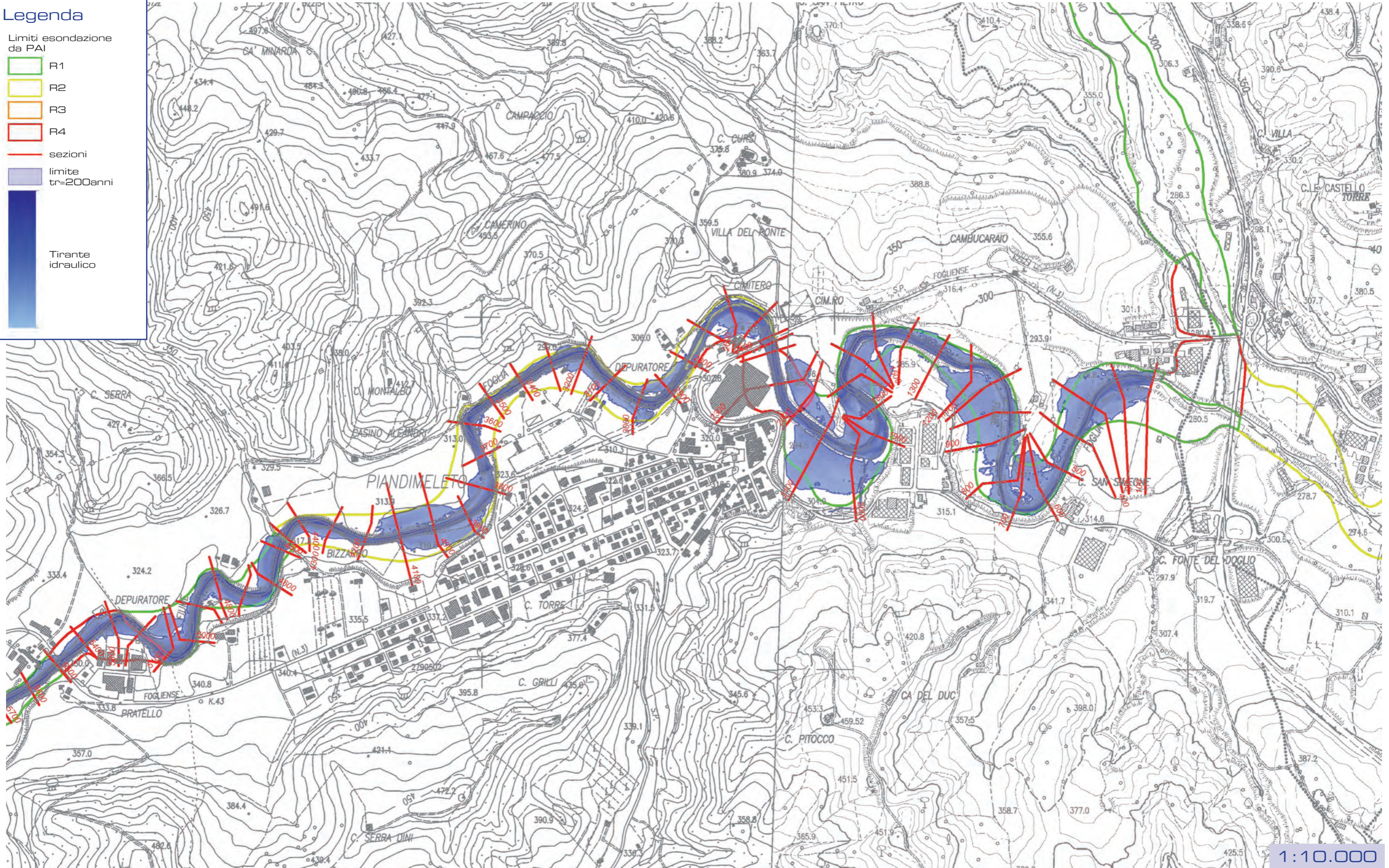
Limiti esondazione da PAI

- R1
- R2
- R3
- R4

— sezioni

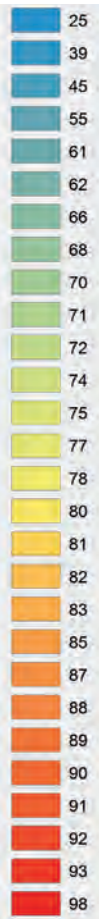
limite tr=200anni

Tirante idraulico

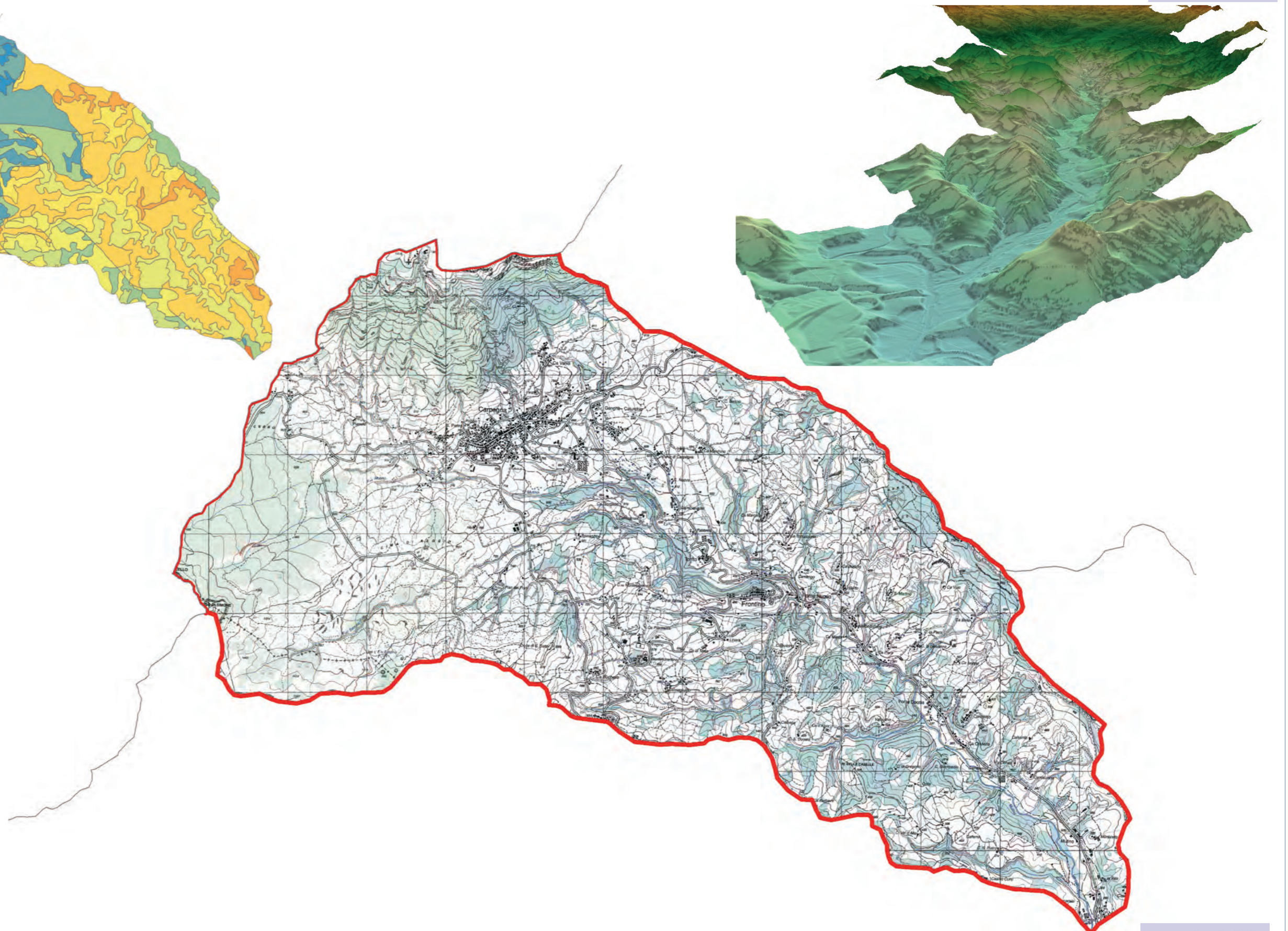


1:10.000

Valore dell'SCS-CN



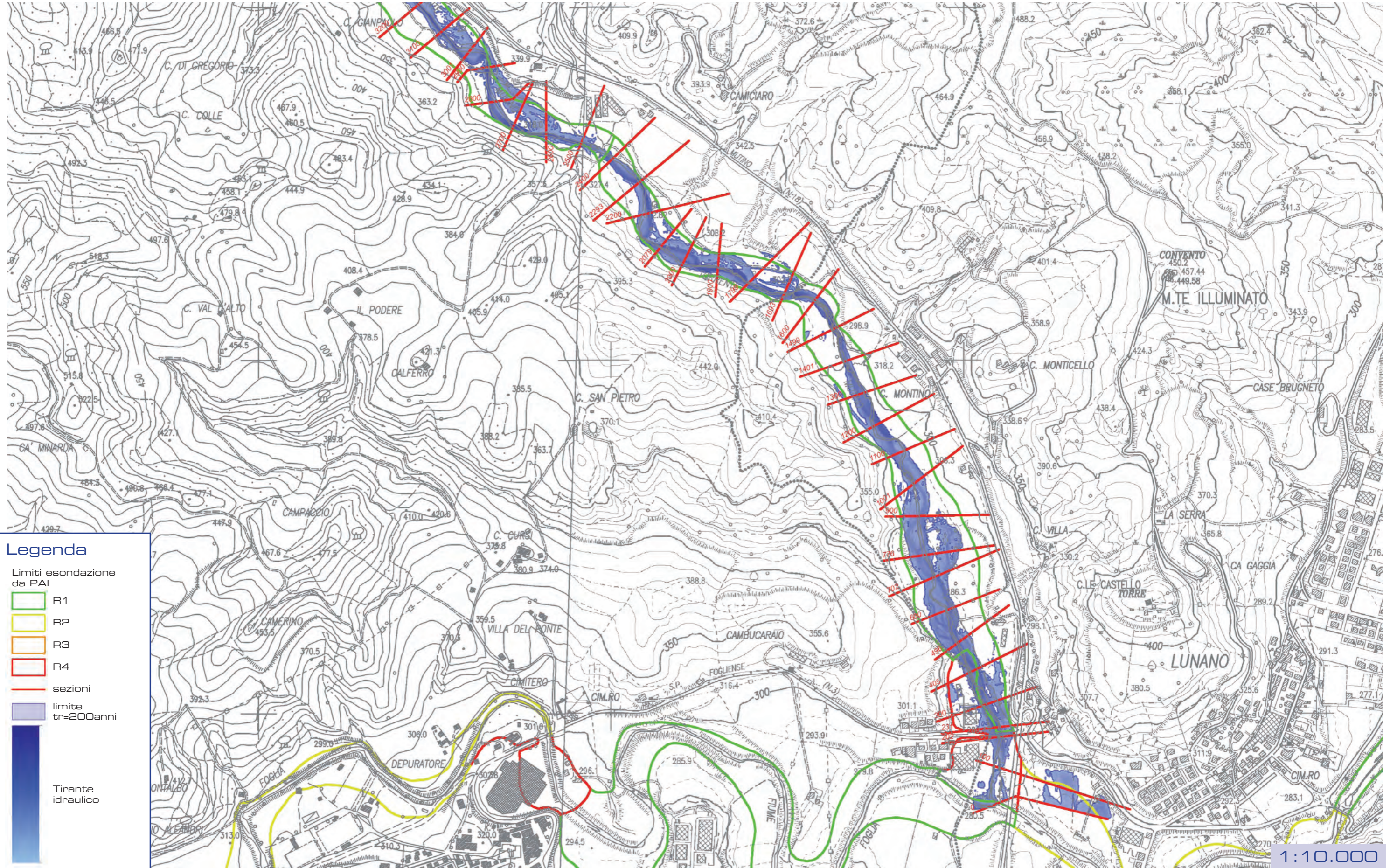
Vista 3D



<b>Cod.</b>	03-0B
<b>Sottobacino</b>	Mutino
<b>Area (km<sup>2</sup>)</b>	52.8
<b>L. asta (km)</b>	16.9
<b>CN</b>	73.8
<b>tc (h)</b>	4.0
<b>lag time (')</b>	144
<b>la (mm)</b>	9.0
<b>pendenza versanti</b>	10.4
<b>pendenza asta</b>	0.043

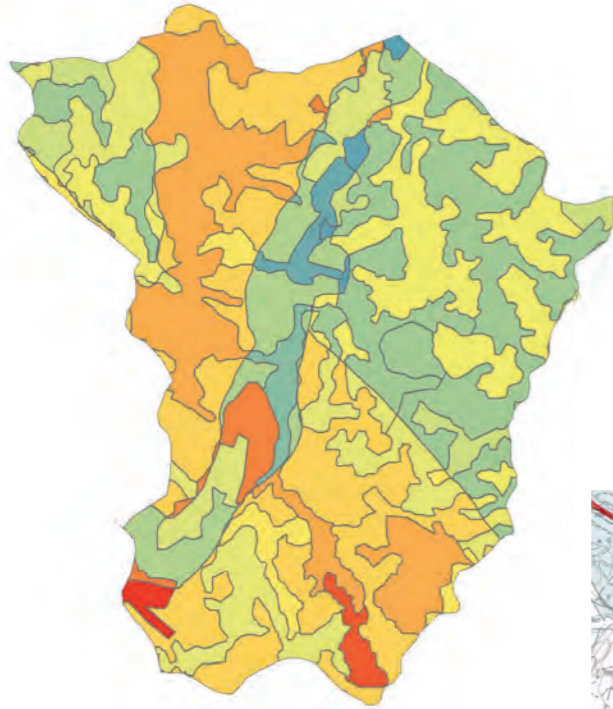
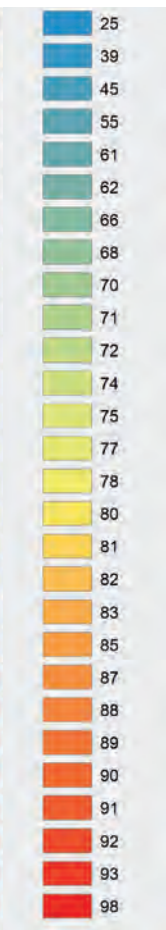
1:50.000



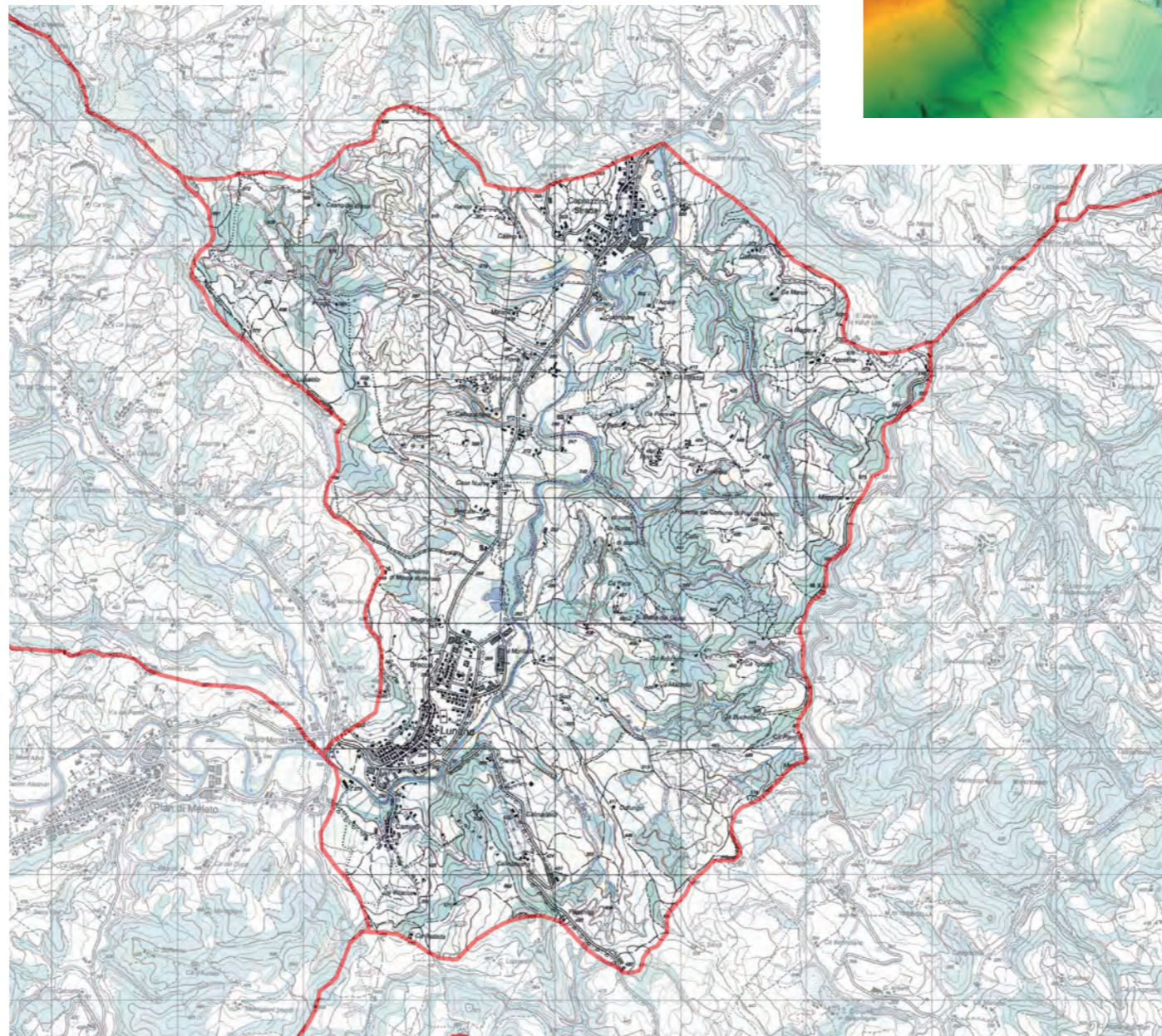
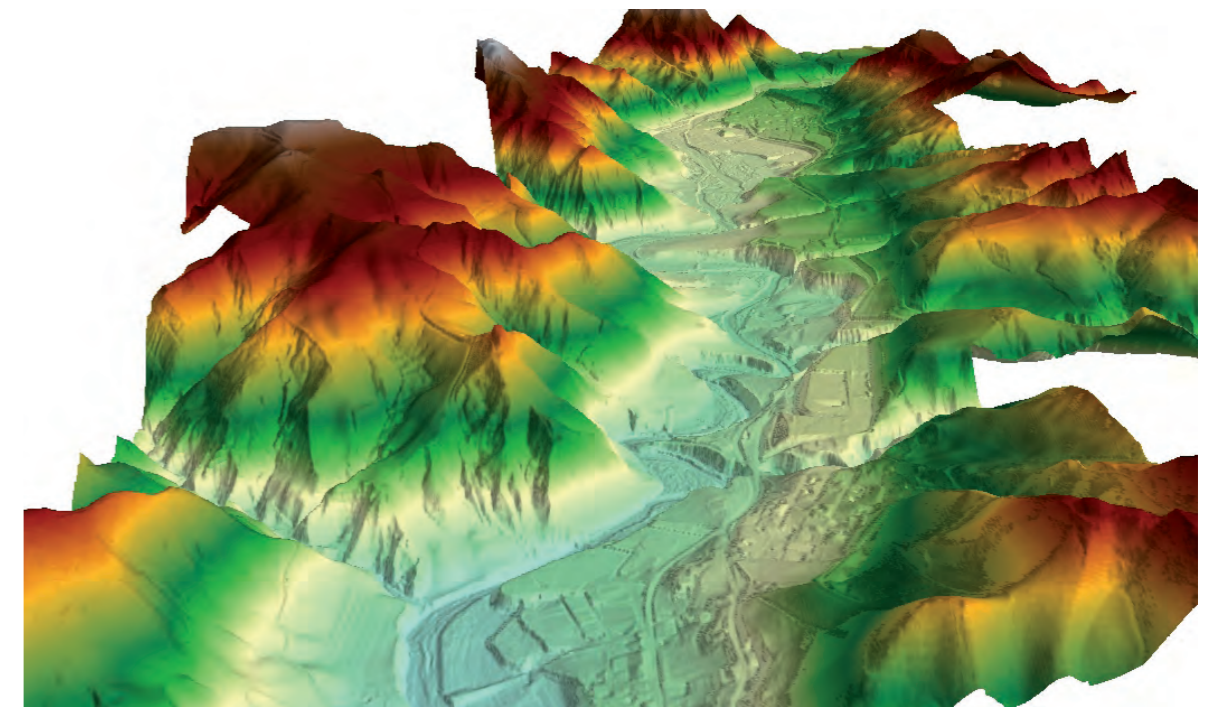


1:10.000

Valore dell'SCS-CN

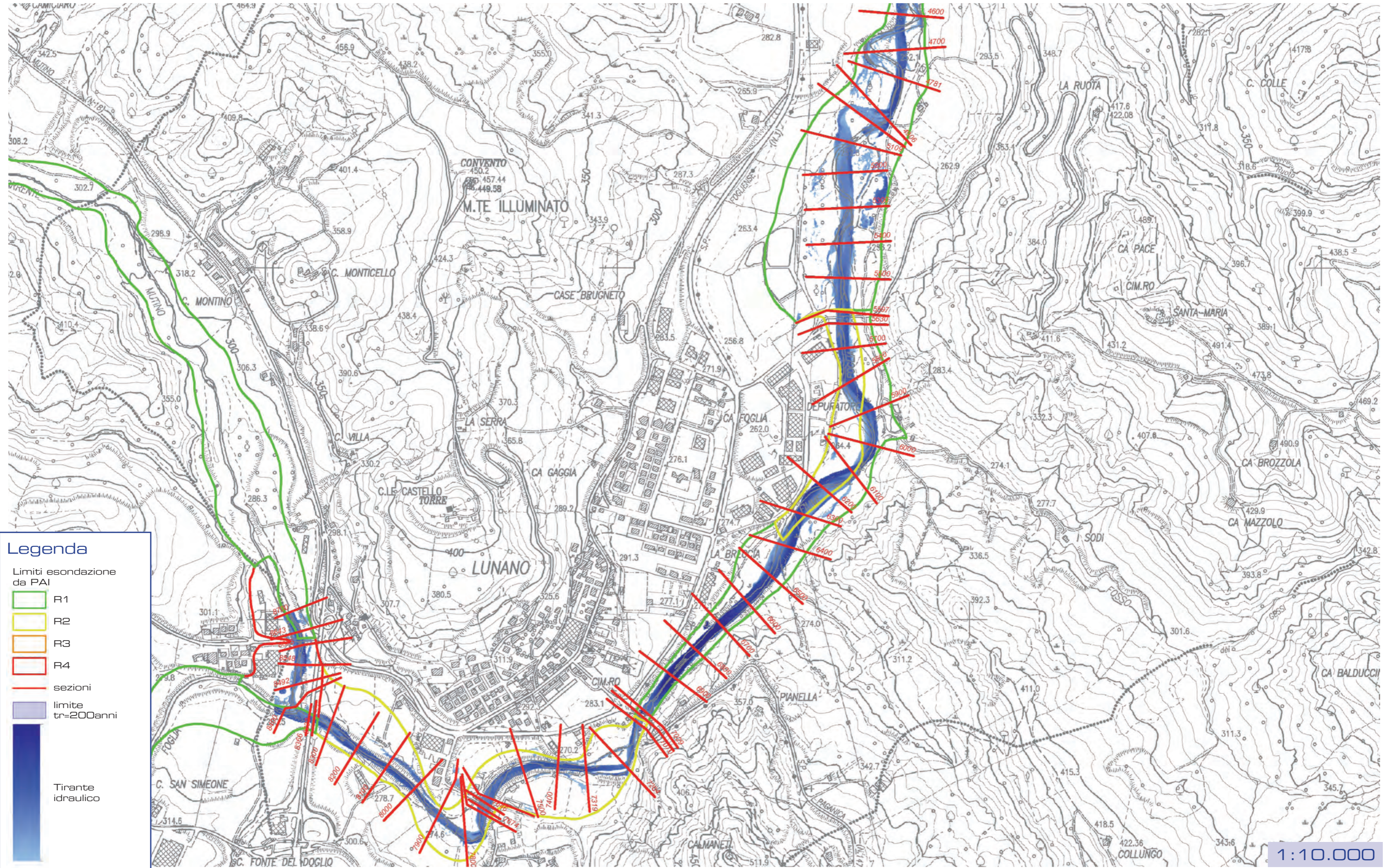


Vista 3D

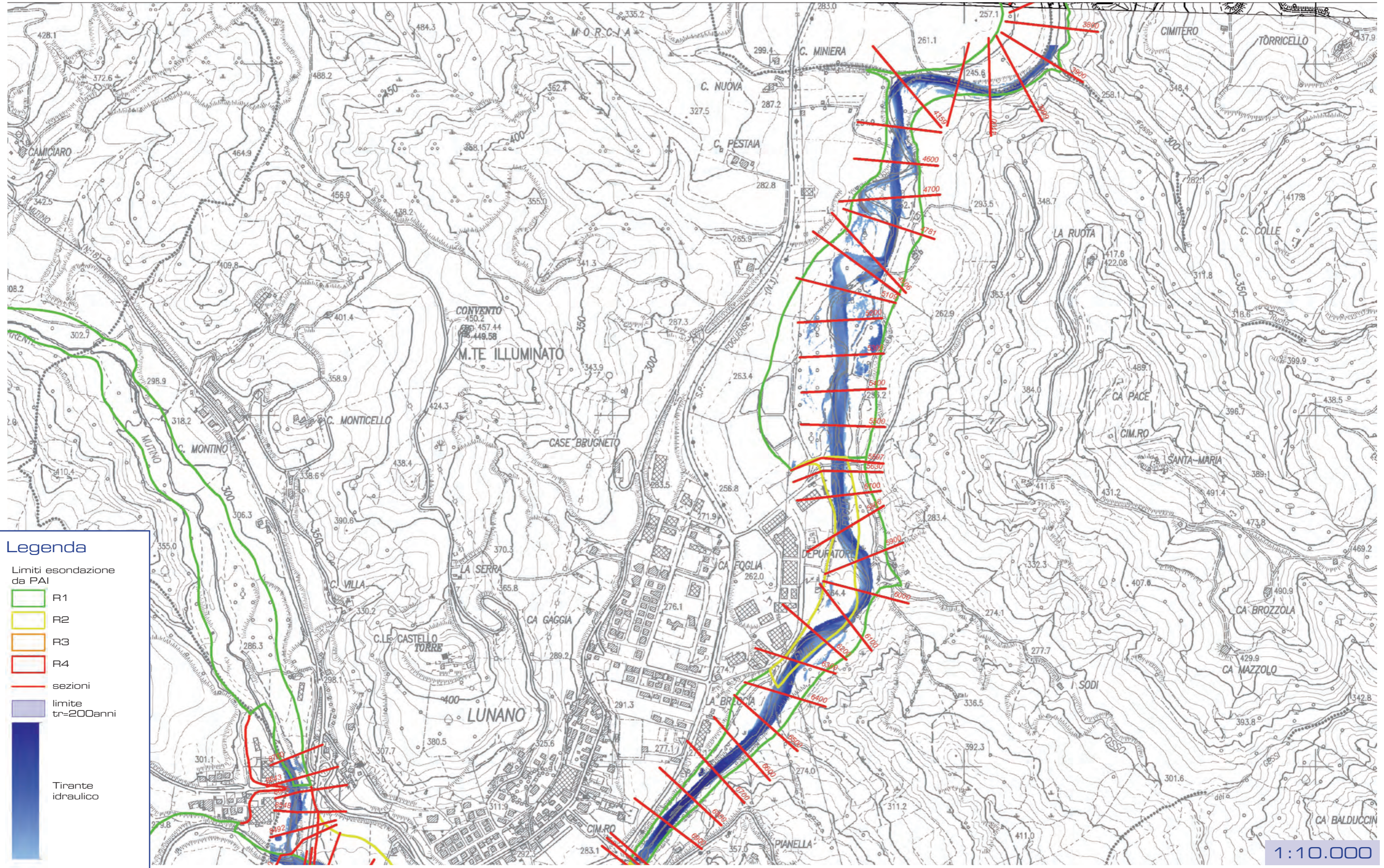


<b>Cod.</b>	03-0C
<b>Sottobacino</b>	Scolante1
<b>Area (km<sup>2</sup>)</b>	24.3
<b>L. asta (km)</b>	10.7
<b>CN</b>	77.1
<b>tc (h)</b>	3.9*
<b>lag time (')</b>	140
<b>la (mm)</b>	7.5
<b>pendenza versanti</b>	12.2
<b>pendenza asta</b>	0.010

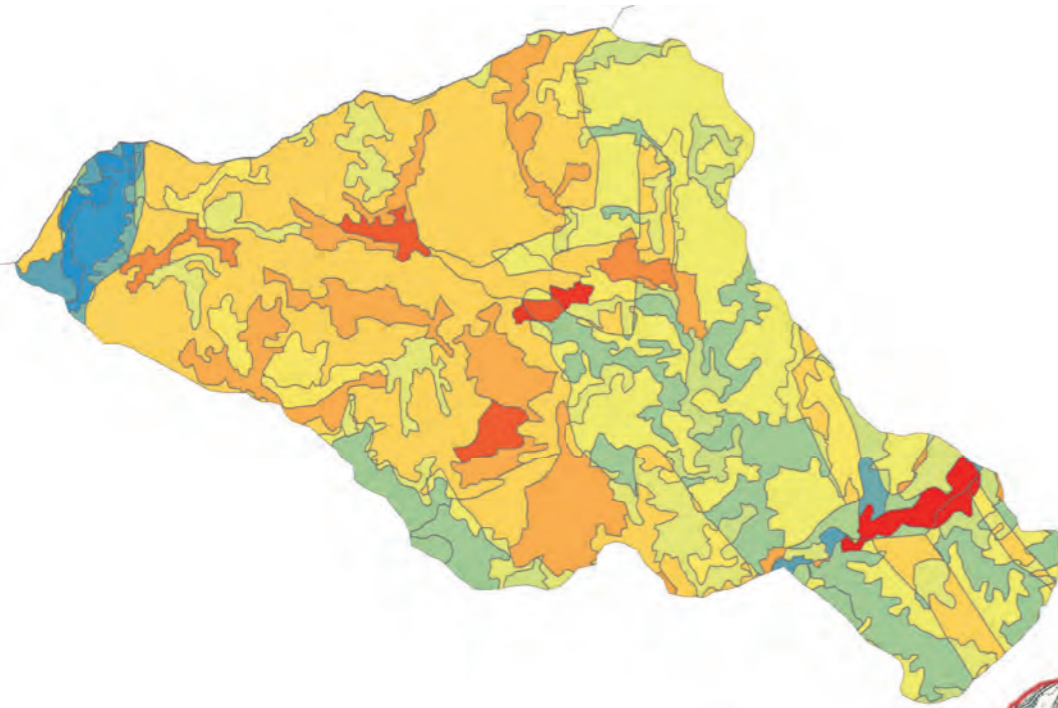
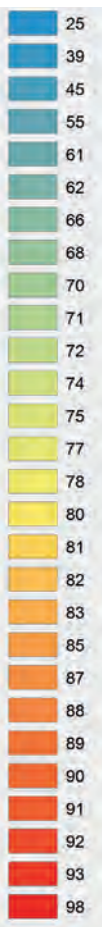
1:50.000



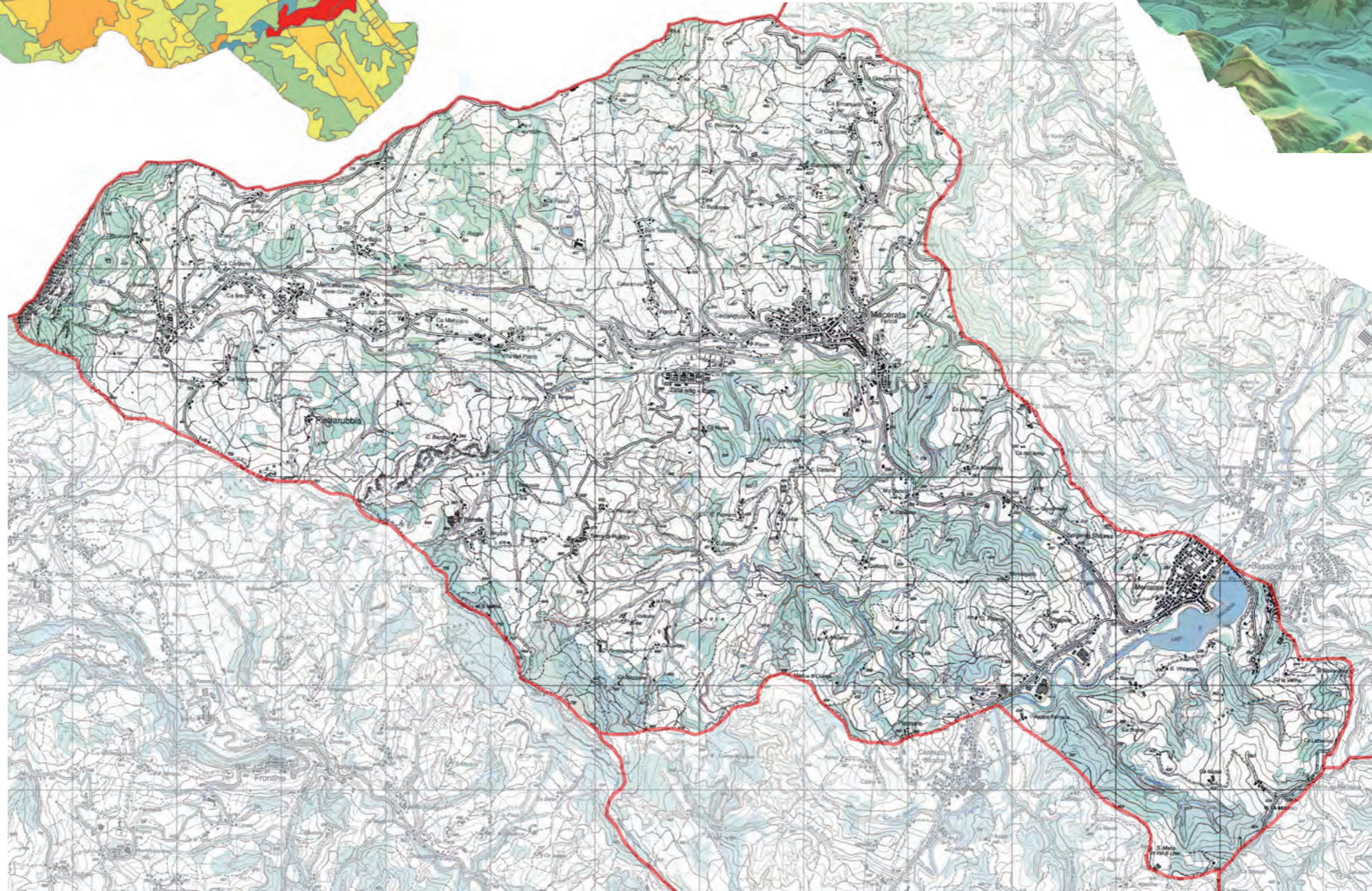
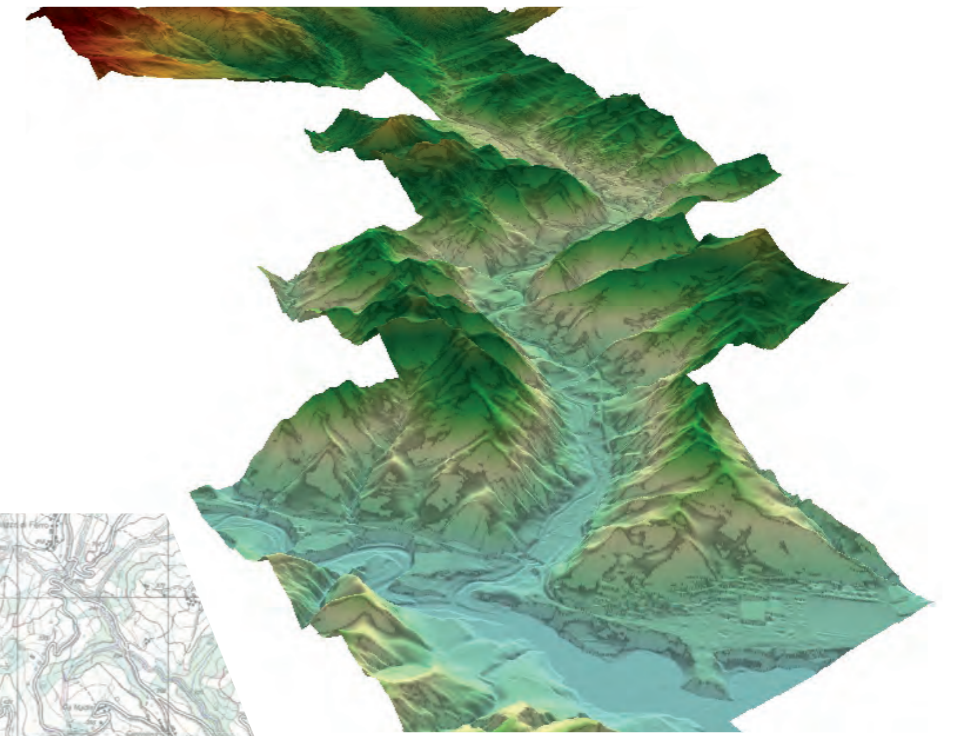
1:10.000



Valore dell'SCS-CN

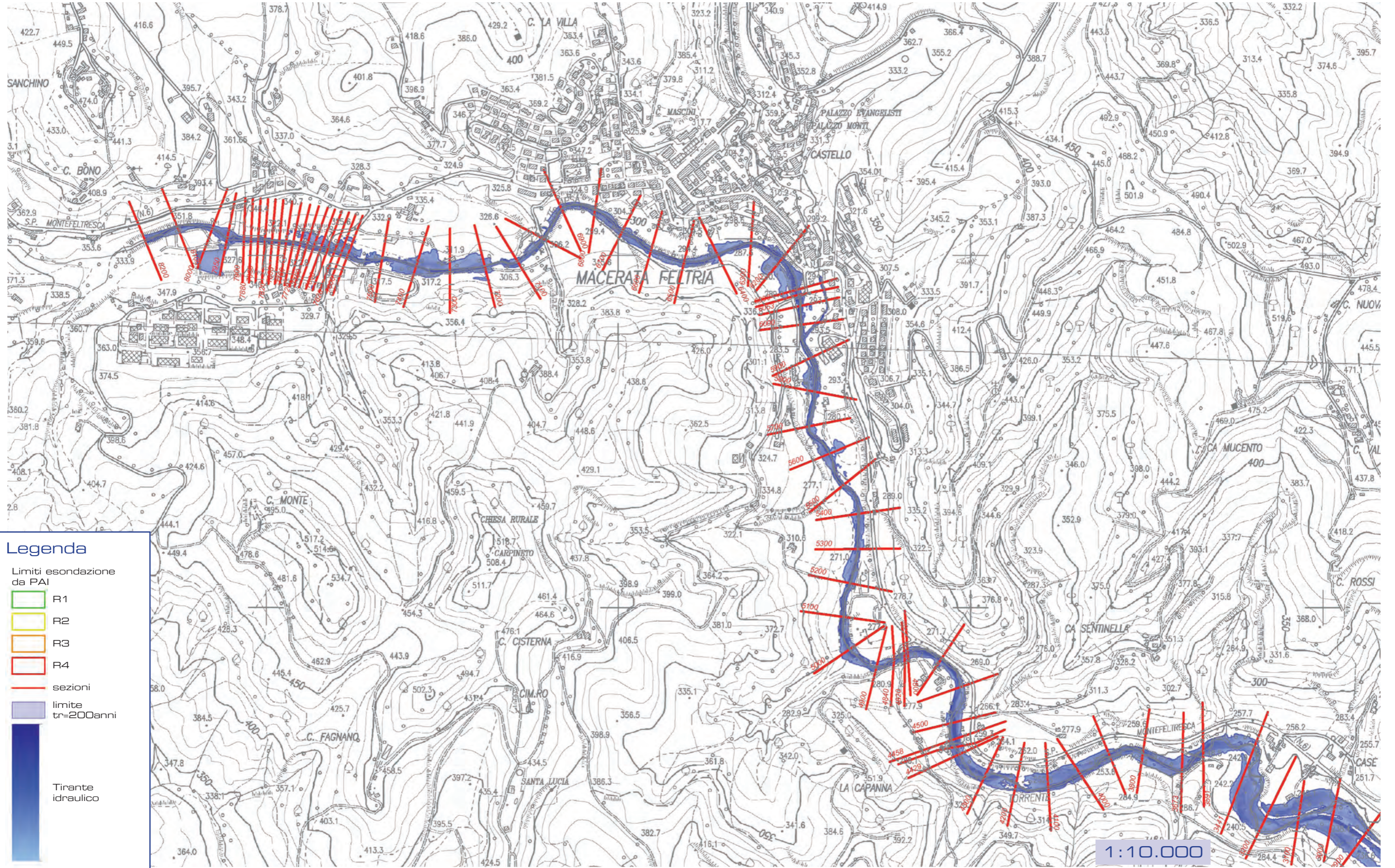


Vista 3D

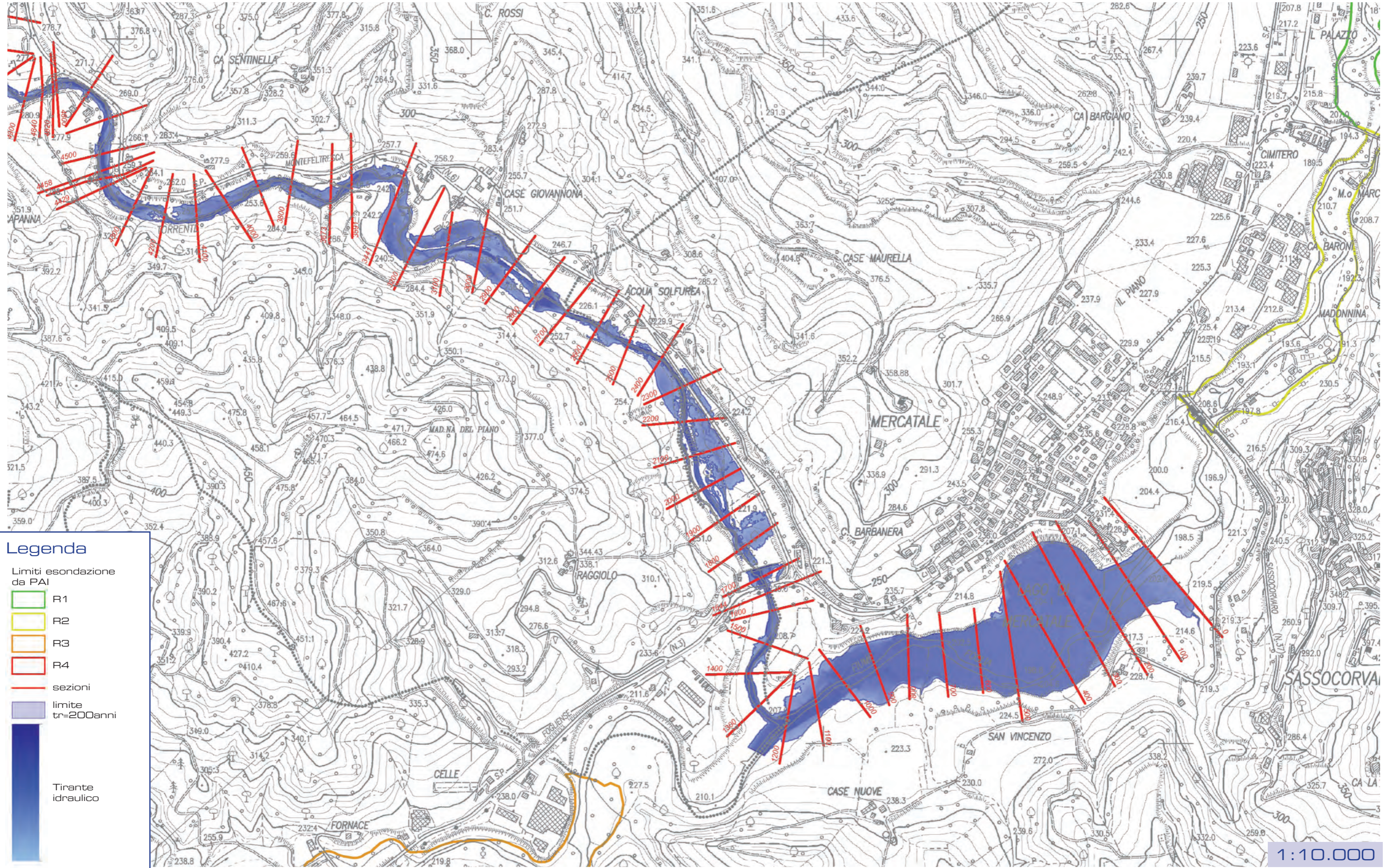


<b>Cod.</b>	03-0D
<b>Sottobacino</b>	Apsa di M.Feltria
<b>Area (km<sup>2</sup>)</b>	50.6
<b>L. asta (km)</b>	13.9
<b>CN</b>	77.7
<b>tc (h)</b>	3.6
<b>lag time (')</b>	130
<b>la (mm)</b>	7.3
<b>pendenza versanti</b>	11.7
<b>pendenza asta</b>	0.045

1:50.000



1:10.000

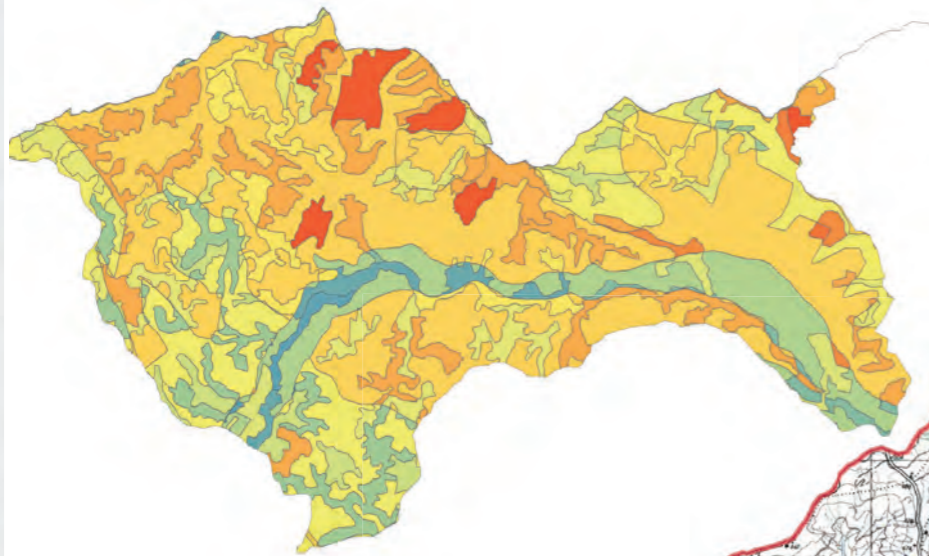
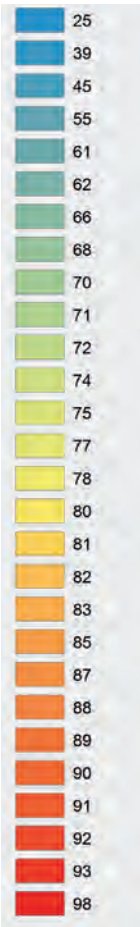


**Legenda**

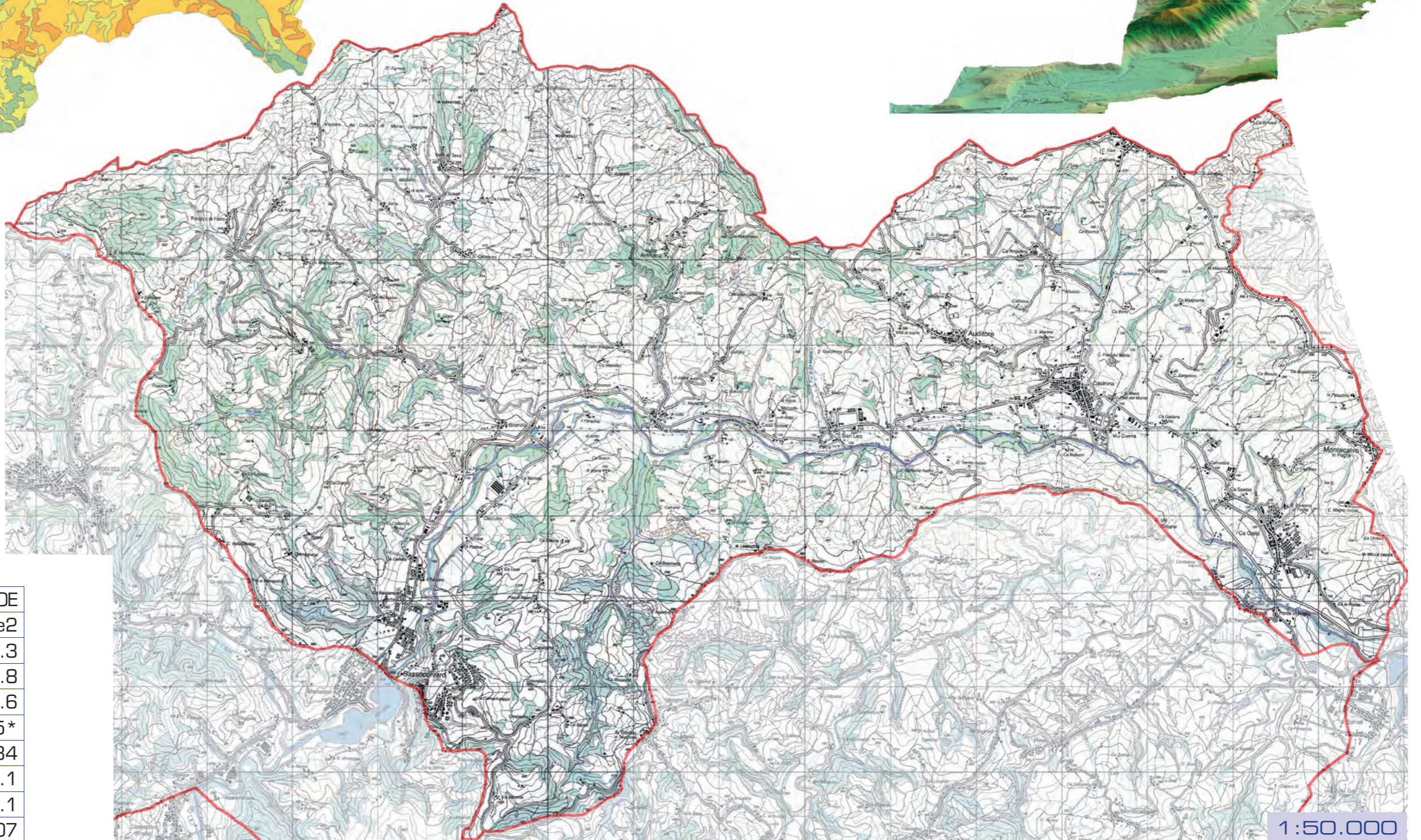
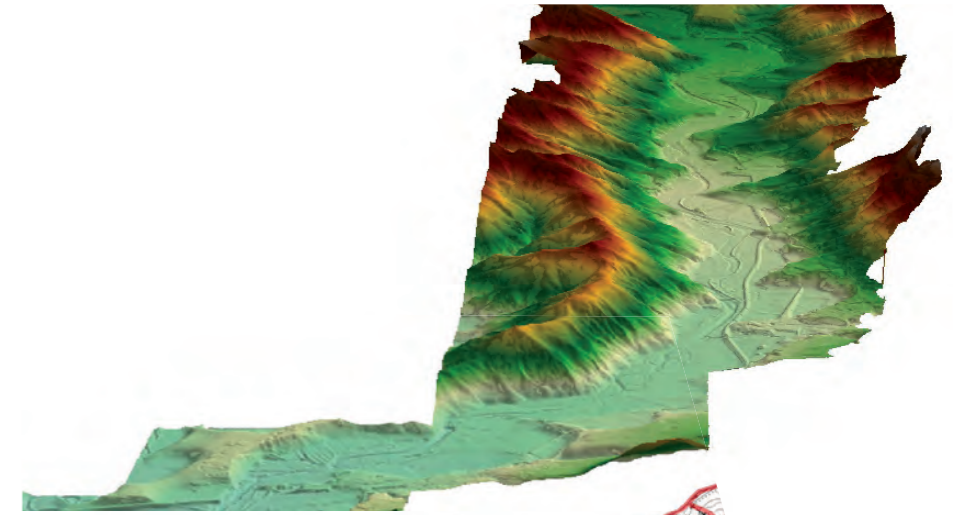
- Limiti esondazione da PAI
- R1
- R2
- R3
- R4
- sezioni
- limite tr=200anni
- Tirante idraulico

1:10.000

Valore dell'SCS-CN

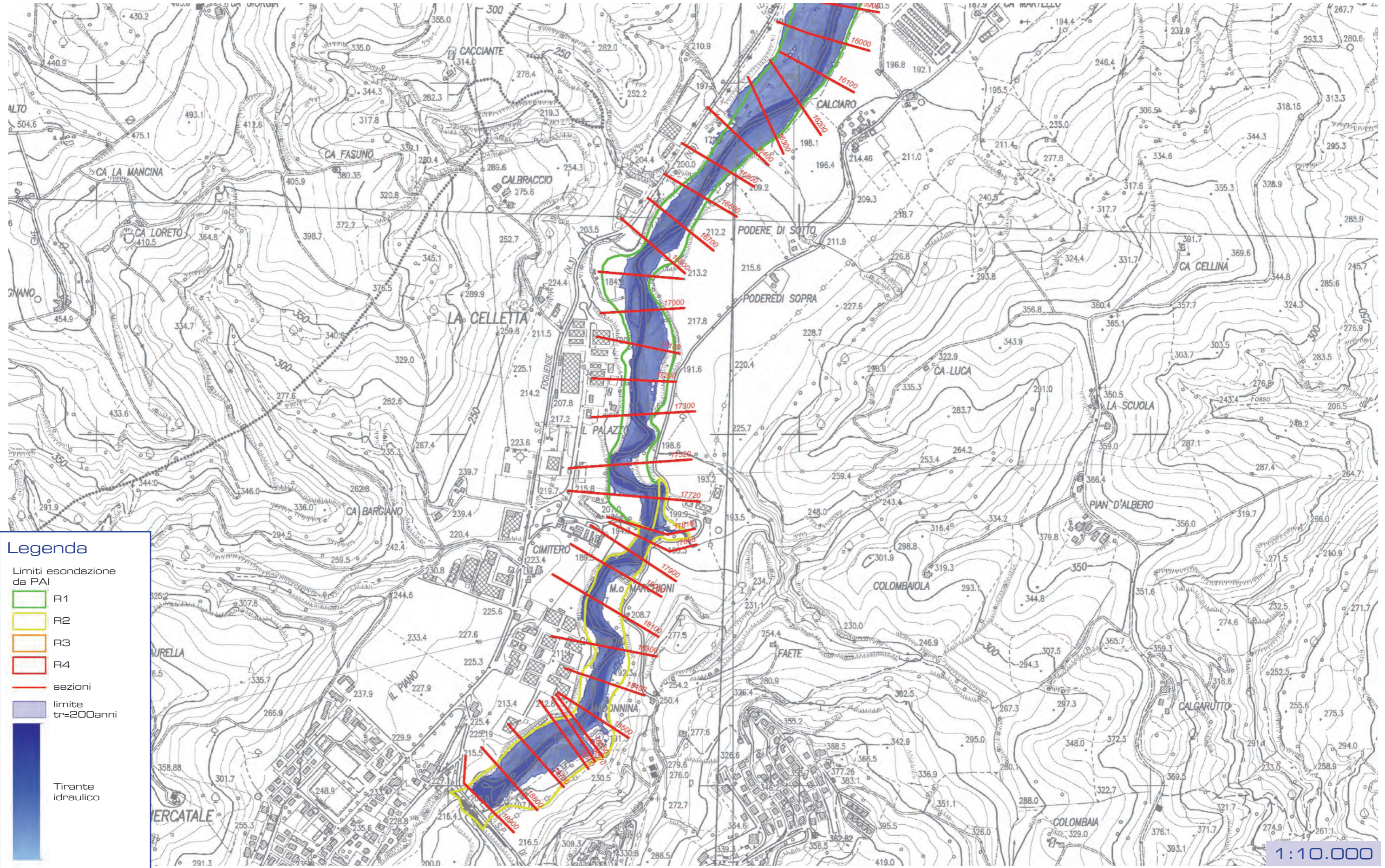


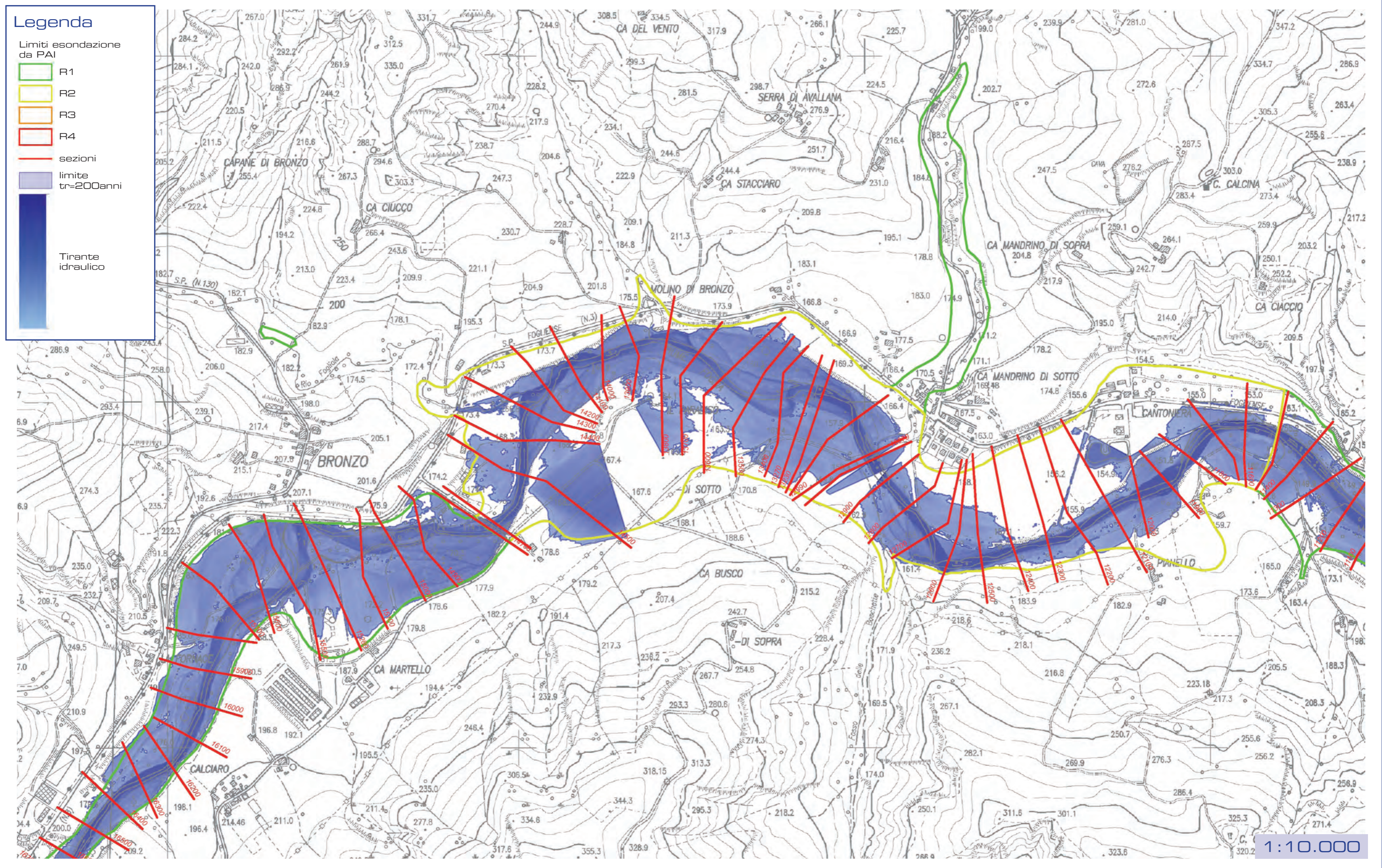
Vista 3D

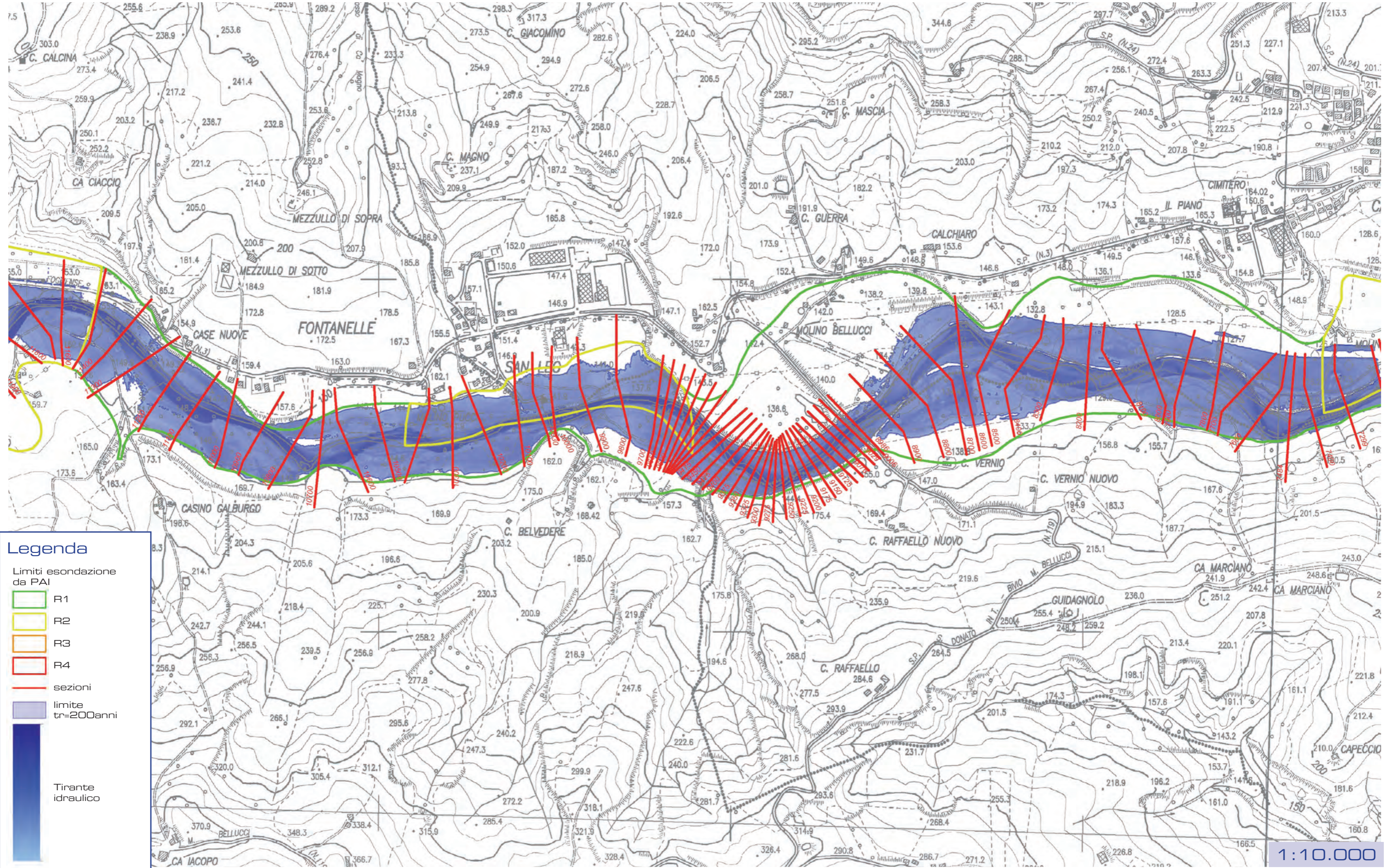


<b>Cod.</b>	03-0E
<b>Sottobacino</b>	Scolante2
<b>Area (km<sup>2</sup>)</b>	79.3
<b>L. asta (km)</b>	18.8
<b>CN</b>	73.6
<b>tc (h)</b>	6.5*
<b>lag time (')</b>	234
<b>la (mm)</b>	9.1
<b>pendenza versanti</b>	8.1
<b>pendenza asta</b>	0.007

1:50.000



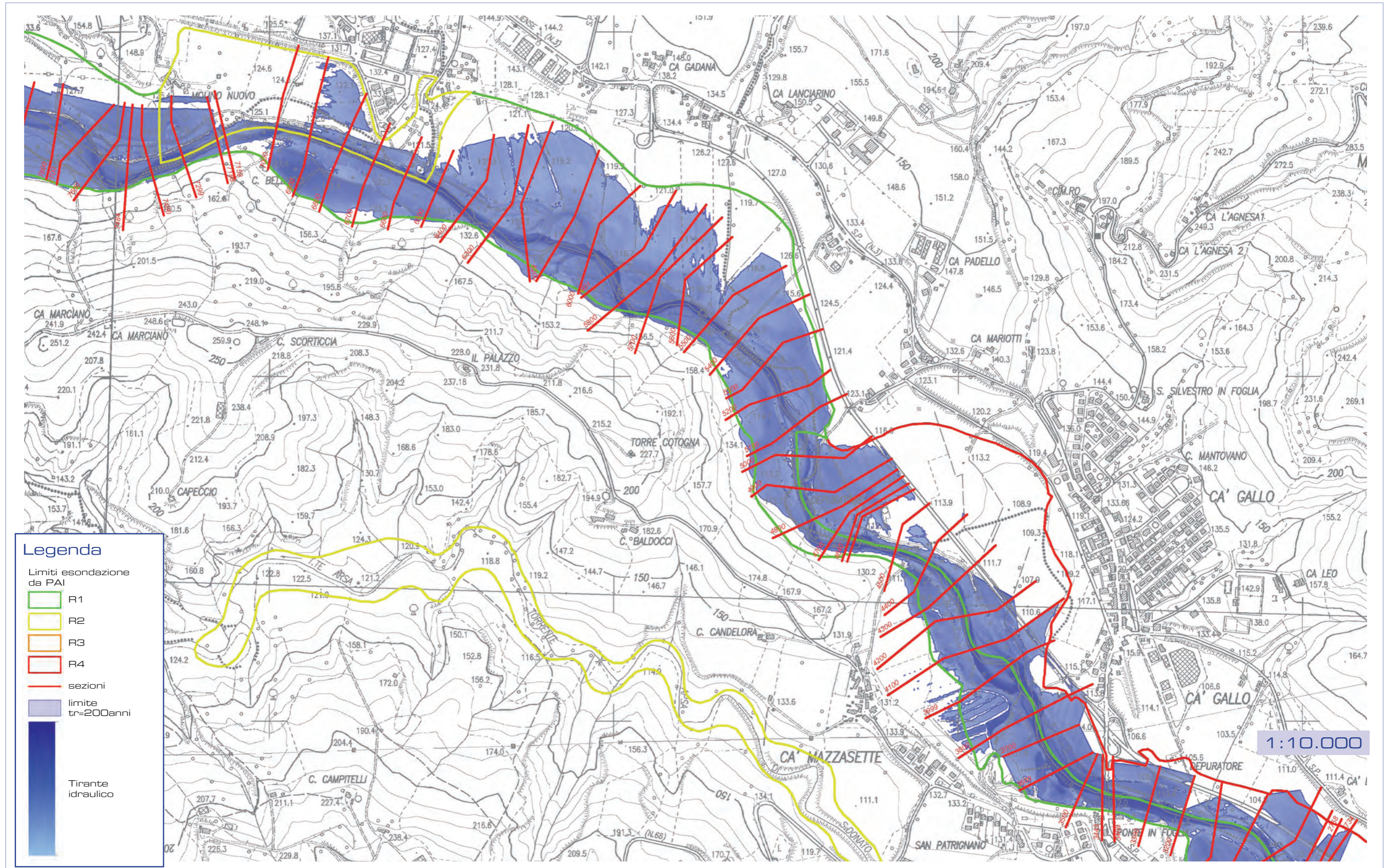


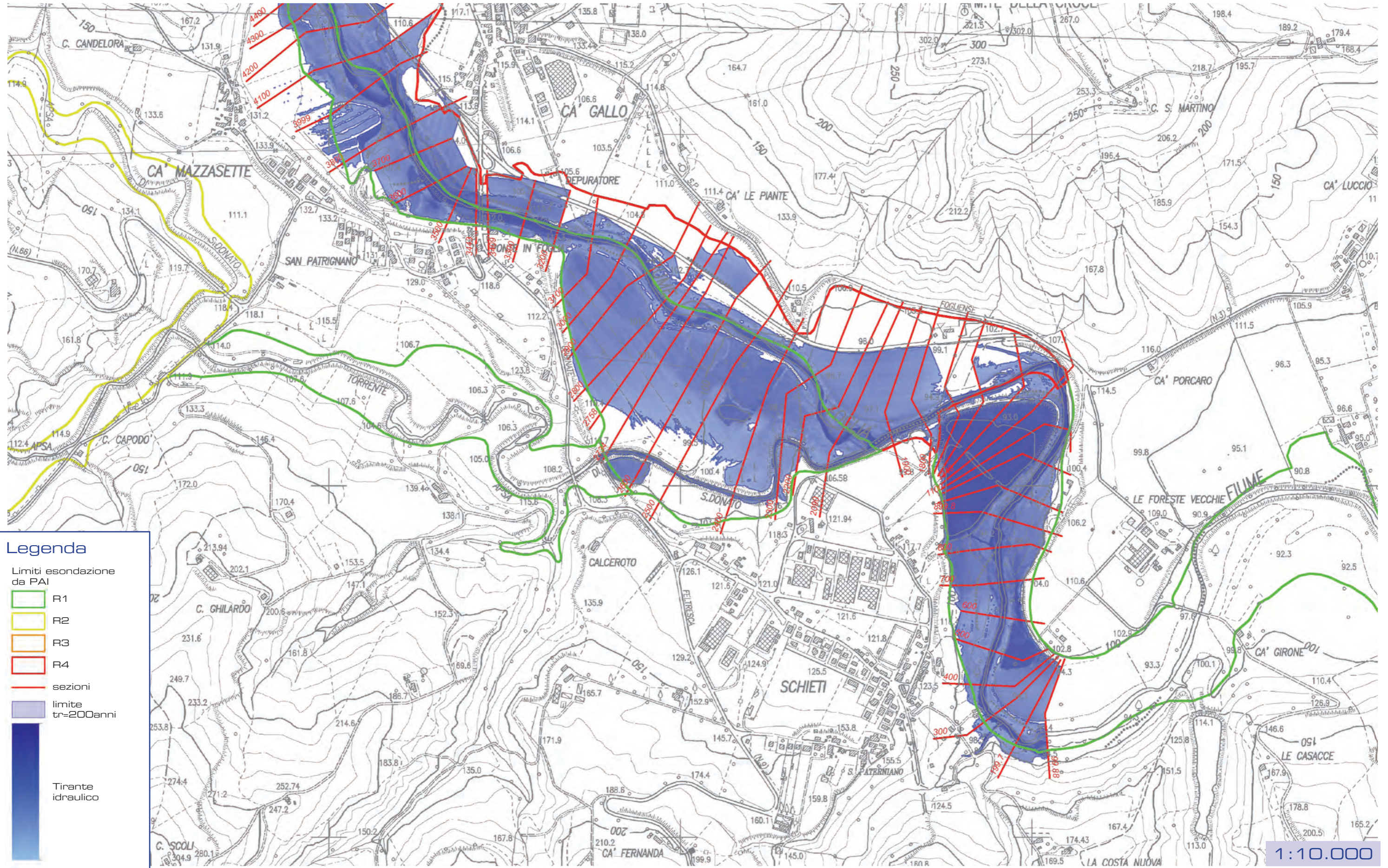


**Legenda**

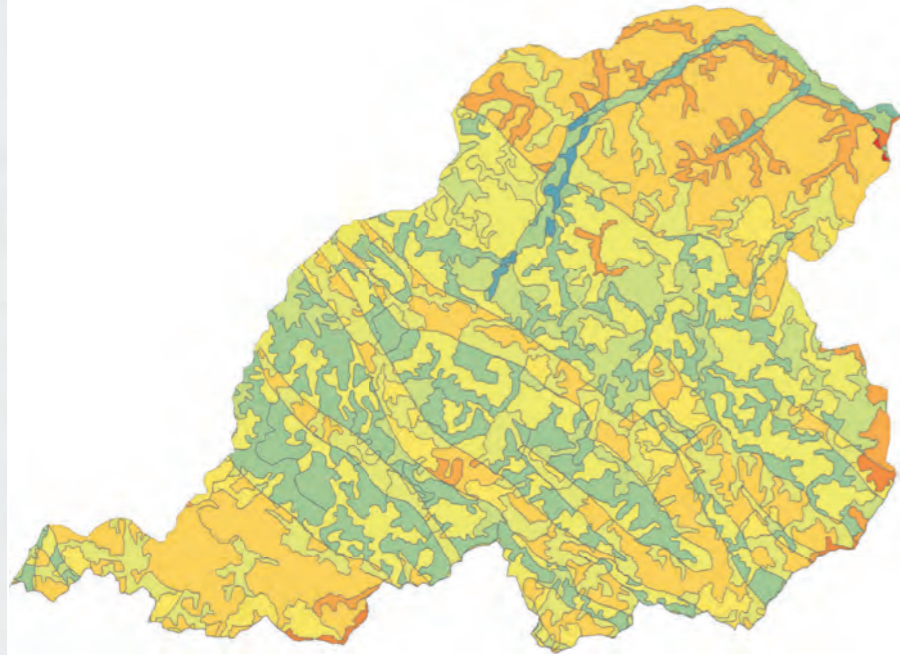
- R1
- R2
- R3
- R4
- sezioni
- limite tr=200anni
- Tirante idraulico

1:10.000

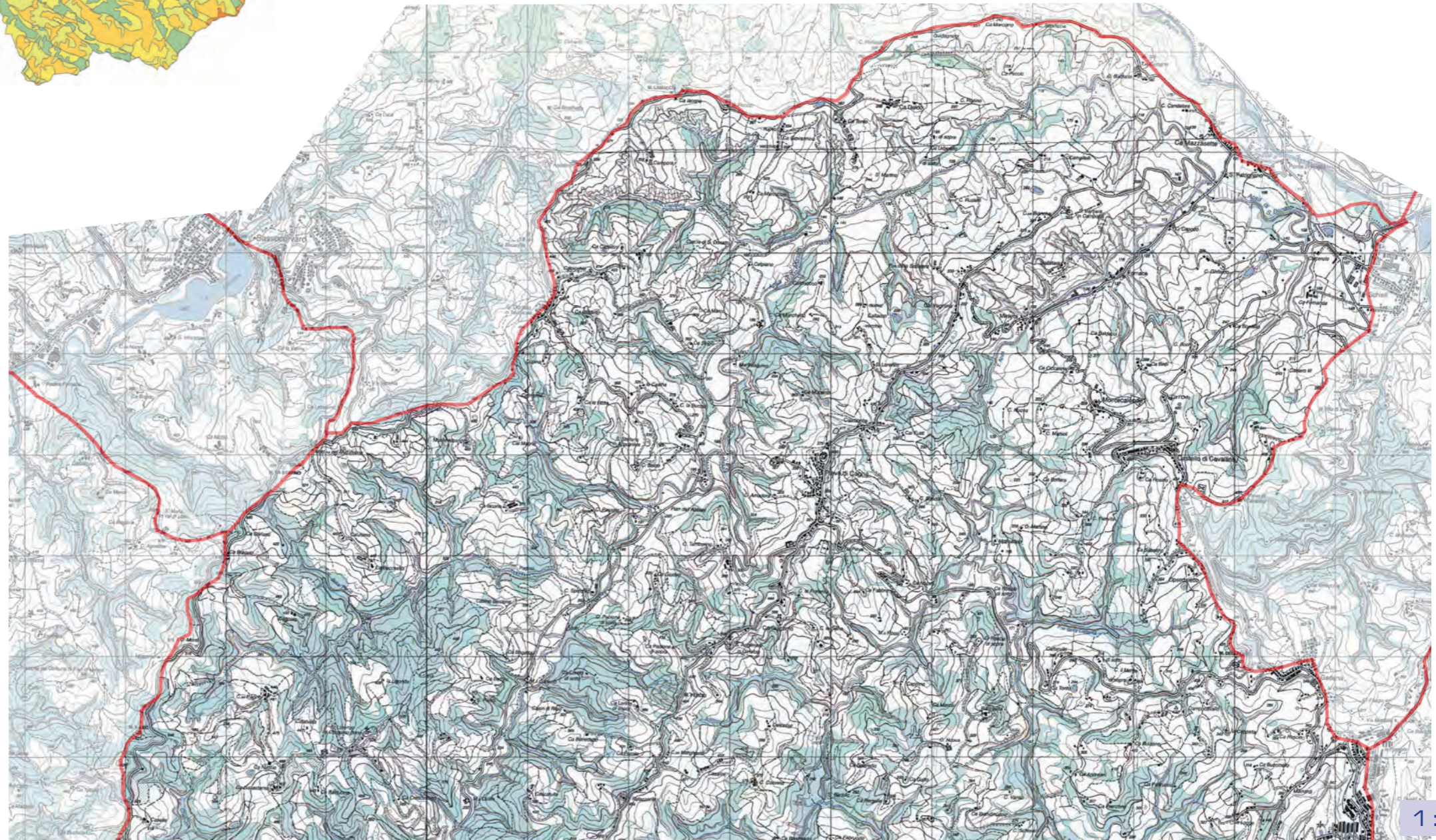
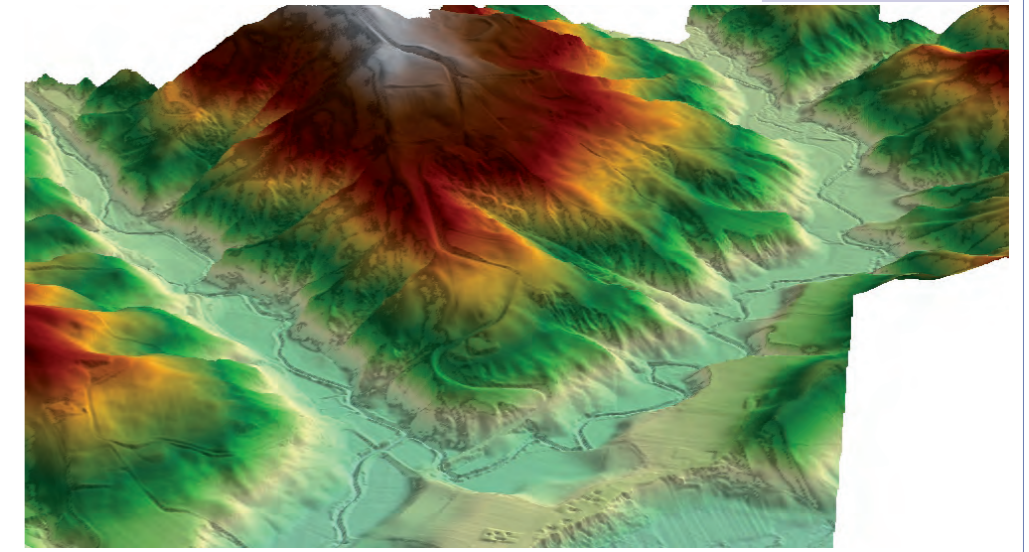




Valore dell'SCS-CN

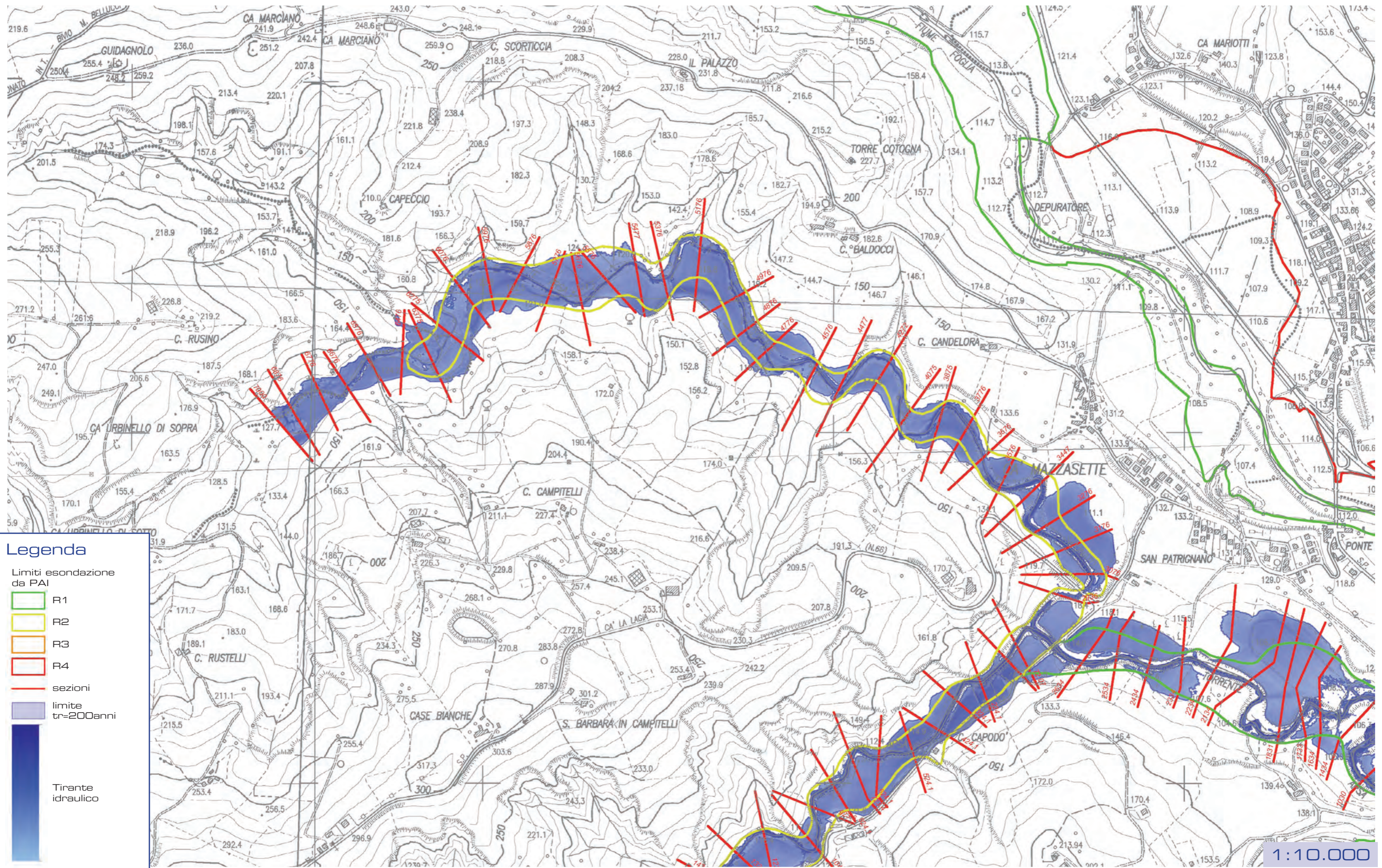


Vista 3D

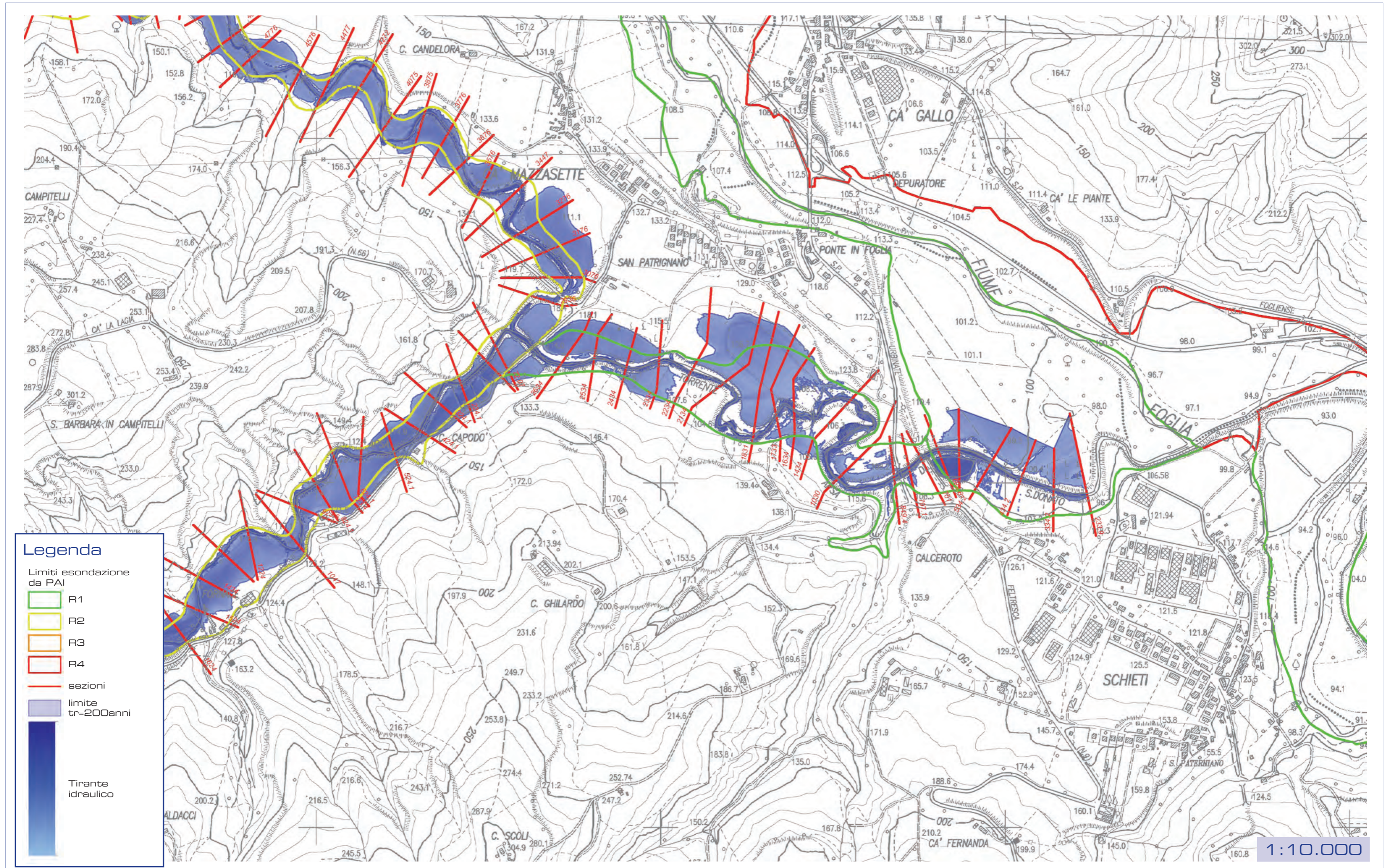


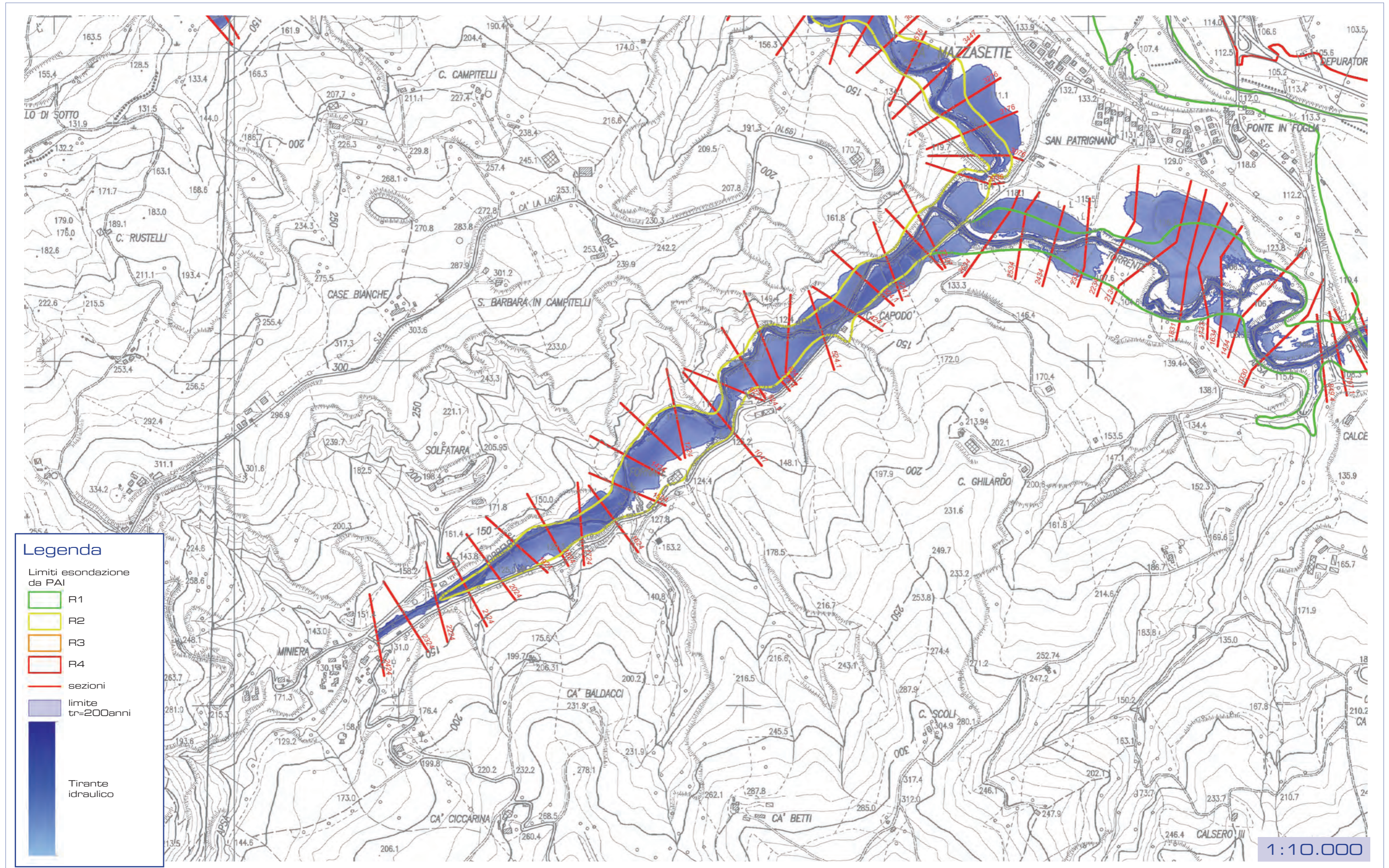
<b>Cod.</b>	03-OF
<b>Sottobacino</b>	Apsa di S. Donato
<b>Area (km<sup>2</sup>)</b>	115.5
<b>L. asta (km)</b>	21.5
<b>CN</b>	77.0
<b>tc (h)</b>	7.1
<b>lag time (')</b>	256
<b>la (mm)</b>	7.6
<b>pendenza versanti</b>	12.6
<b>pendenza asta</b>	0.012

1:50.000

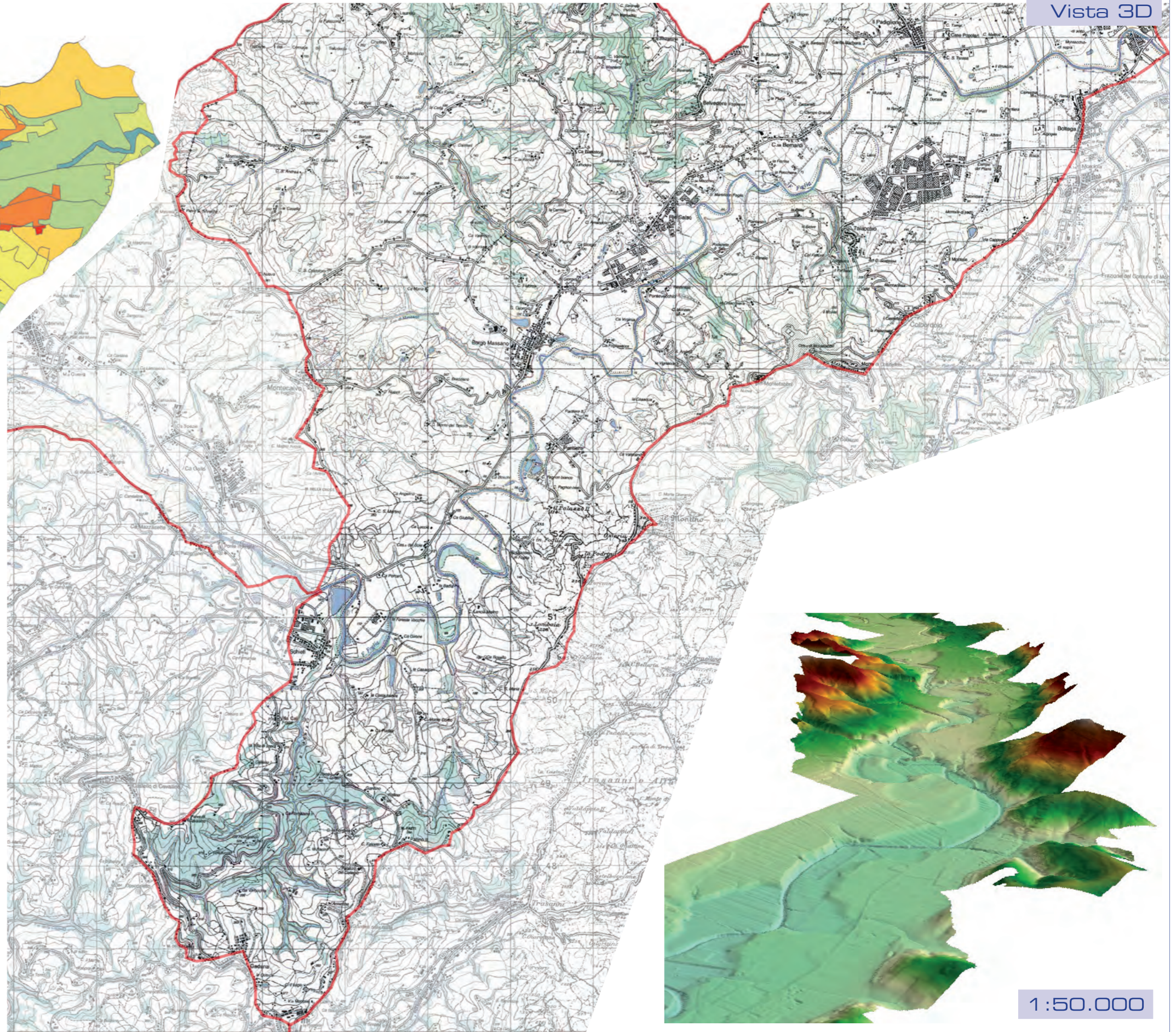
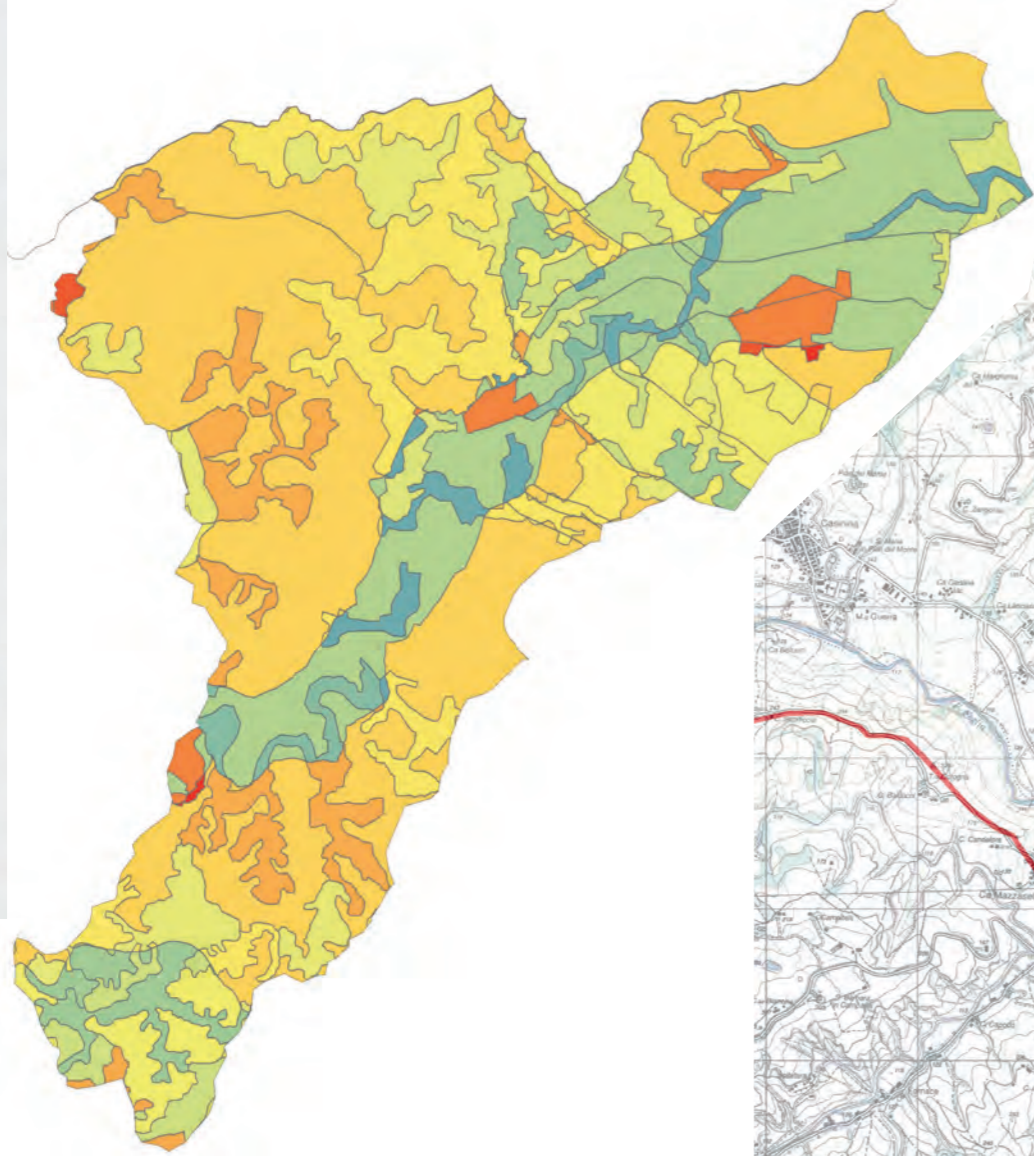


1:10.000





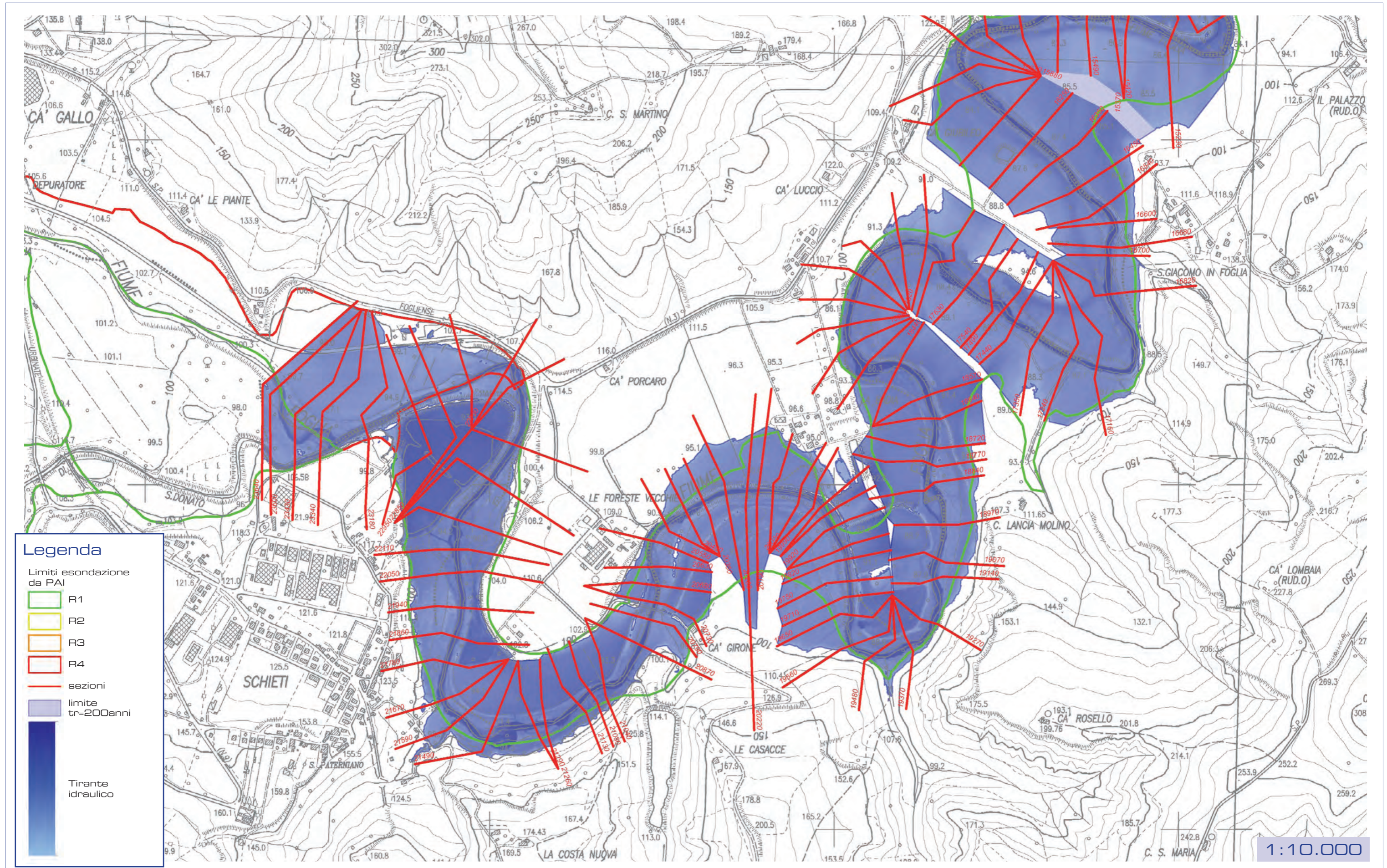
Valore dell'SCS-CN

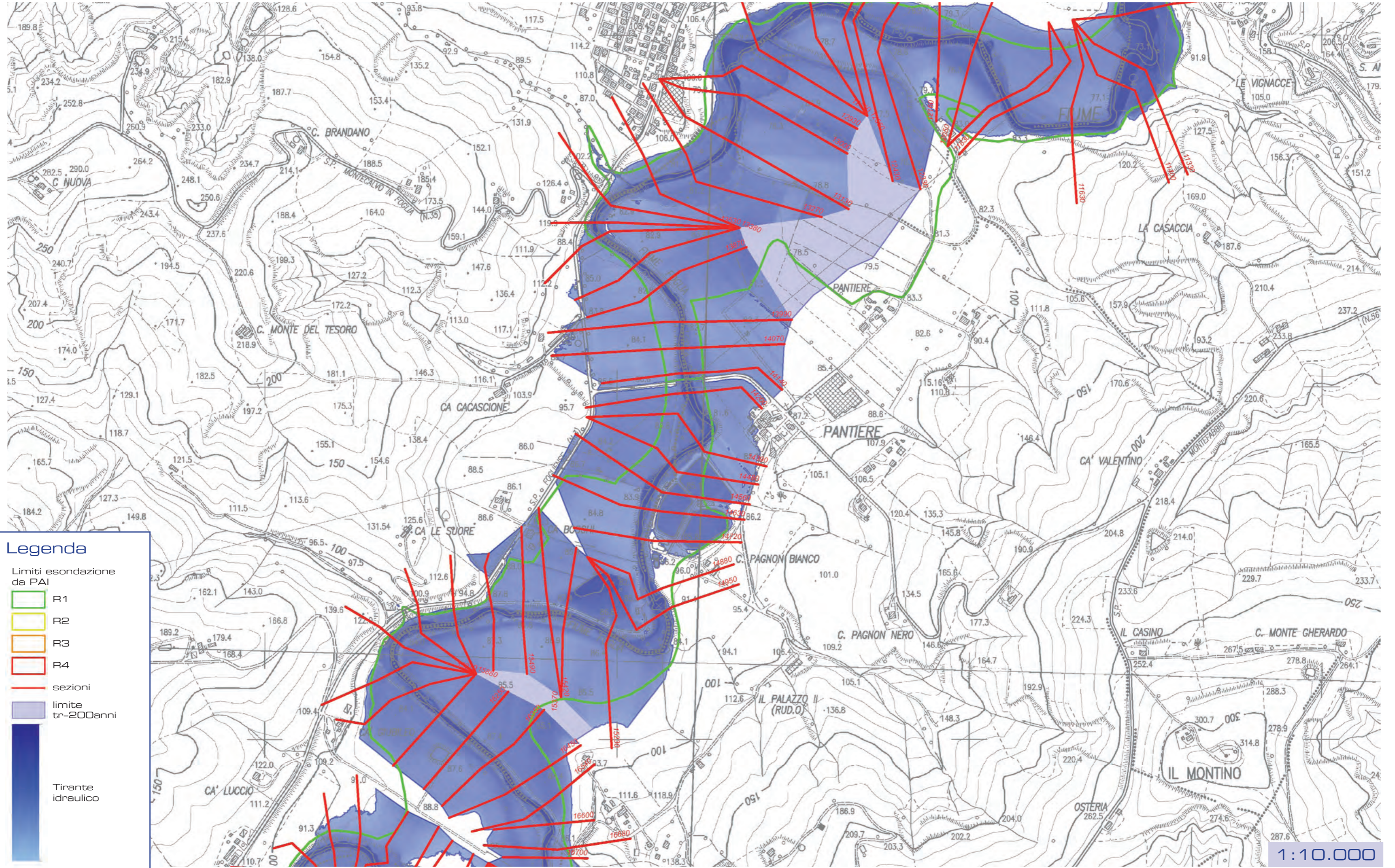


Vista 3D

<b>Cod.</b>	03-0G
<b>Sottobacino</b>	Scolante3
<b>Area (km<sup>2</sup>)</b>	72.9
<b>L. asta (km)</b>	23.0
<b>CN</b>	77.6
<b>tc (h)</b>	7.9*
<b>lag time (')</b>	284
<b>la (mm)</b>	7.3
<b>pendenza versanti</b>	8.1
<b>pendenza asta</b>	0.007

1:50.000





**Legenda**

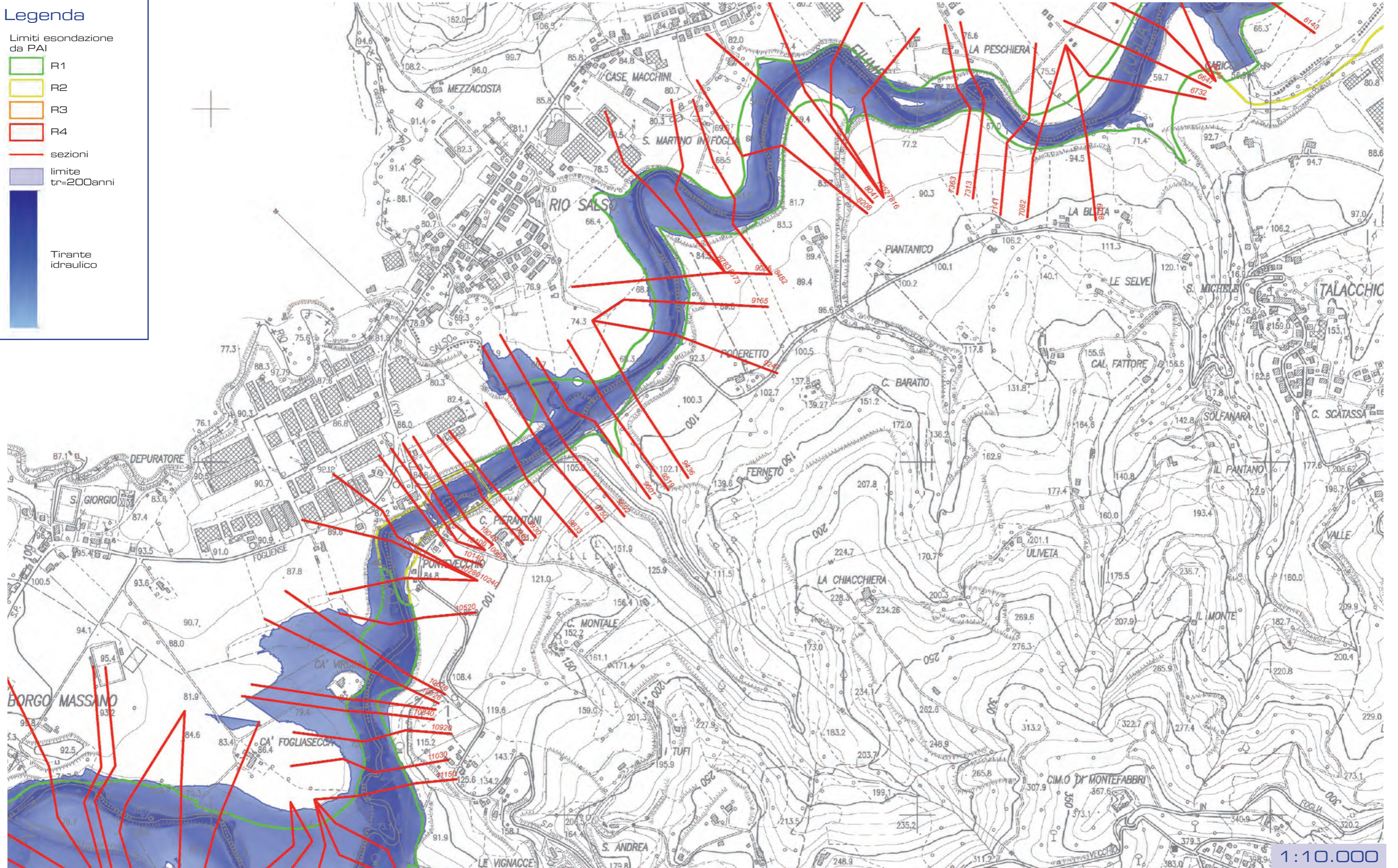
- Limiti esondazione da PAI
- R1
- R2
- R3
- R4
- sezioni
- limite tr=200anni
- Tirante idraulico

1:10.000

**Legenda**

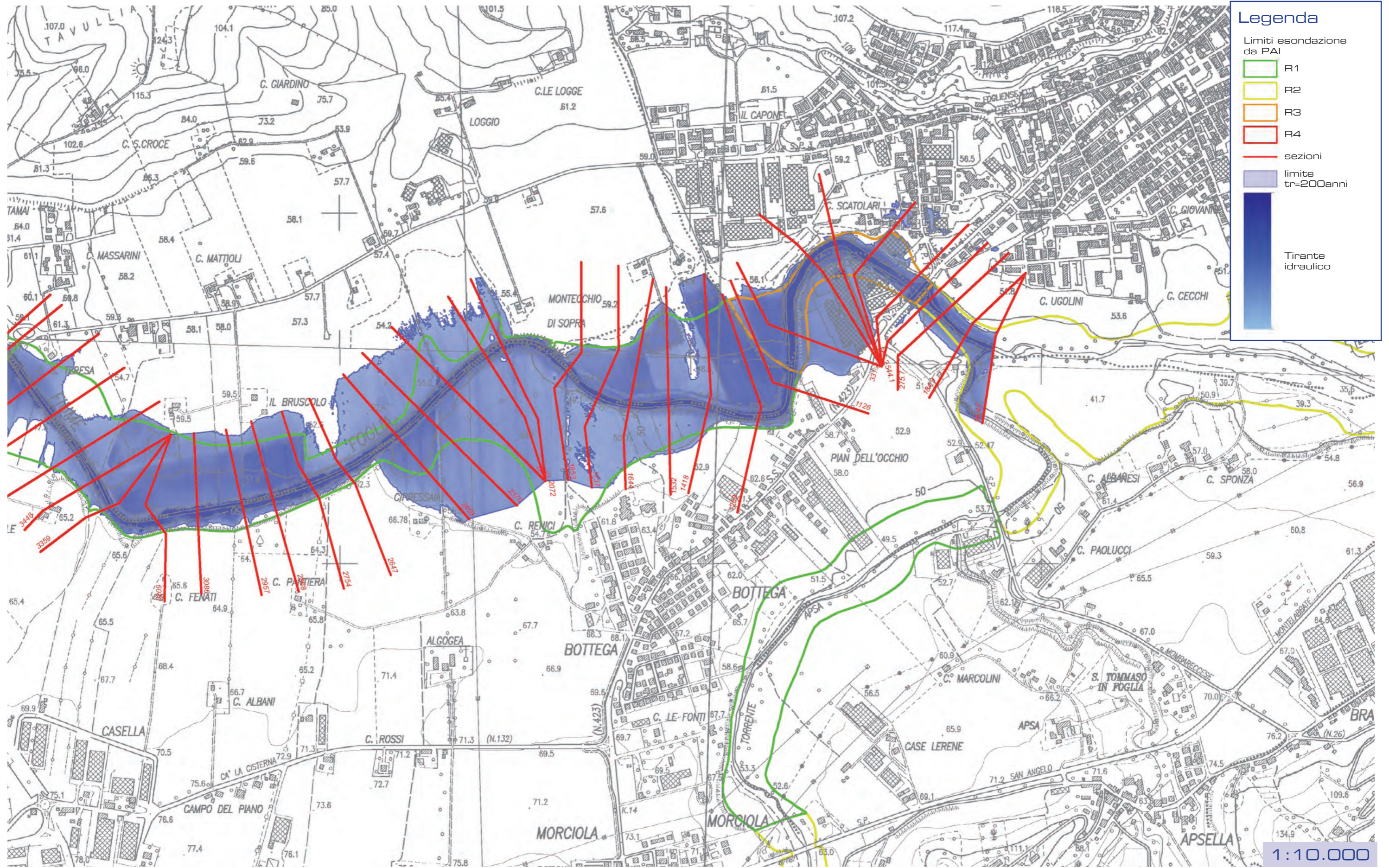
Limiti esondazione da PAI

- R1
- R2
- R3
- R4
- sezioni
- limite tr=200anni
- Tirante idraulico



1:10.000





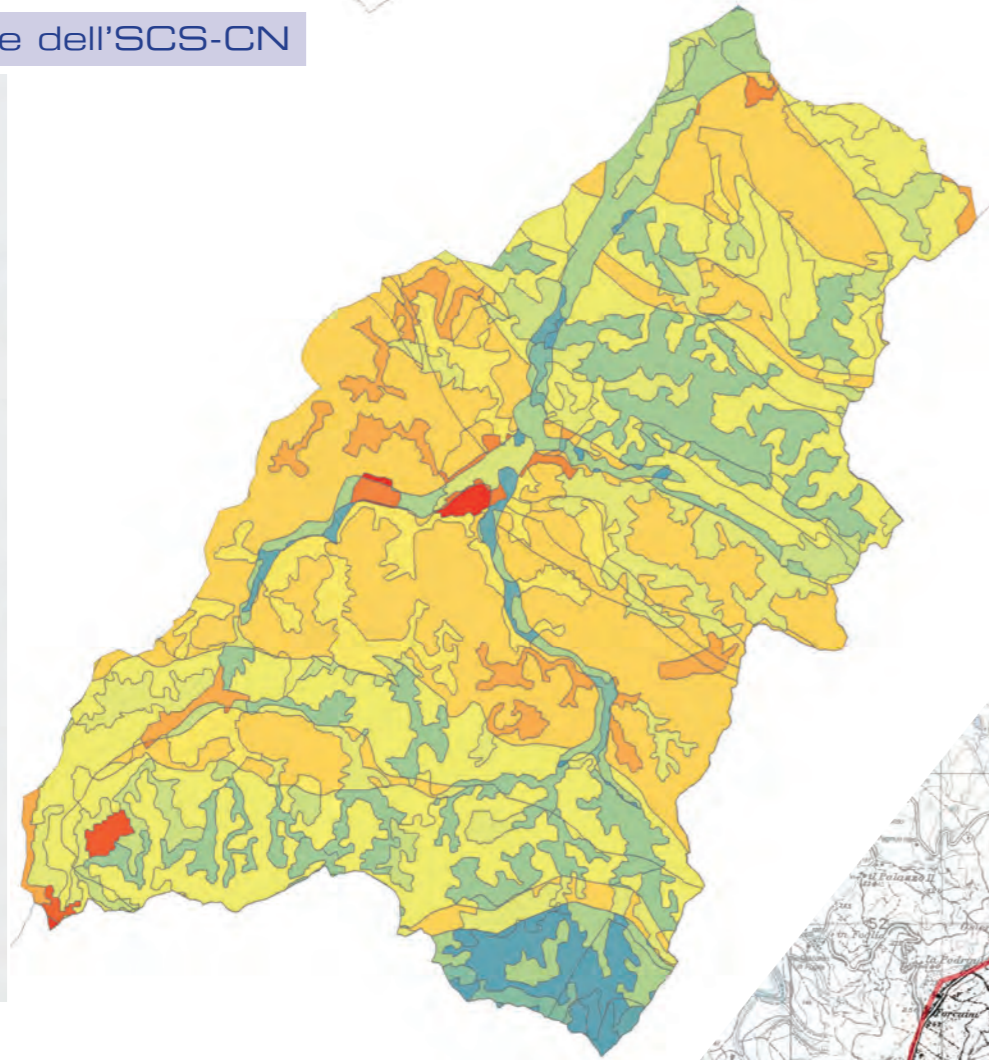
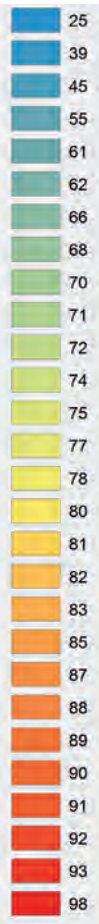
**Legenda**

Limiti esondazione da PAI

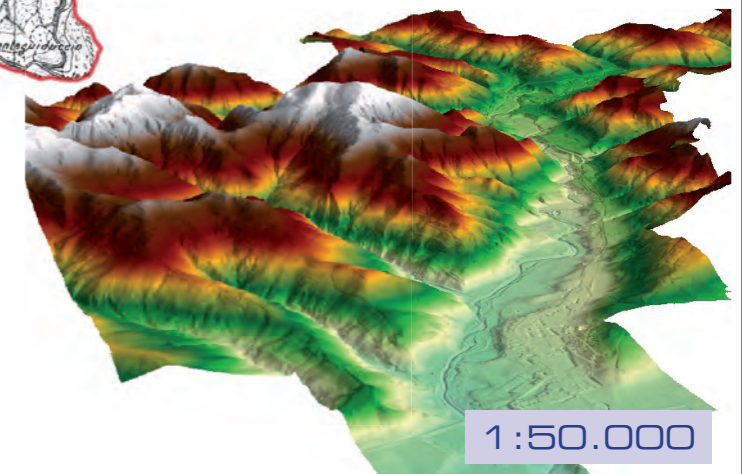
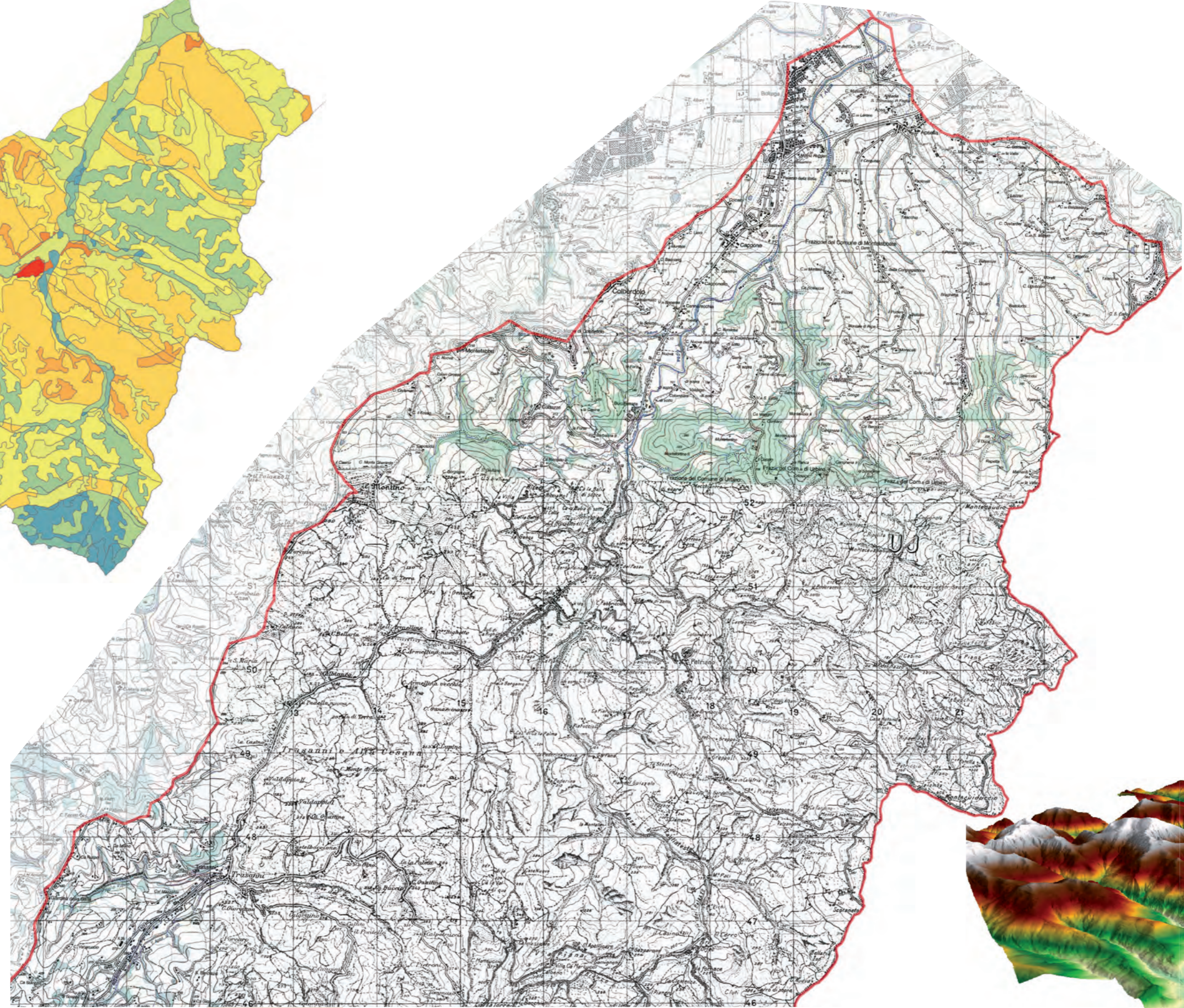
- R1
- R2
- R3
- R4
- sezioni
- limite tr=200anni
- Tirante idraulico

1:10.000

Valore dell'SCS-CN



Vista 3D



<b>Cod.</b>	03-0H
<b>Sottobacino</b>	Apsa
<b>Area (km<sup>2</sup>)</b>	107.6
<b>L. asta (km)</b>	21.9
<b>CN</b>	77.0
<b>tc (h)</b>	7.0
<b>lag time (')</b>	252
<b>la (mm)</b>	7.6
<b>pendenza versanti</b>	10.8
<b>pendenza asta</b>	0.014

1:75.000

1:50.000

**Legenda**

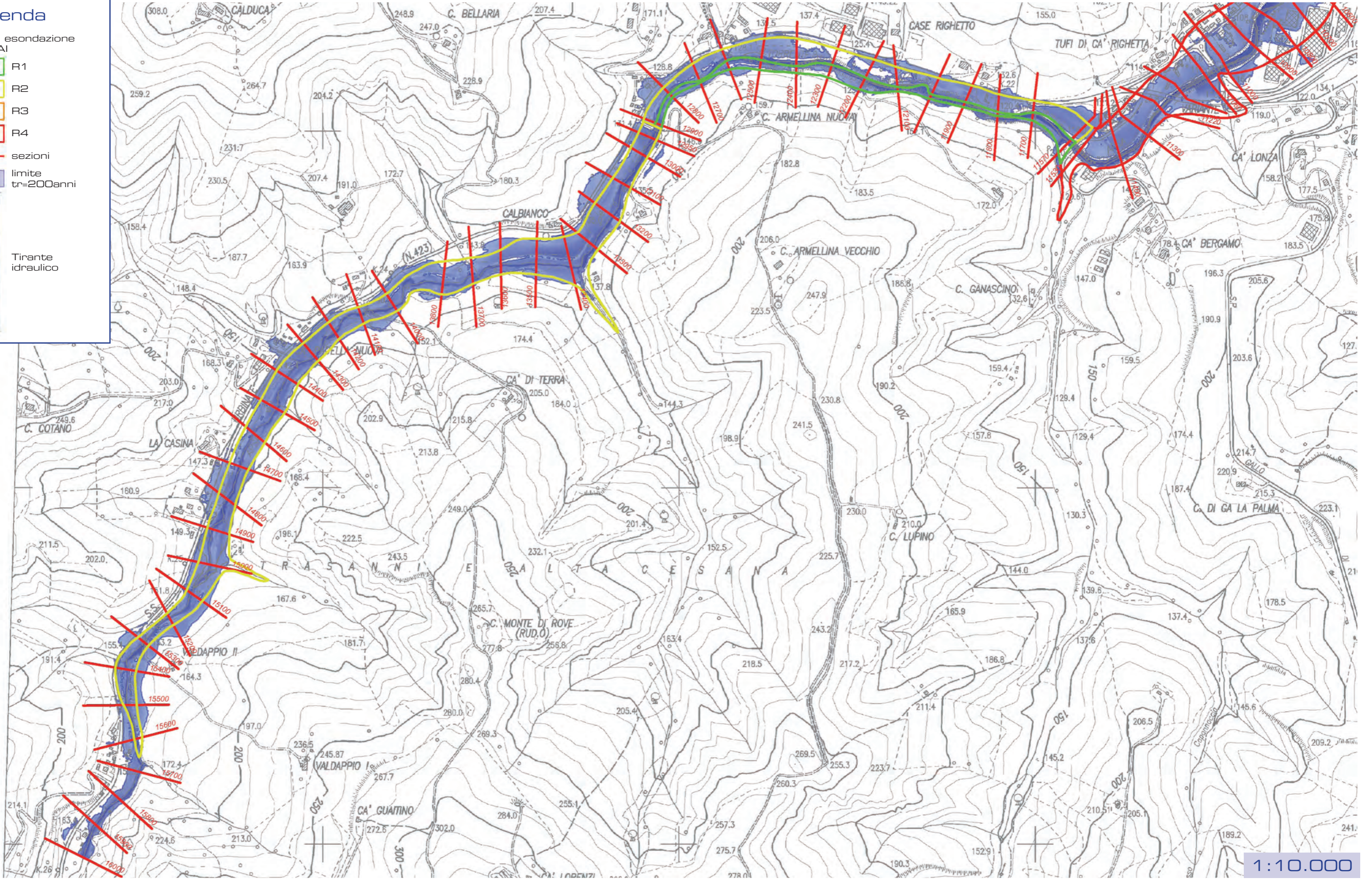
Limiti esondazione da PAI

- R1
- R2
- R3
- R4

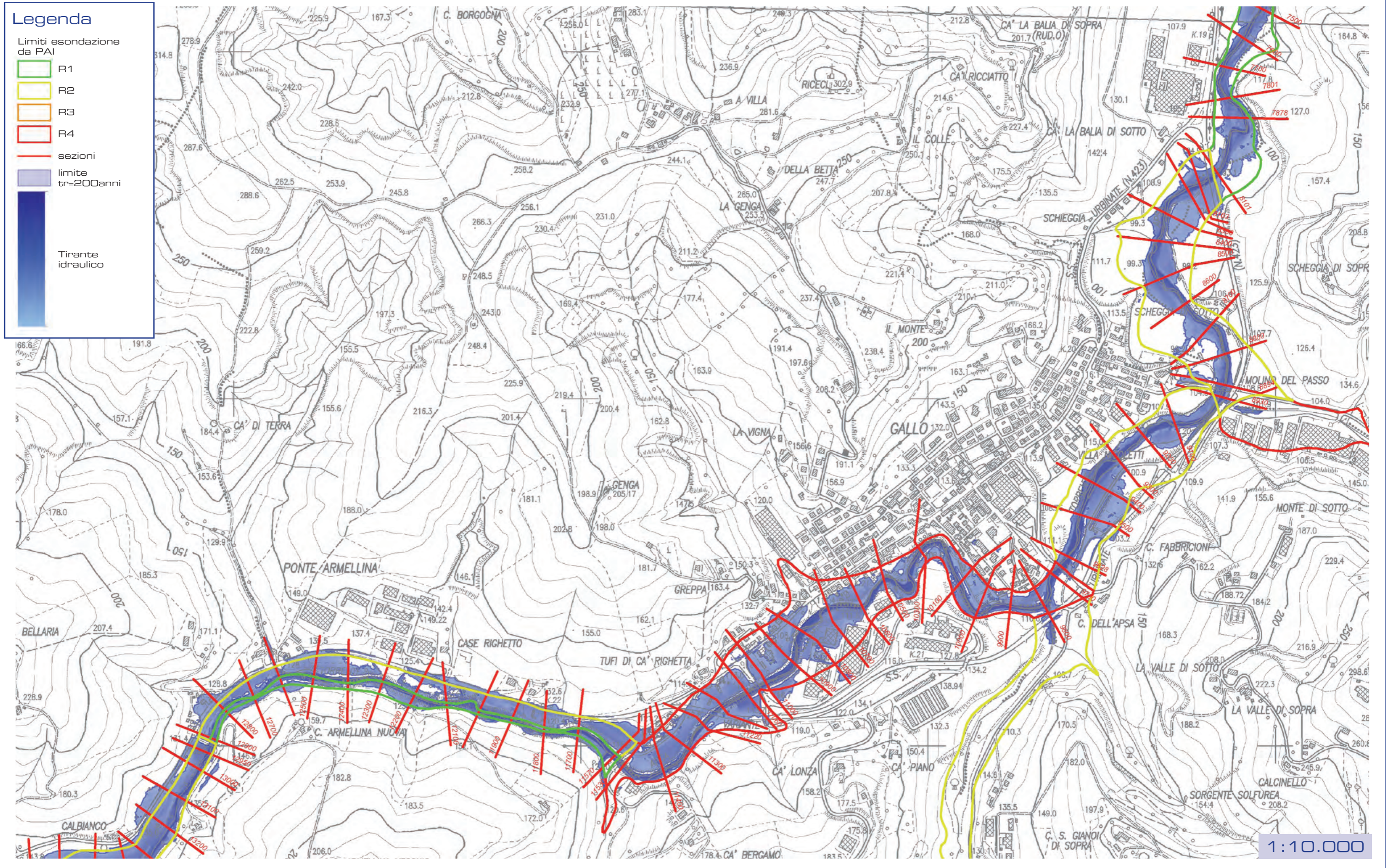
— sezioni

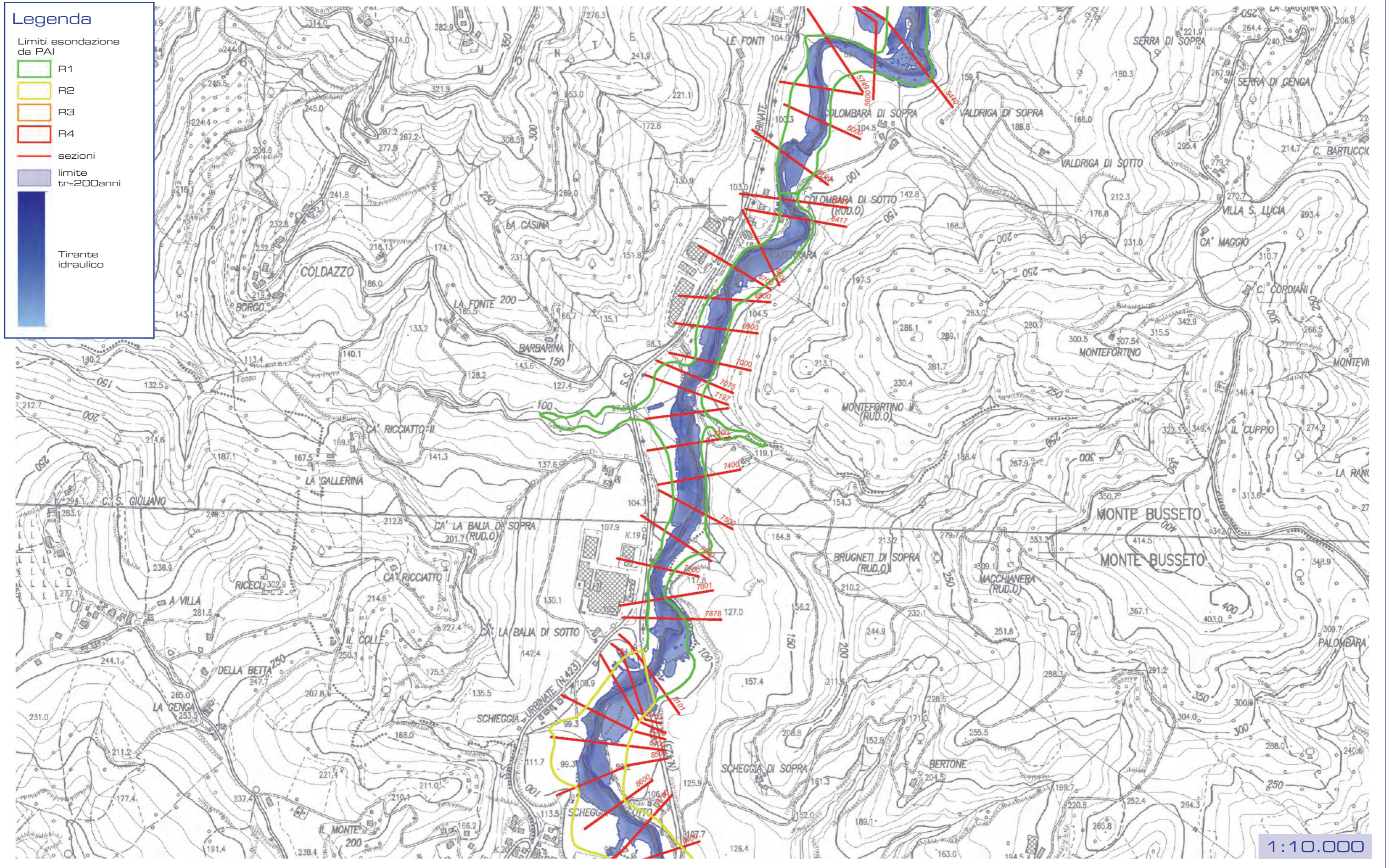
limite tr=200anni

Tirante idraulico



1:10.000





**Legenda**

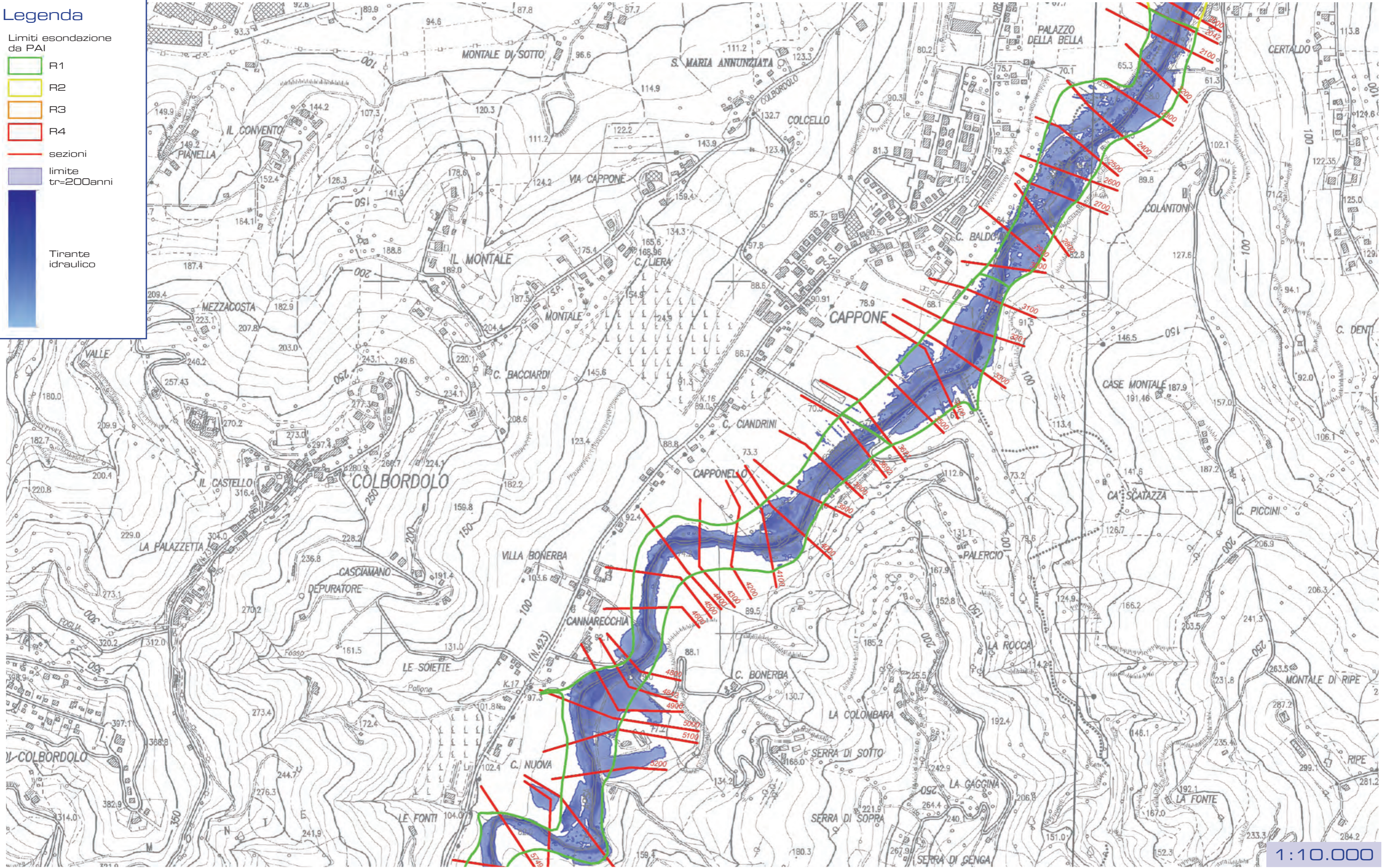
Limiti esondazione da PAI

- R1
- R2
- R3
- R4

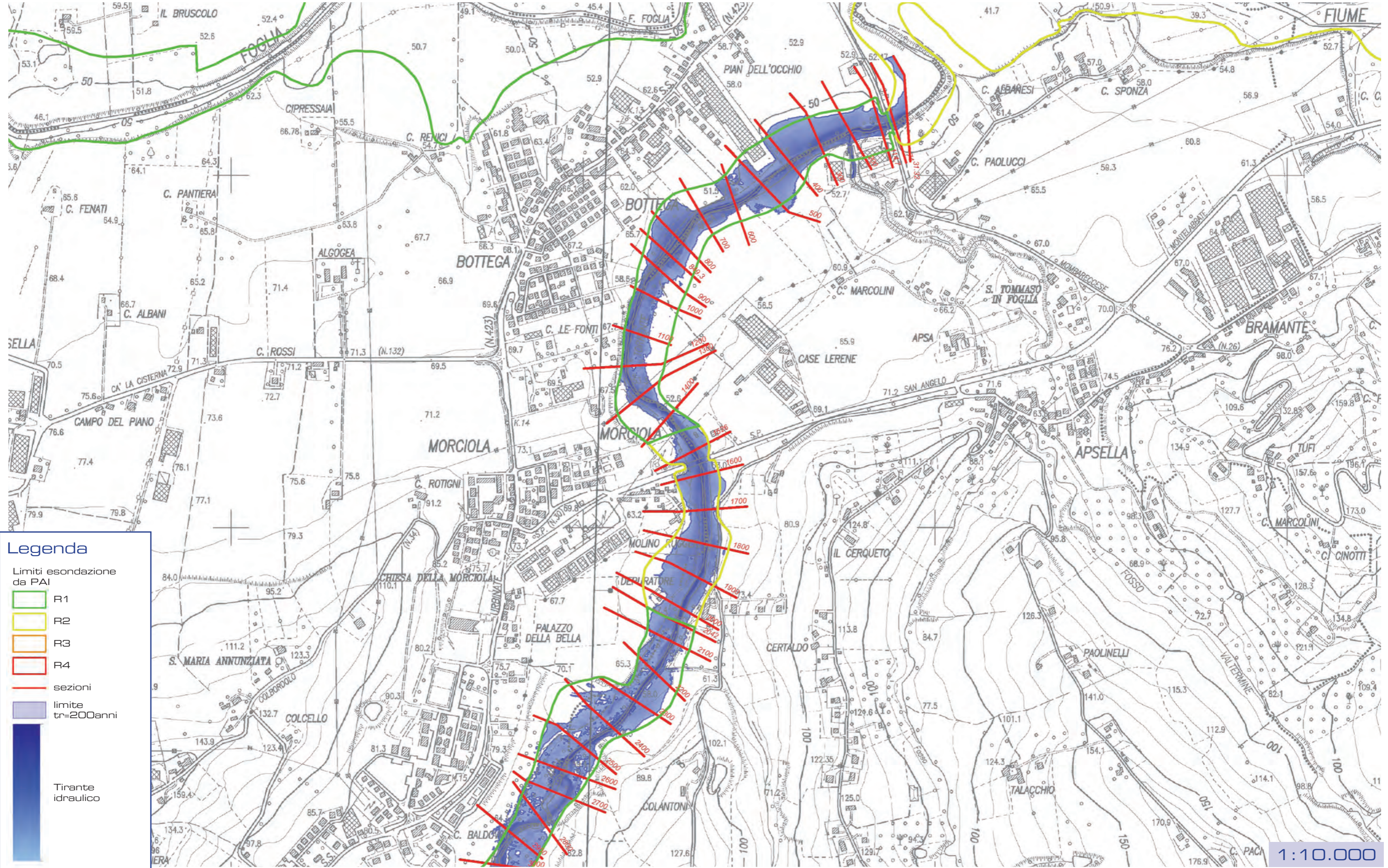
— sezioni

limite tr=200anni

Tirante idraulico

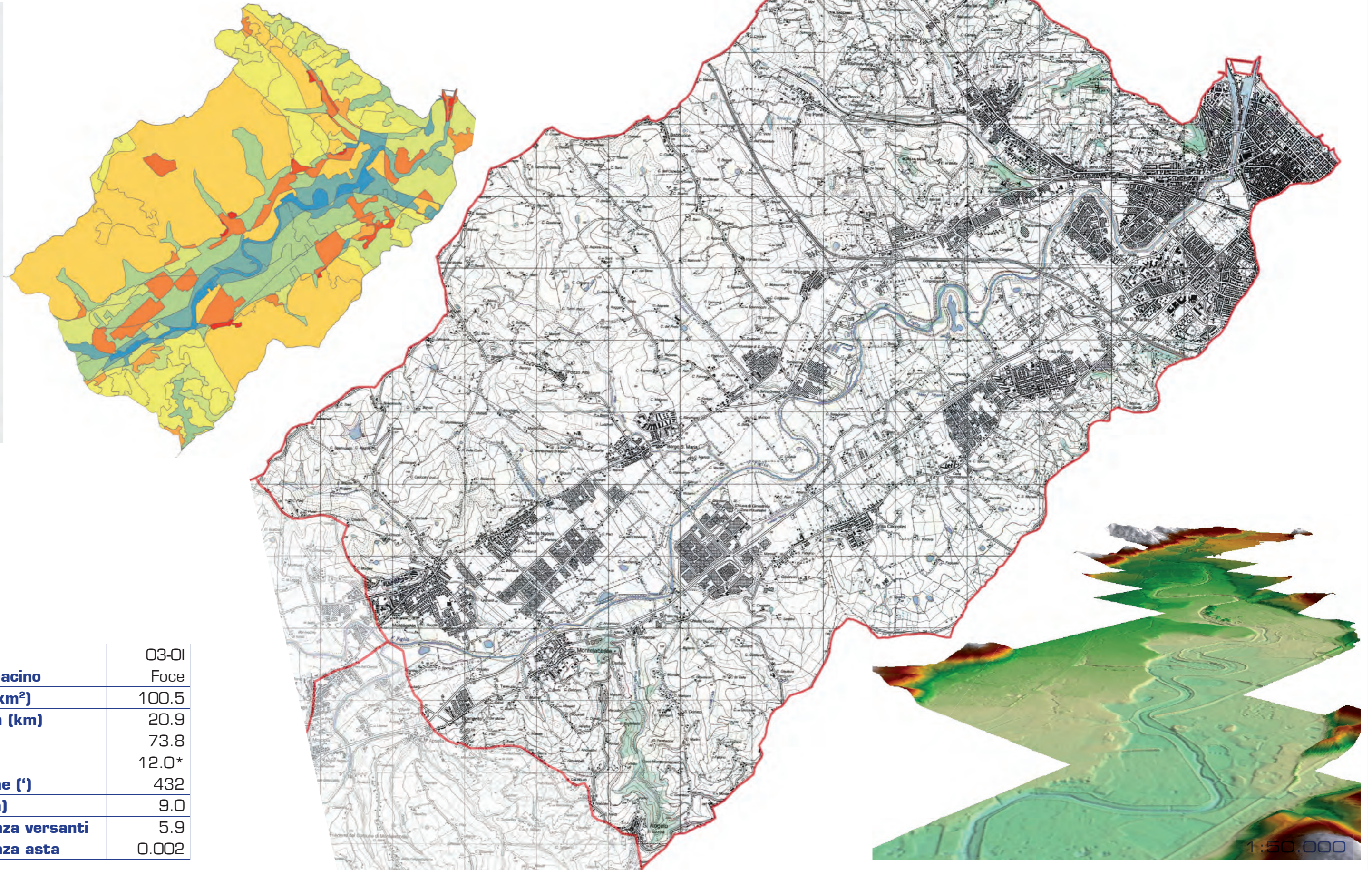
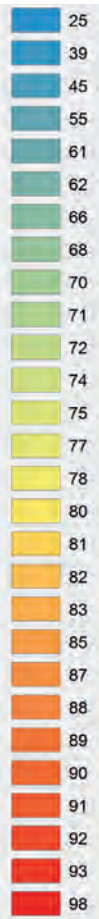


1:10.000



1:10.000

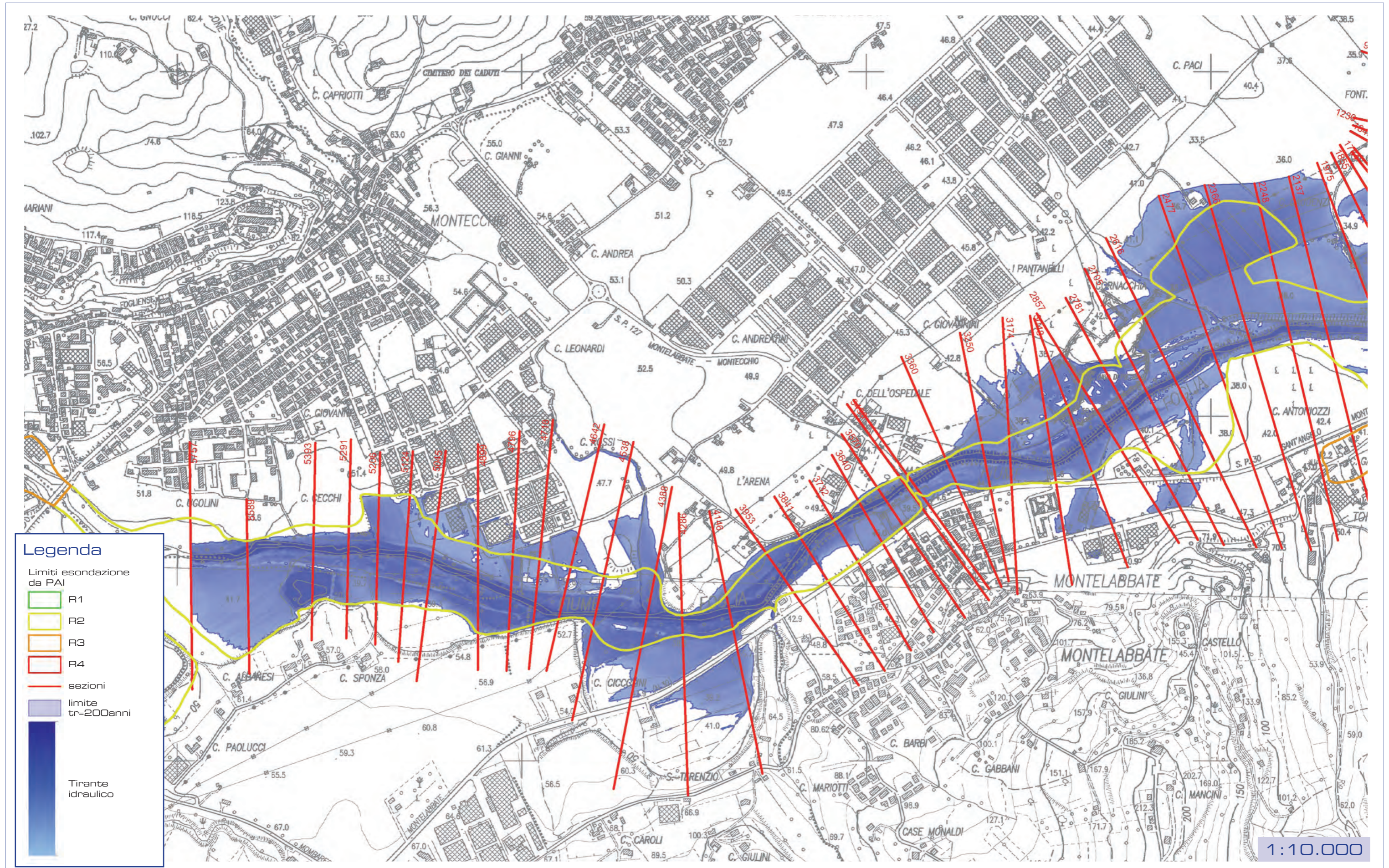
Valore dell'SCS-CN

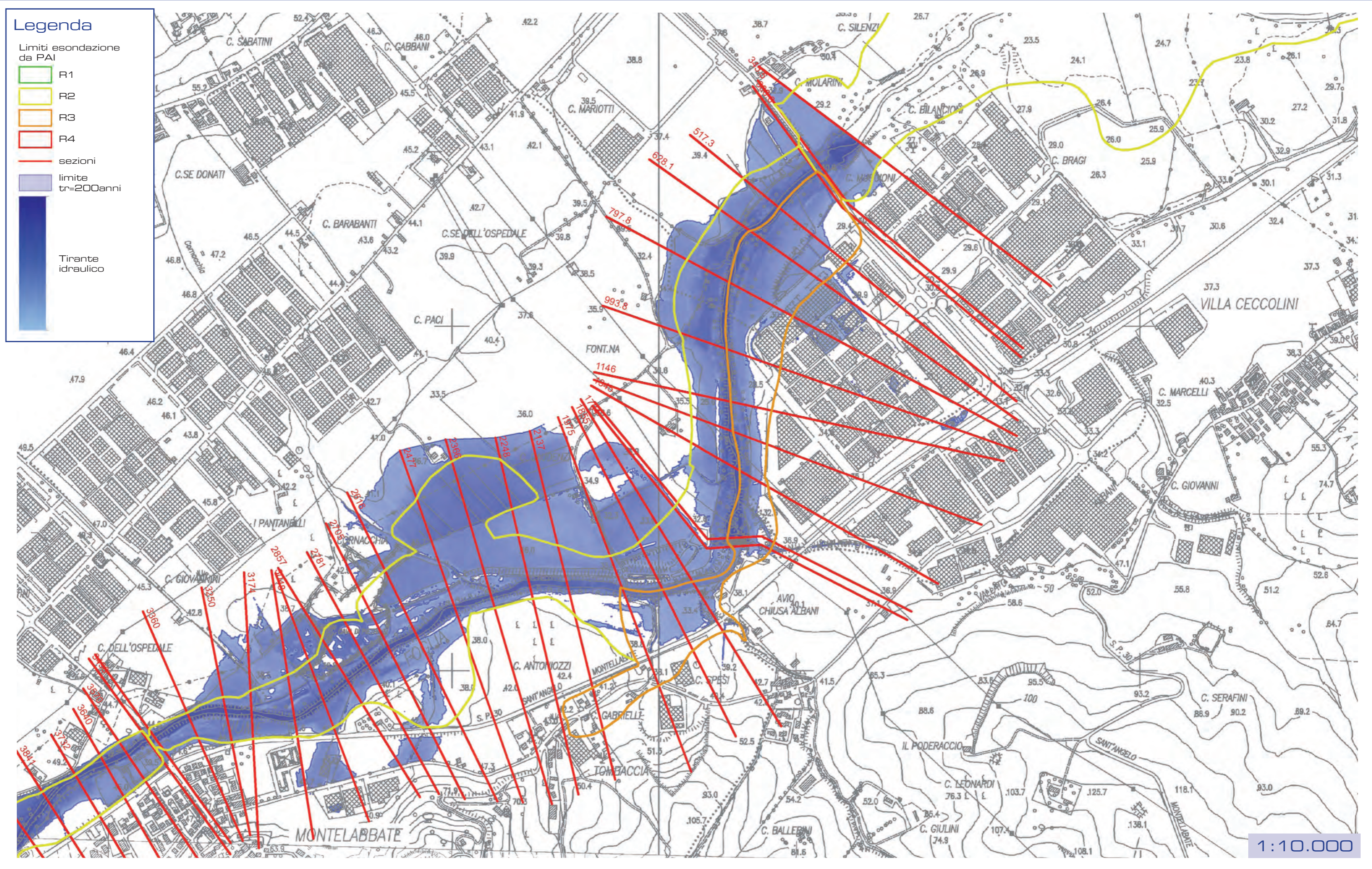


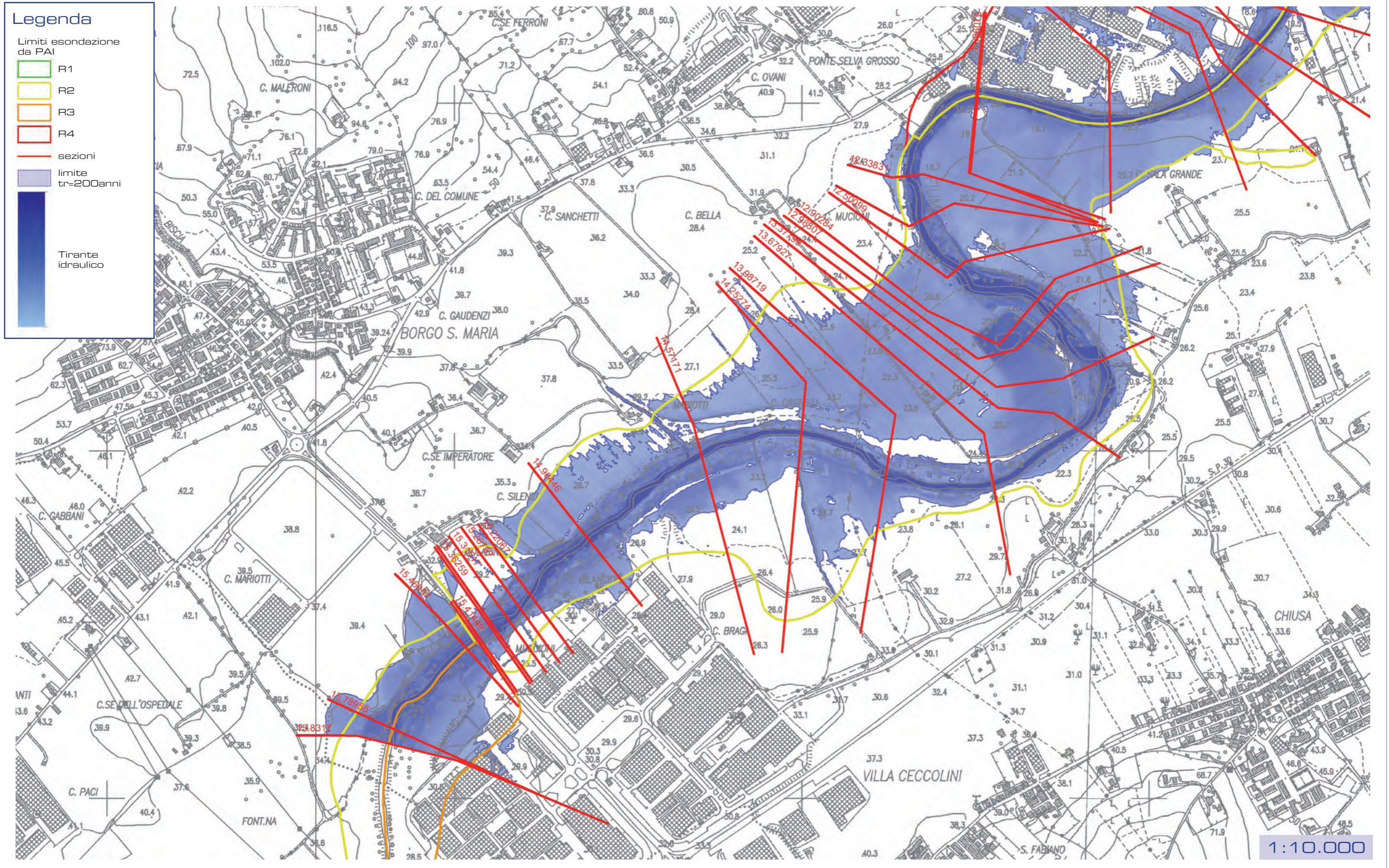
Vista 3D

<b>Cod.</b>	03-01
<b>Sottobacino</b>	Foce
<b>Area (km<sup>2</sup>)</b>	100.5
<b>L. asta (km)</b>	20.9
<b>CN</b>	73.8
<b>tc (h)</b>	12.0*
<b>lag time (')</b>	432
<b>la (mm)</b>	9.0
<b>pendenza versanti</b>	5.9
<b>pendenza asta</b>	0.002

1:50.000







**Legenda**

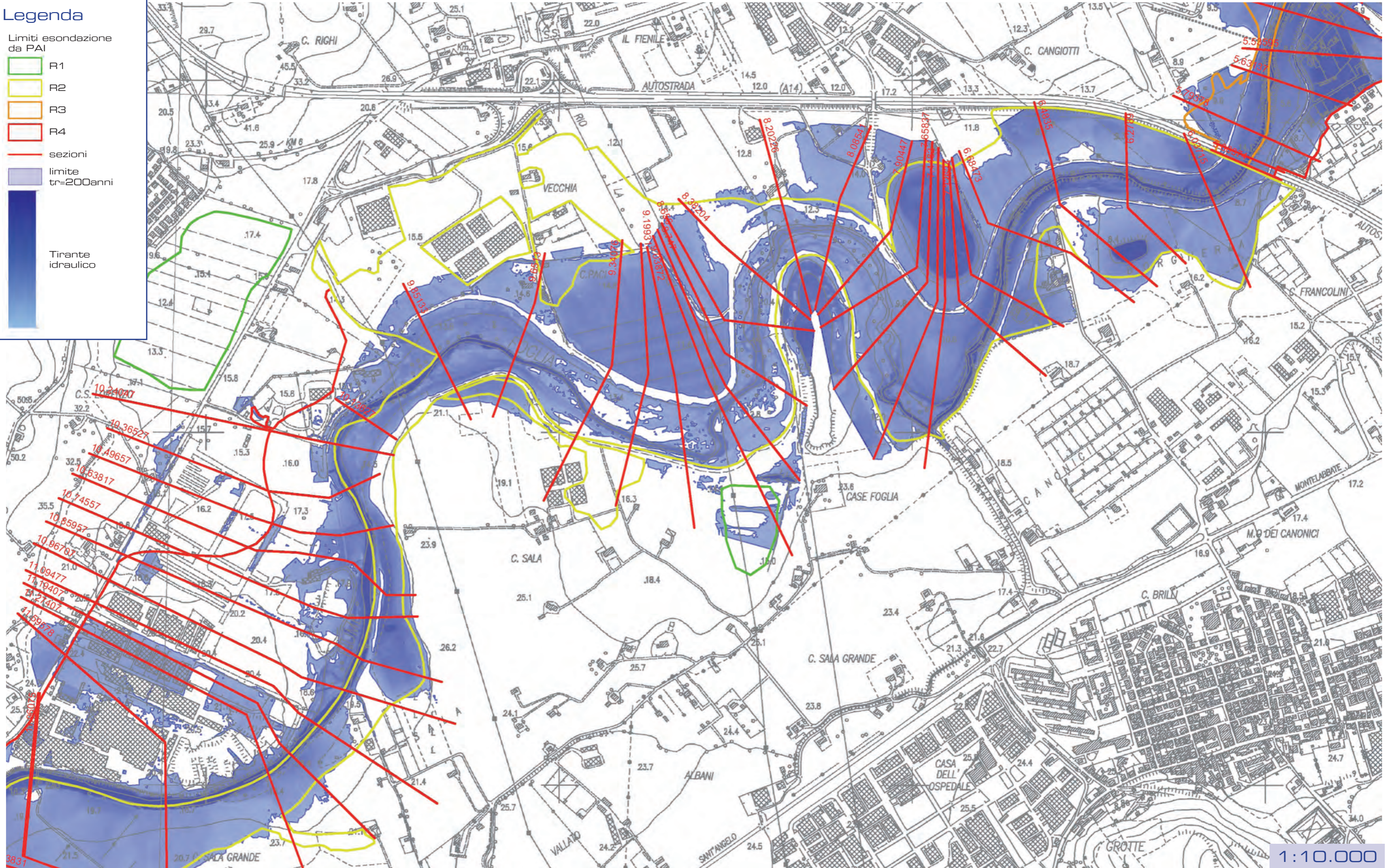
Limiti esondazione da PAI

- R1
- R2
- R3
- R4

— sezioni

— limite tr=200anni

Tirante idraulico



1:10.000

**Legenda**

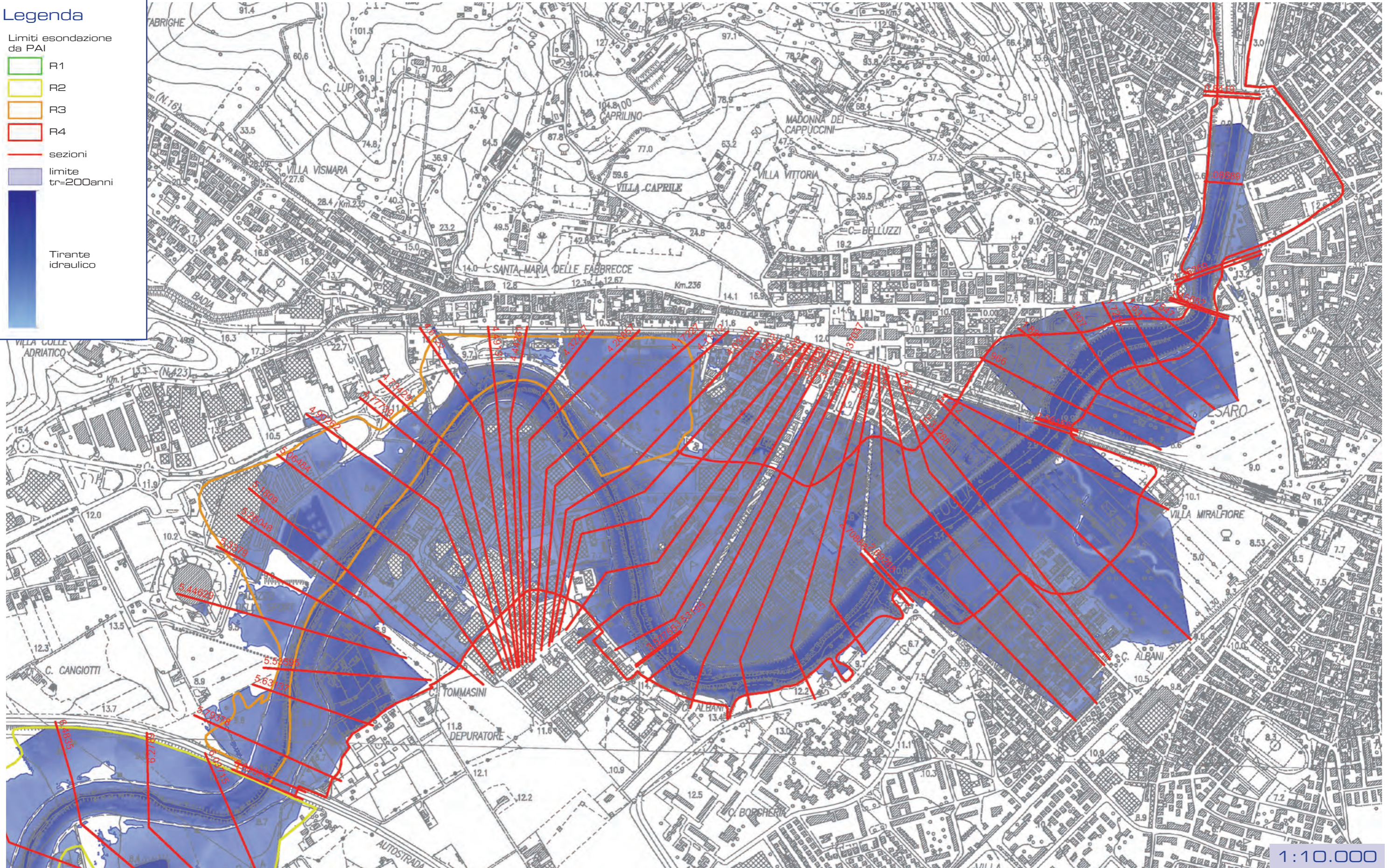
Limiti esondazione da PAI

- R1
- R2
- R3
- R4

— sezioni

limite tr=200anni

Tirante idraulico



In collaborazione con:



1506  
UNIVERSITÀ  
DEGLI STUDI  
DI URBINO  
CARLO BO



## Consorzio di Bonifica delle Marche

### STUDIO PER LA MITIGAZIONE DEL RISCHIO IDROGEOLOGICO DELLA REGIONE MARCHE

INDAGINE CONDOTTA SUI BACINI IDROGRAFICI  
DEI FIUMI CONCA, TAVOLLO, FOGLIA,  
ARZILLA, METAURO E CESANO

ANALISI IDROLOGICA

#### CONSORZIO DI BONIFICA DELLE MARCHE

IL PRESIDENTE

Avv. Claudio Netti

IL RESPONSABILE DELL'AREA BONIFICA

Dott. Michele Tromboni

#### UNIURB

CONSULENZA SCIENTIFICA

Prof.ssa Olivia Nesci

Prof. Francesco Veneri

Geol. Filippo Piscaglia

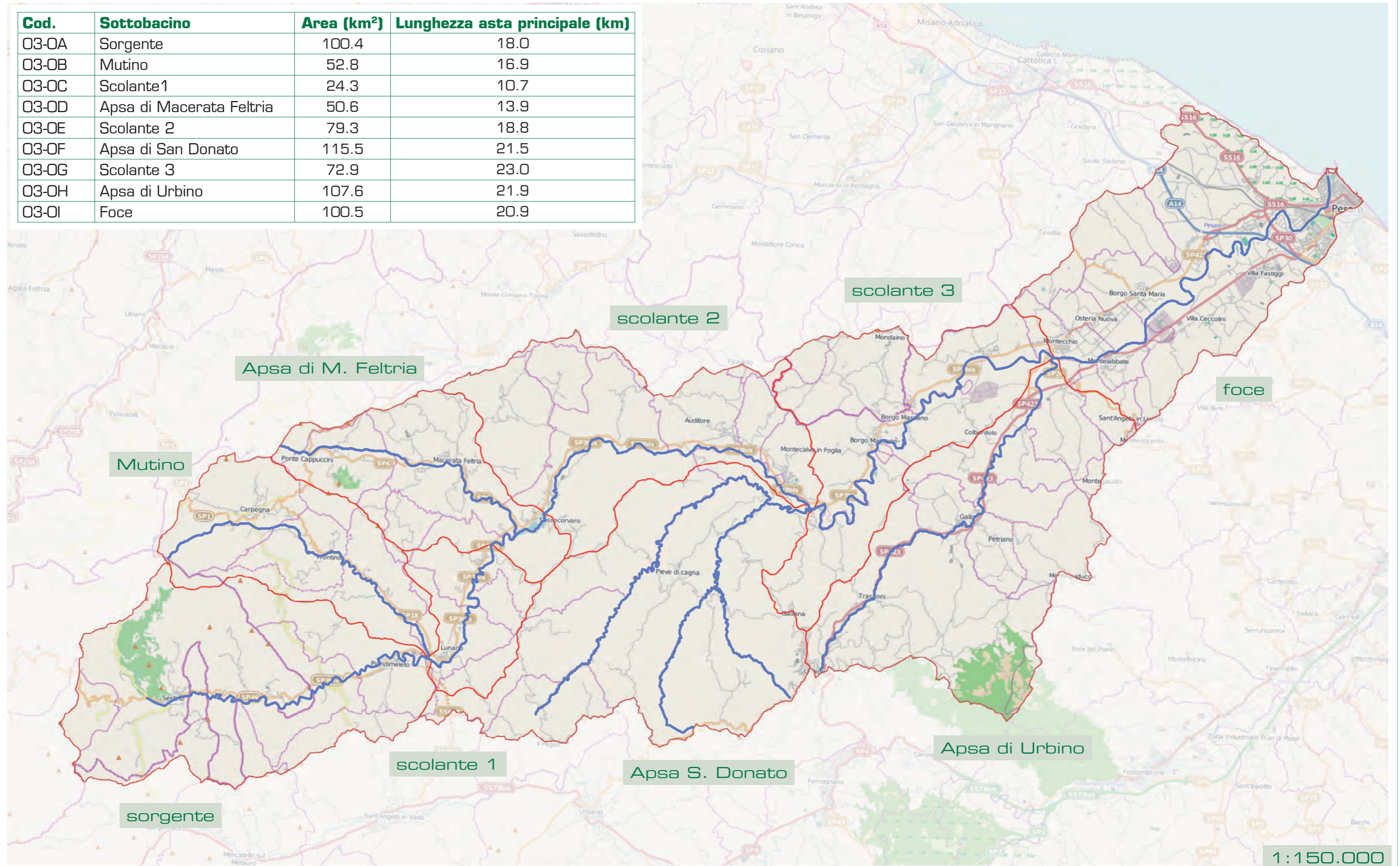
#### COORDINAMENTO SCIENTIFICO UNICAM

Prof. Piero Farabollini

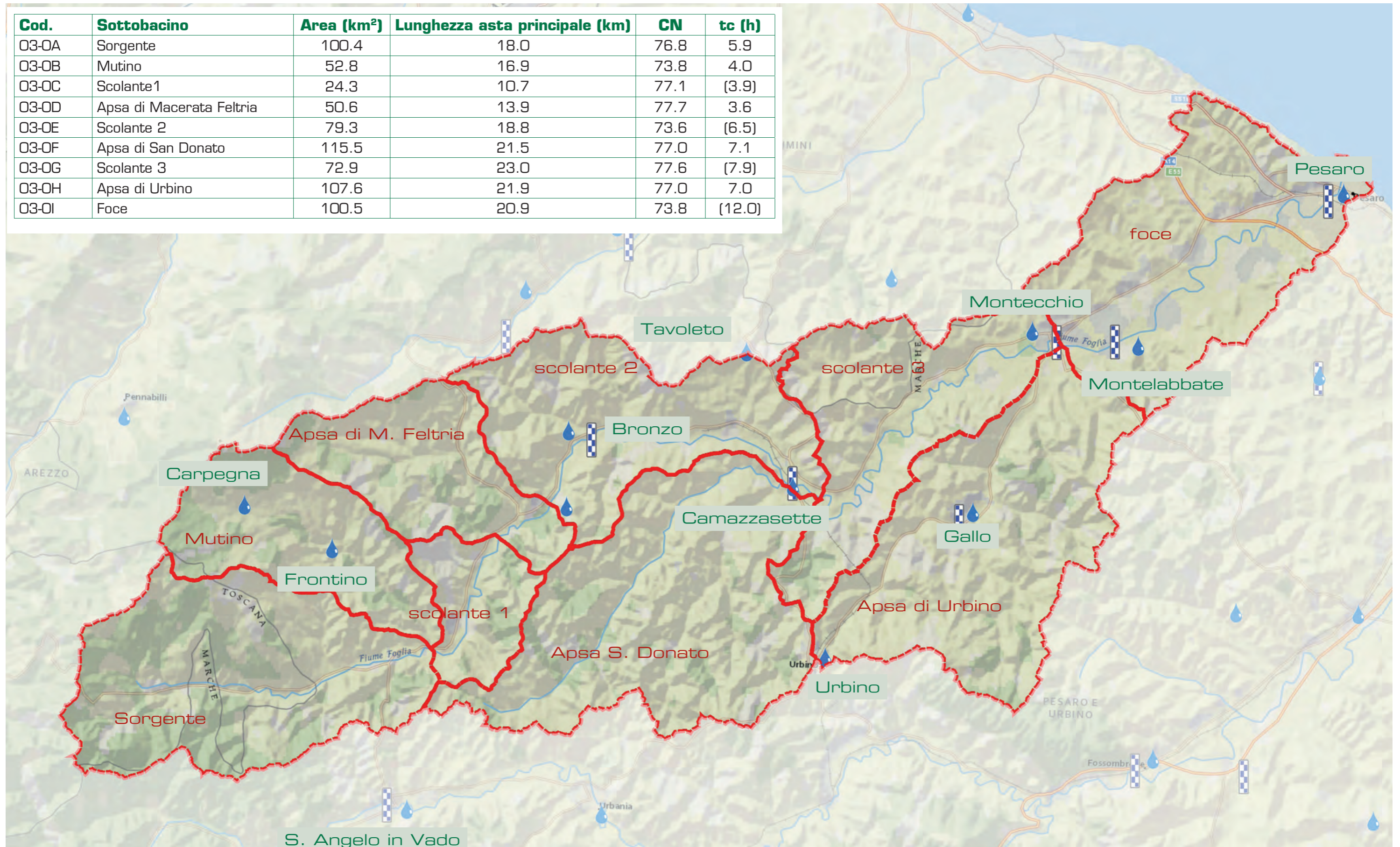
Prof. Massimo Sargolini

Area Bonifica

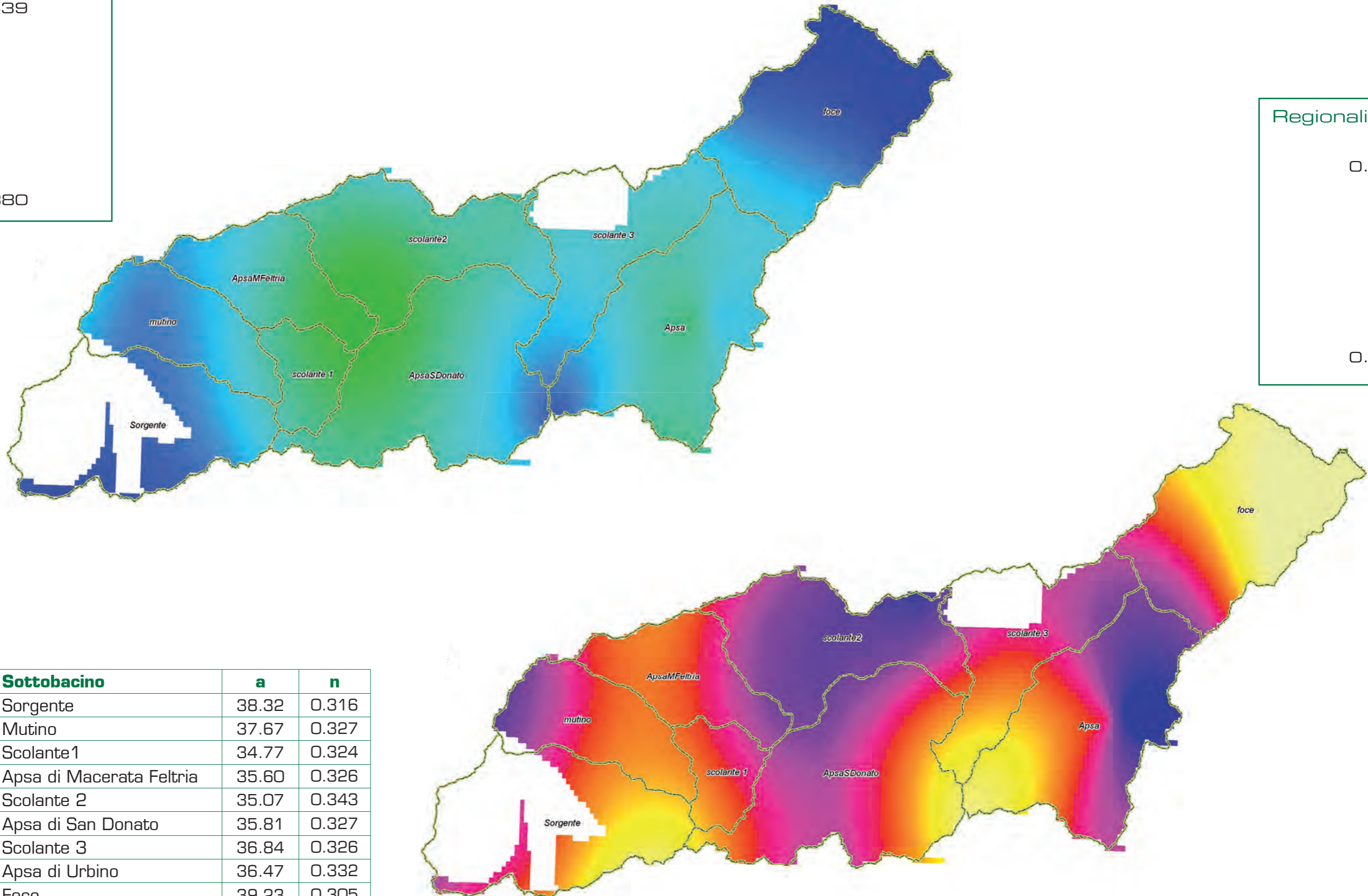
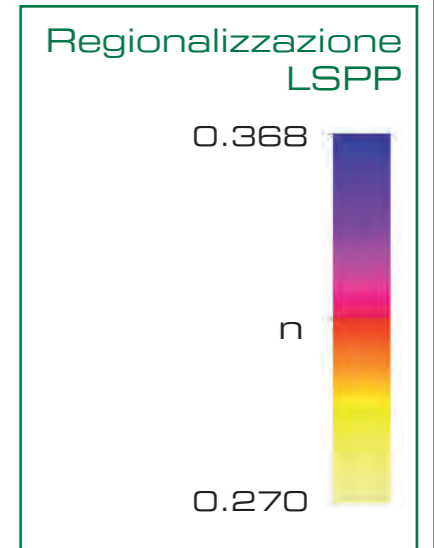
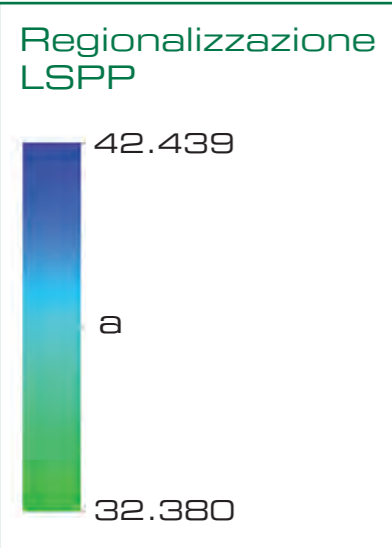
Cod.	Sottobacino	Area (km <sup>2</sup> )	Lunghezza asta principale (km)
03-OA	Sorgente	100.4	18.0
03-OB	Mutino	52.8	16.9
03-OC	Scolante 1	24.3	10.7
03-OD	Apsa di Macerata Feltria	50.6	13.9
03-OE	Scolante 2	79.3	18.8
03-OF	Apsa di San Donato	115.5	21.5
03-OG	Scolante 3	72.9	23.0
03-OH	Apsa di Urbino	107.6	21.9
03-OI	Foce	100.5	20.9



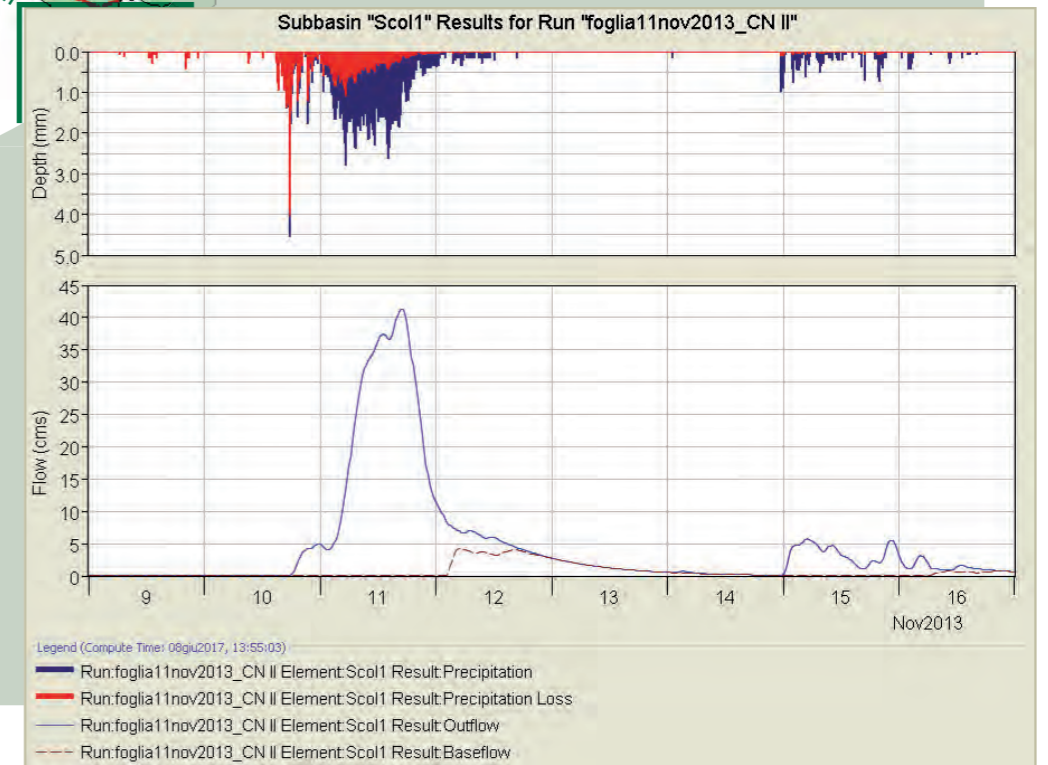
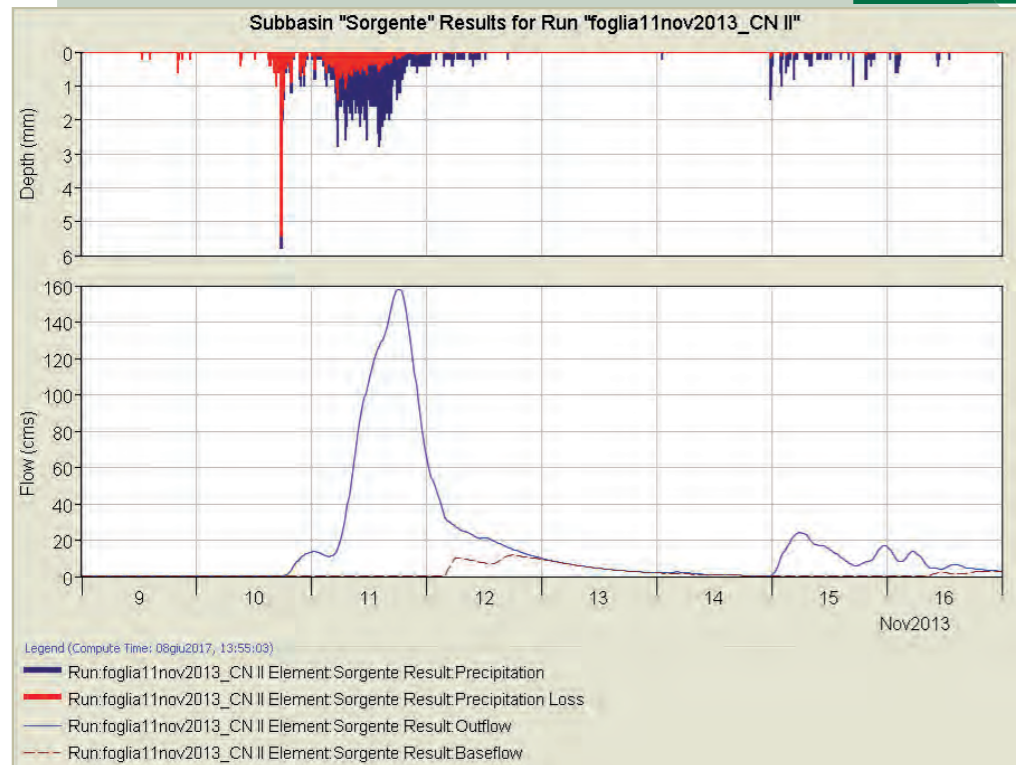
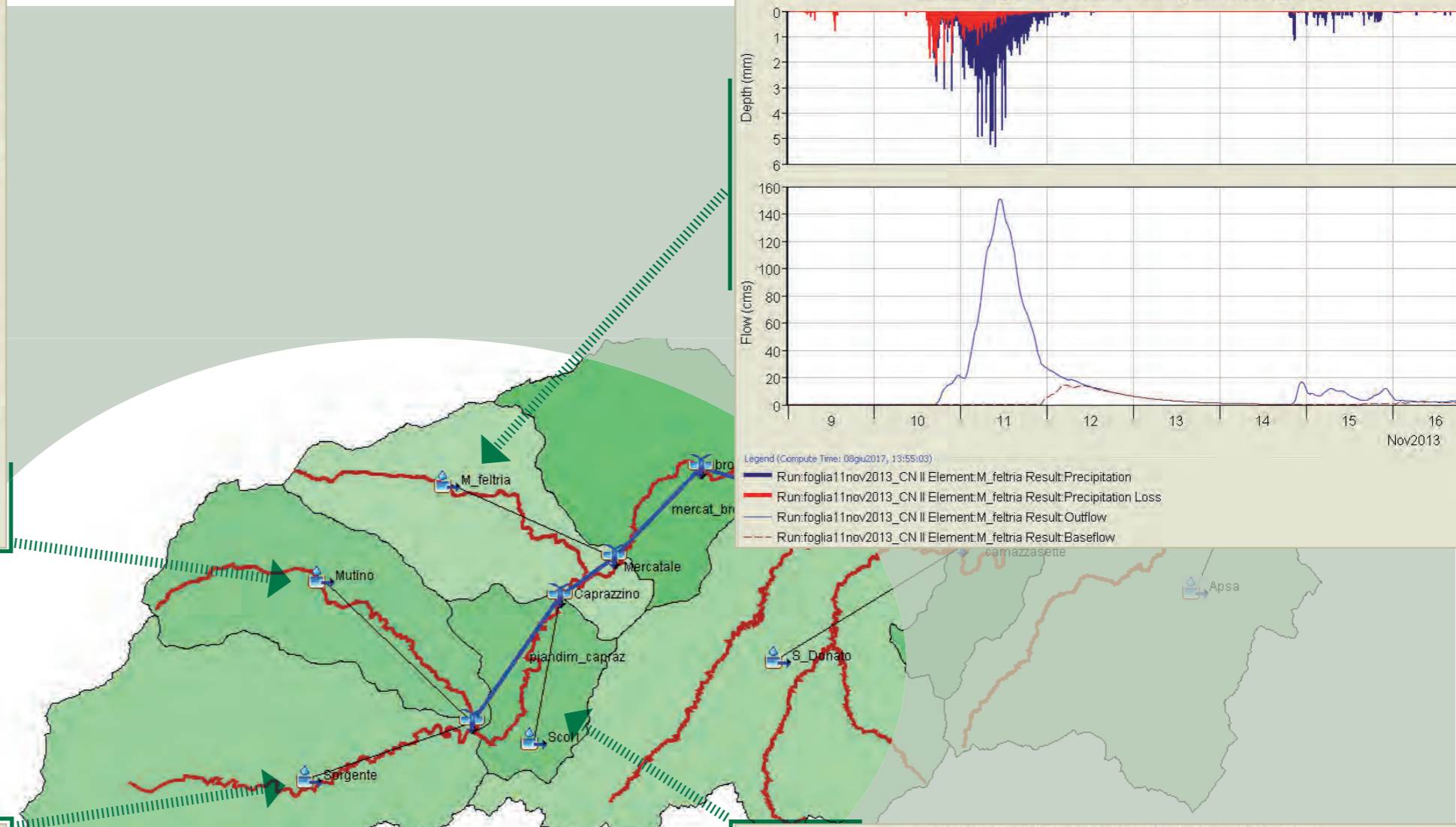
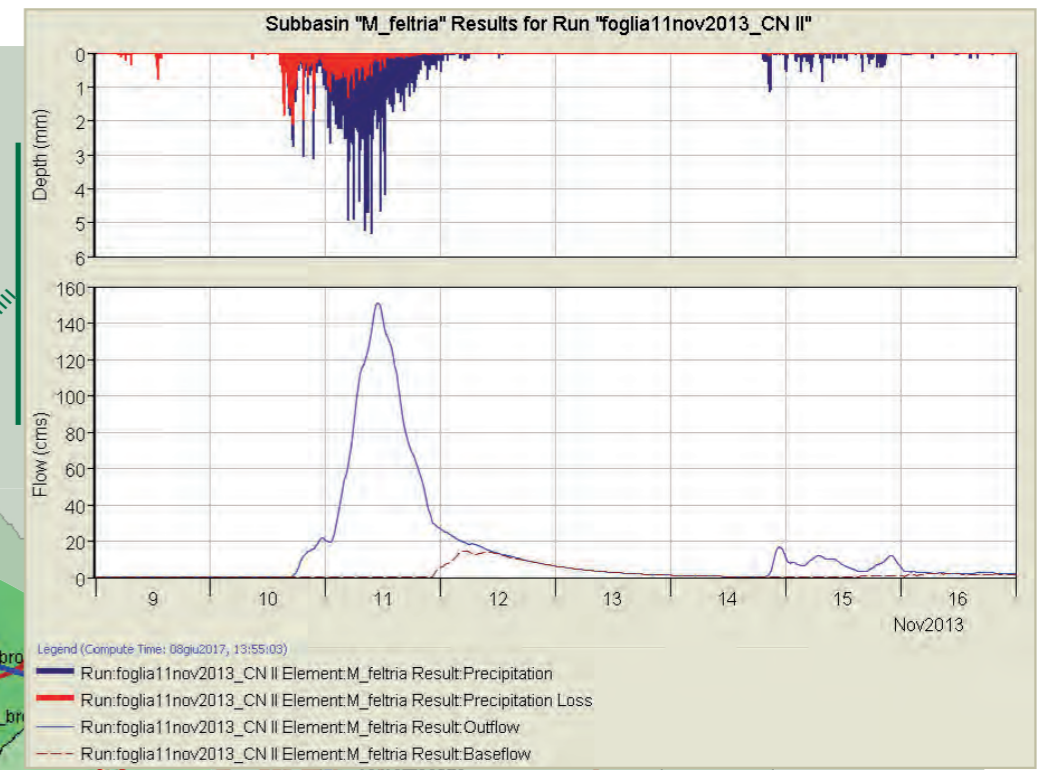
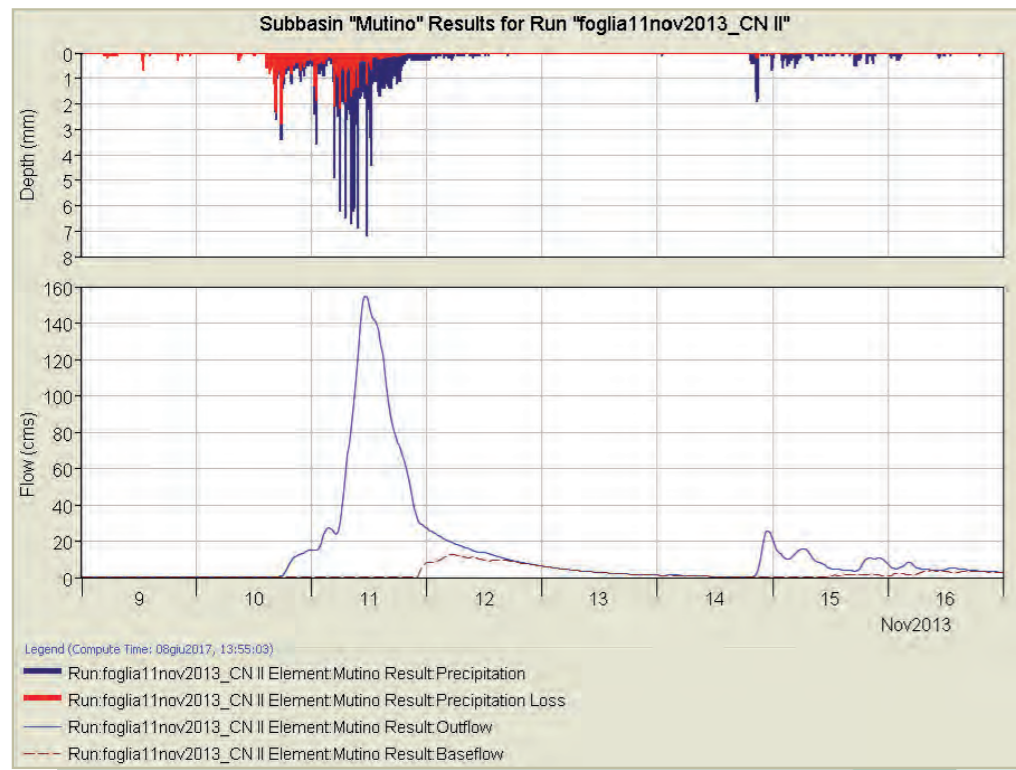
Cod.	Sottobacino	Area (km <sup>2</sup> )	Lunghezza asta principale (km)	CN	tc (h)
03-OA	Sorgente	100.4	18.0	76.8	5.9
03-OB	Mutino	52.8	16.9	73.8	4.0
03-OC	Scolante1	24.3	10.7	77.1	(3.9)
03-OD	Apsa di Macerata Feltria	50.6	13.9	77.7	3.6
03-OE	Scolante 2	79.3	18.8	73.6	(6.5)
03-OF	Apsa di San Donato	115.5	21.5	77.0	7.1
03-OG	Scolante 3	72.9	23.0	77.6	(7.9)
03-OH	Apsa di Urbino	107.6	21.9	77.0	7.0
03-OI	Foce	100.5	20.9	73.8	(12.0)

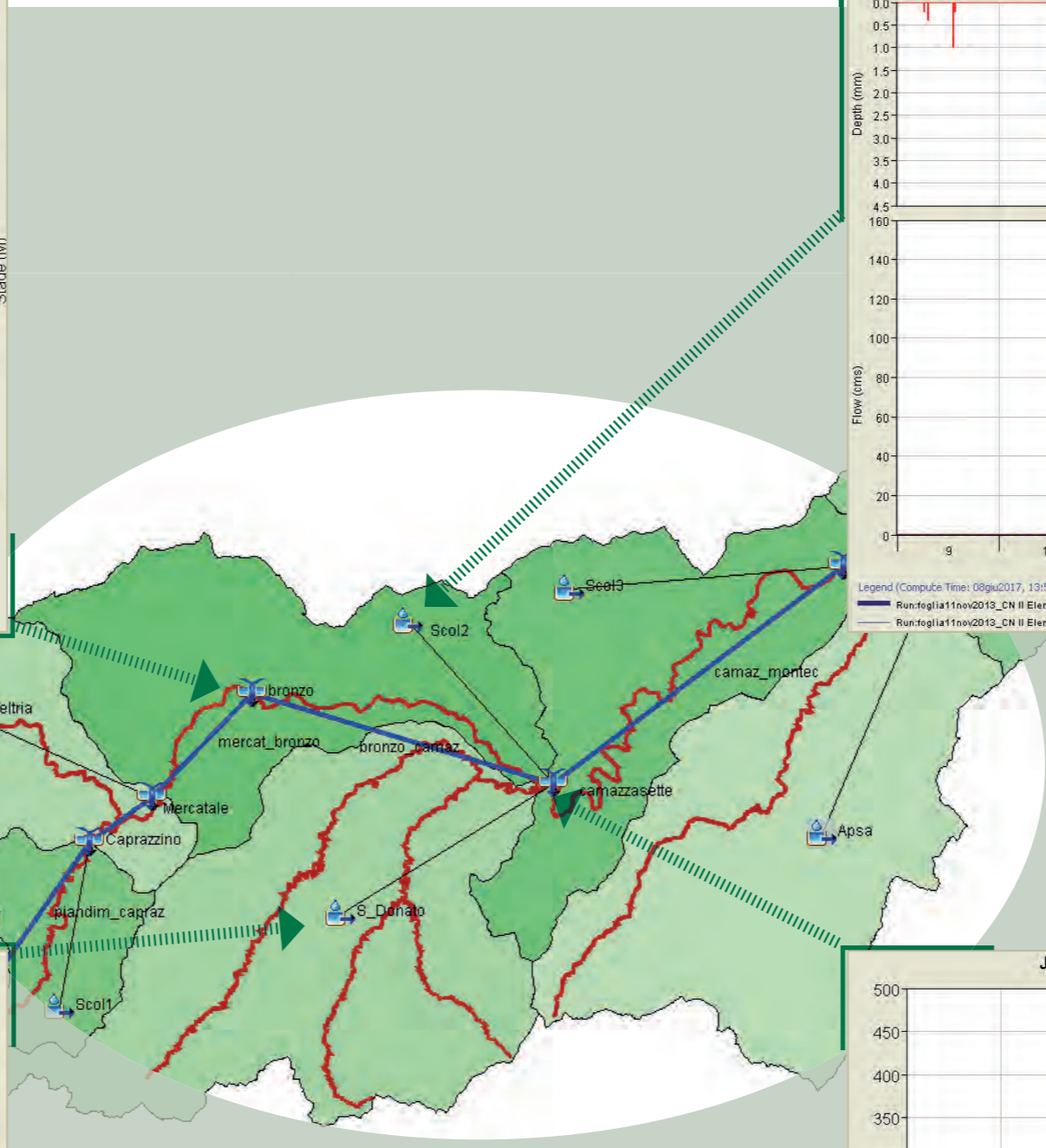
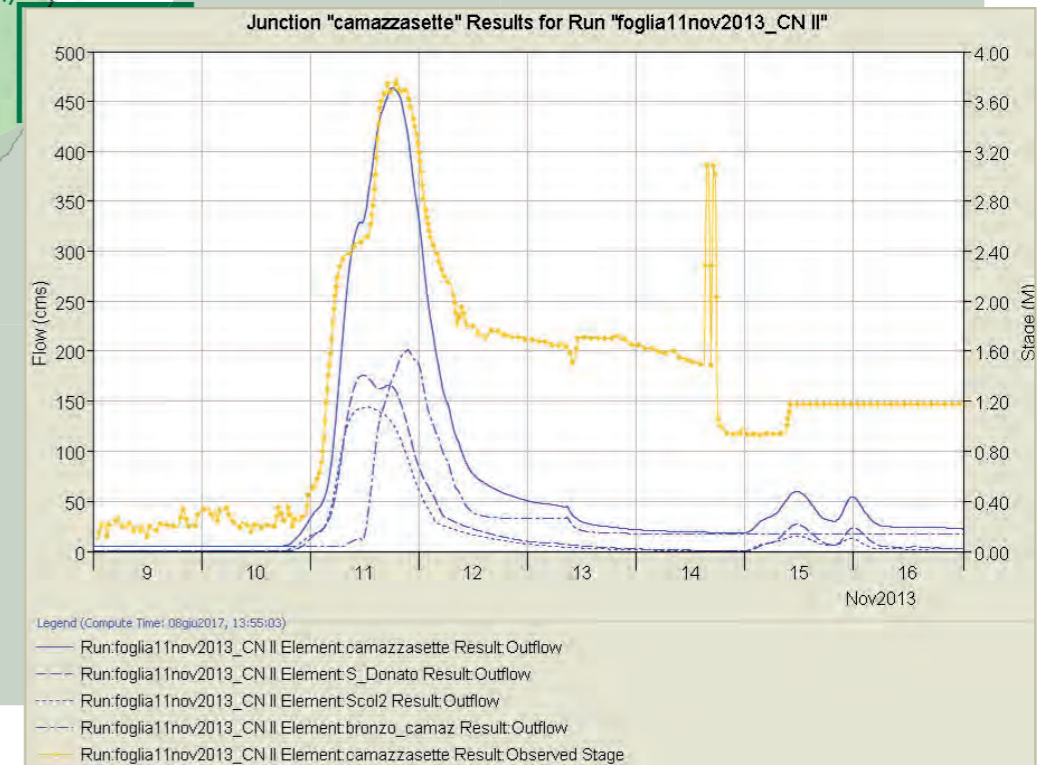
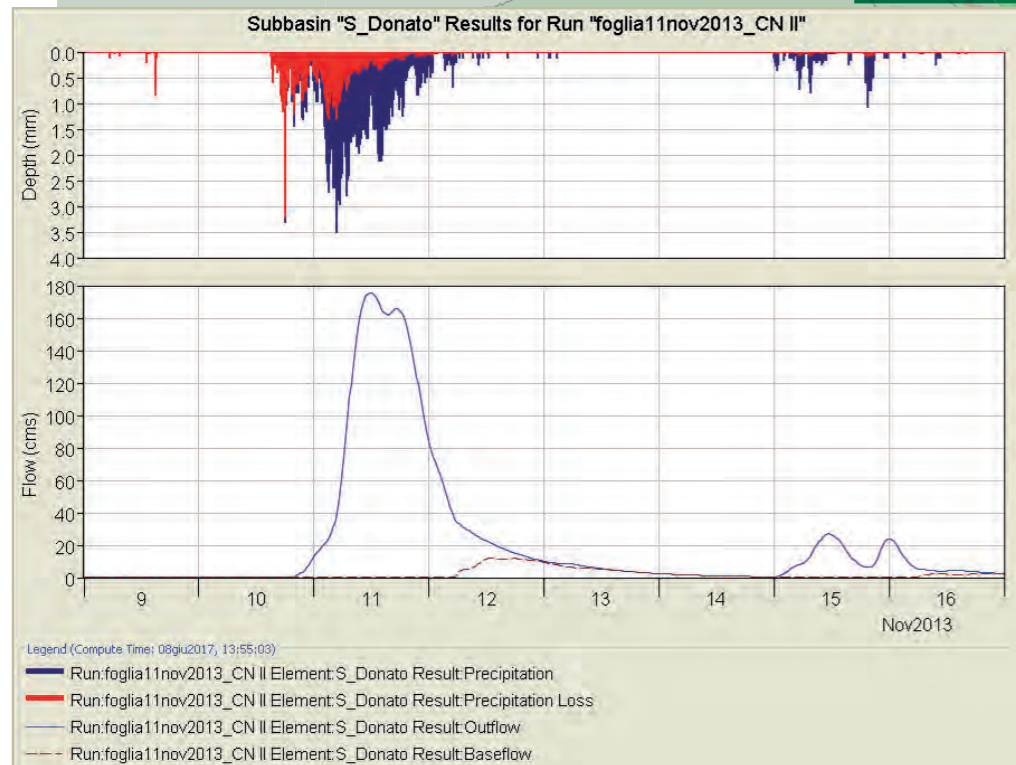
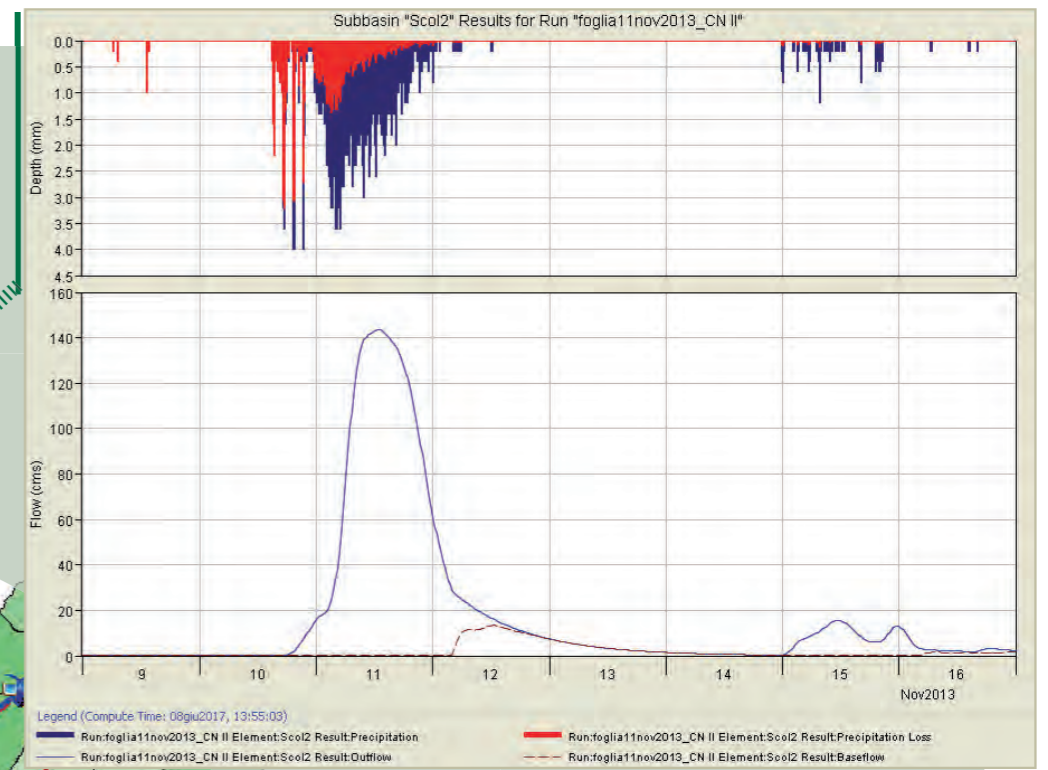
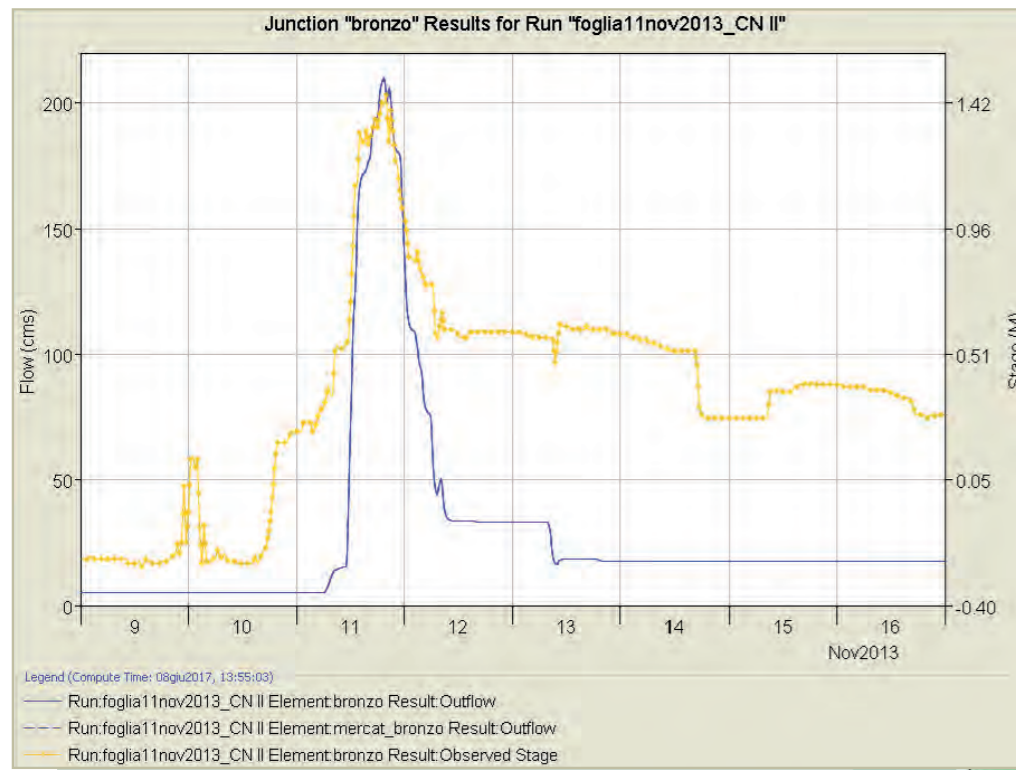


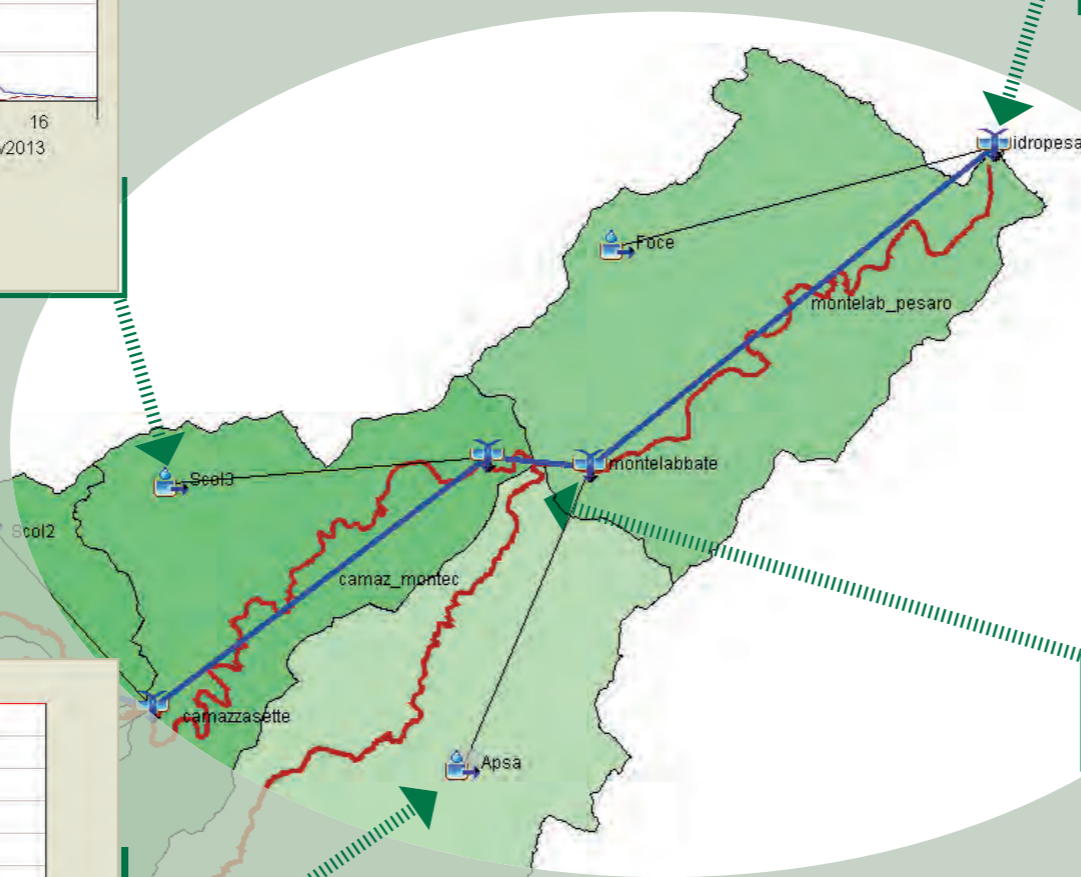
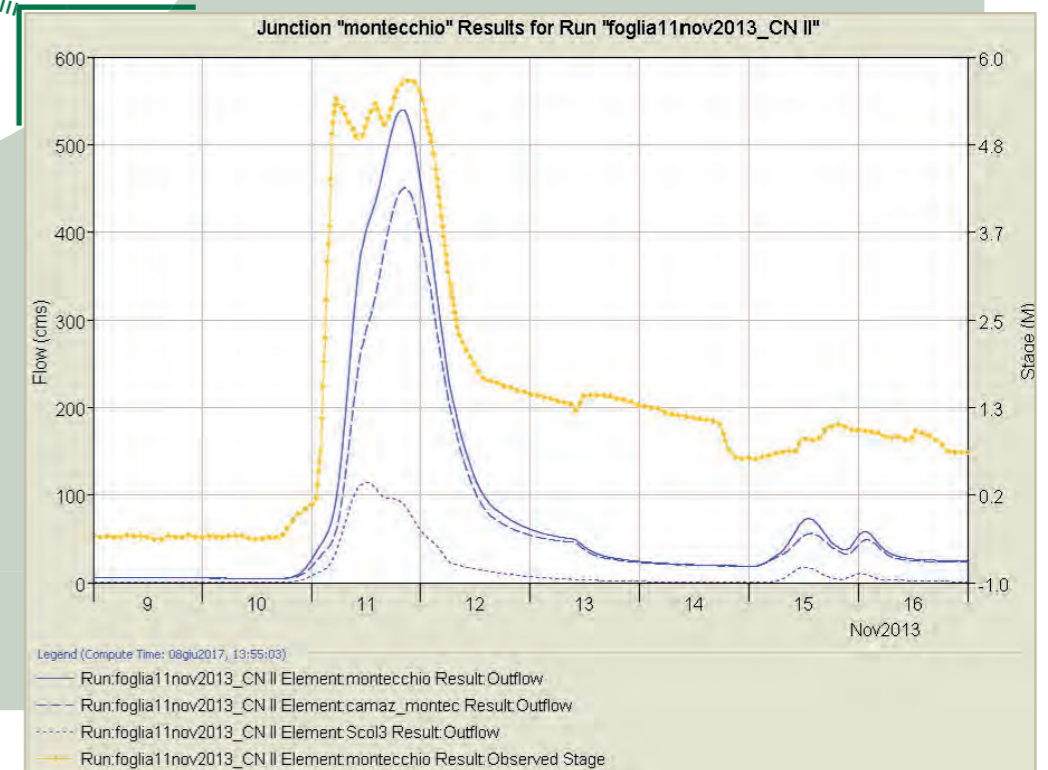
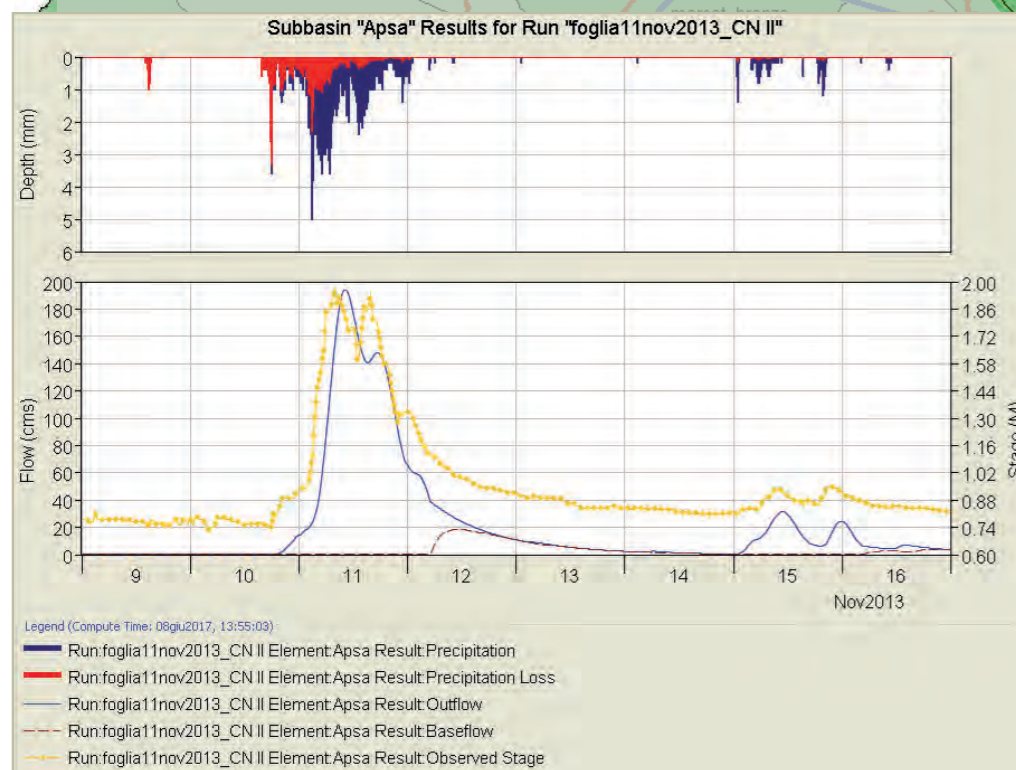
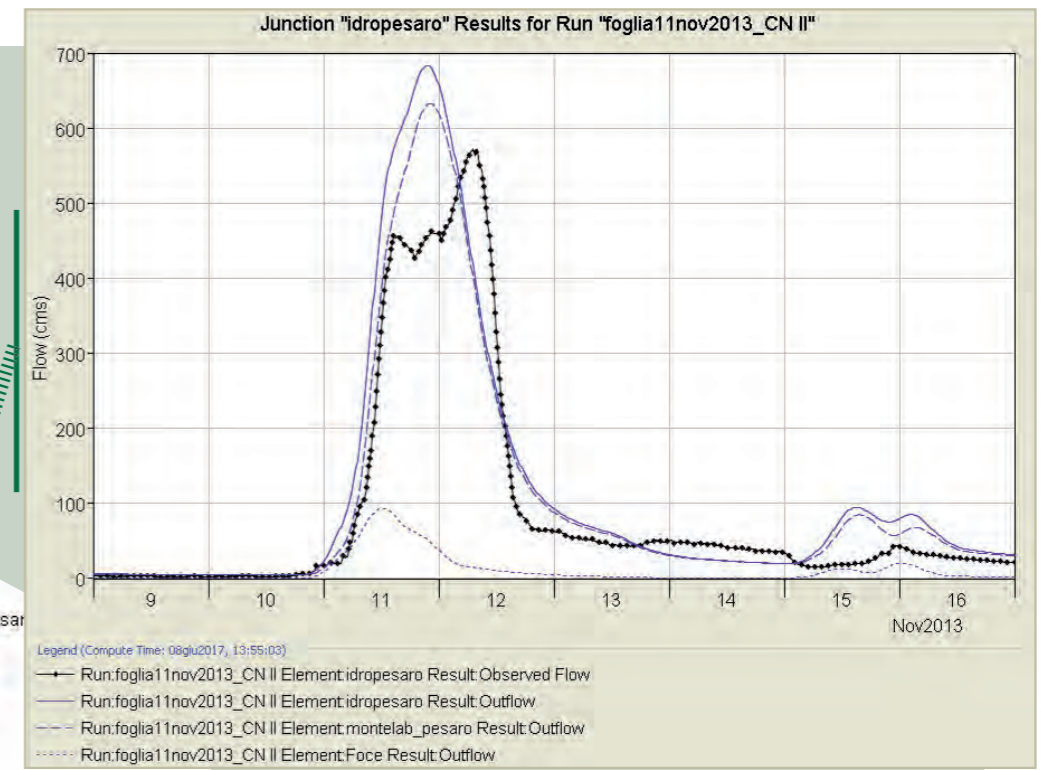
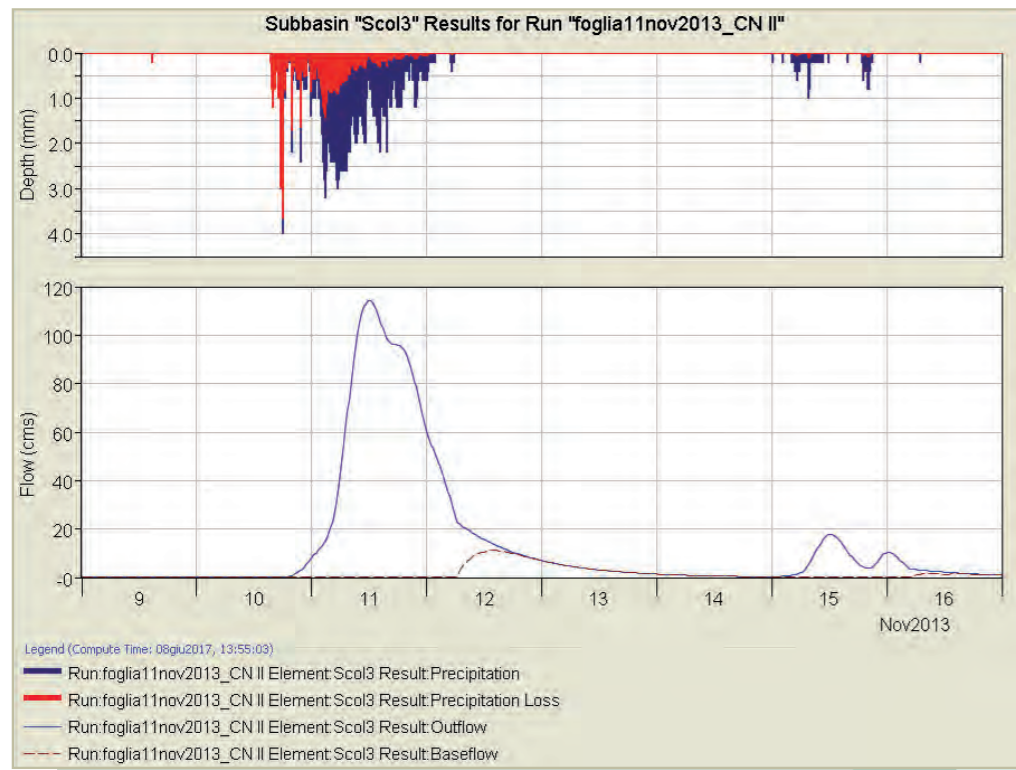
1:150.000

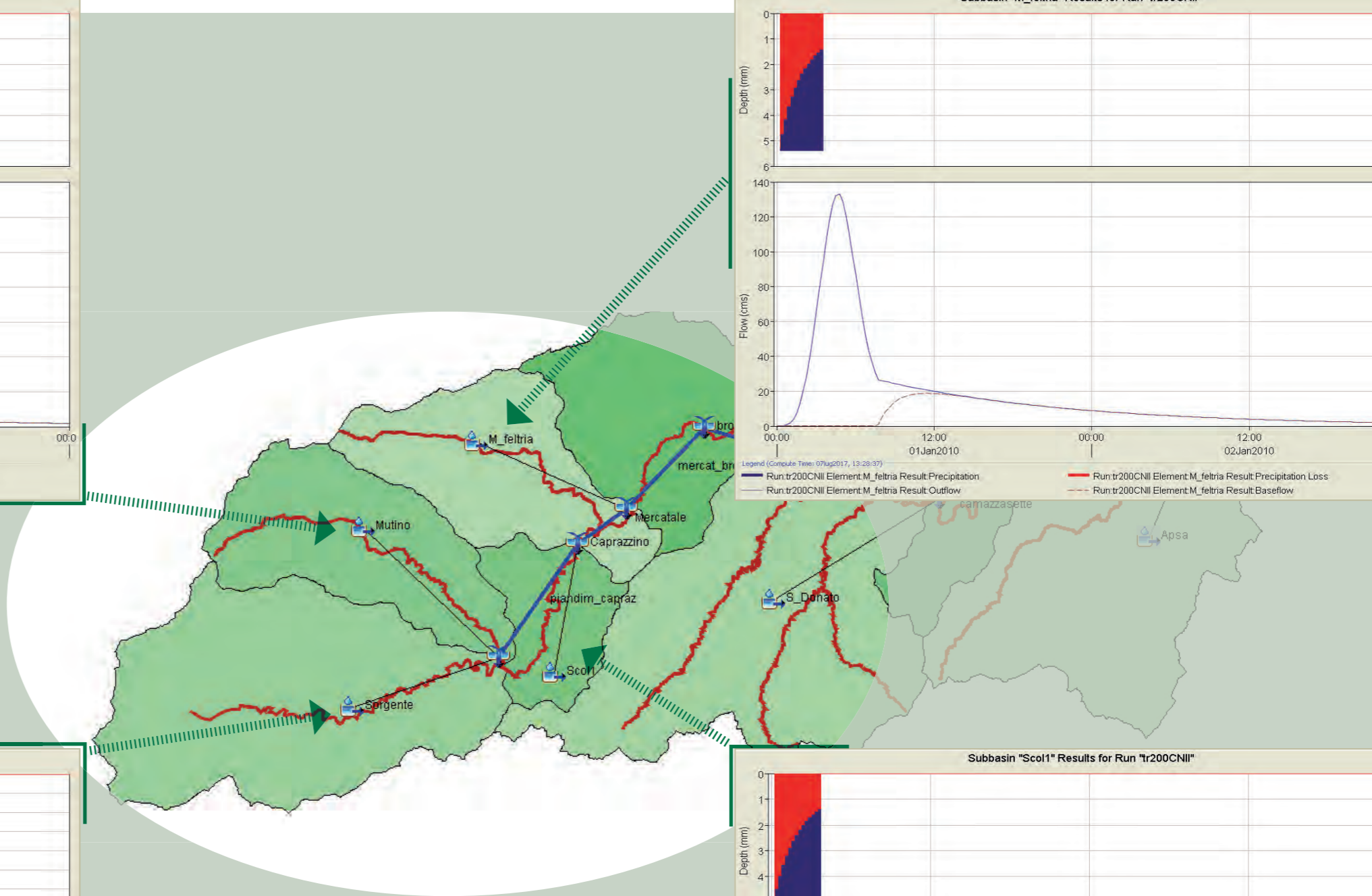
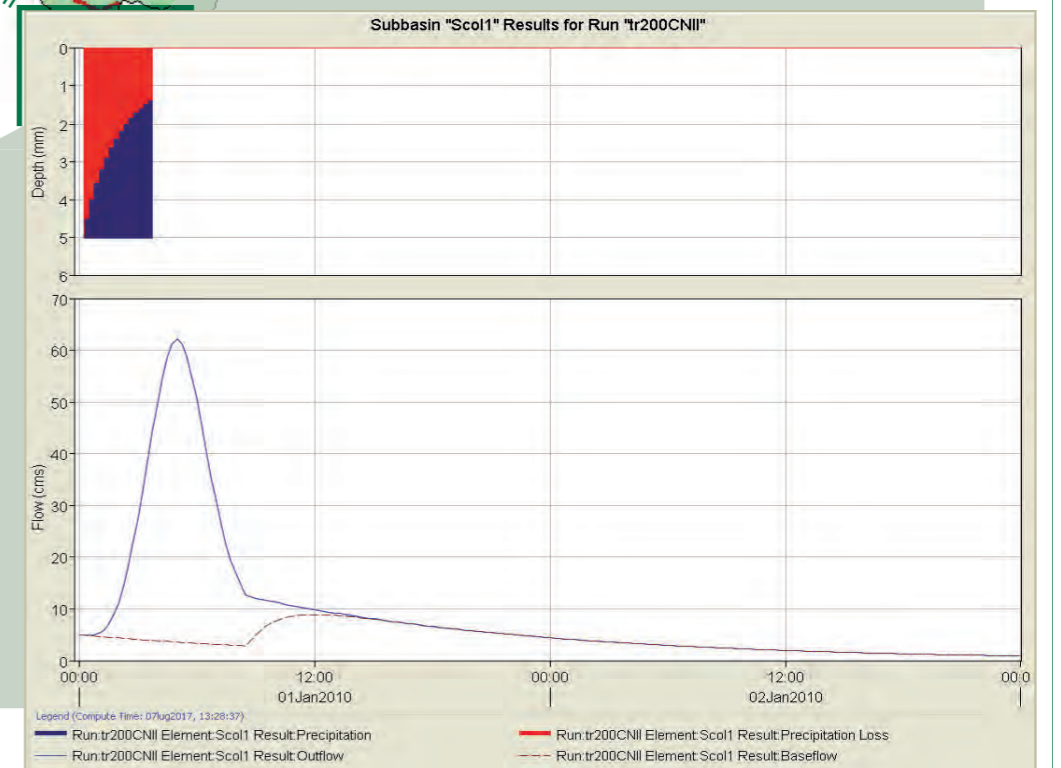
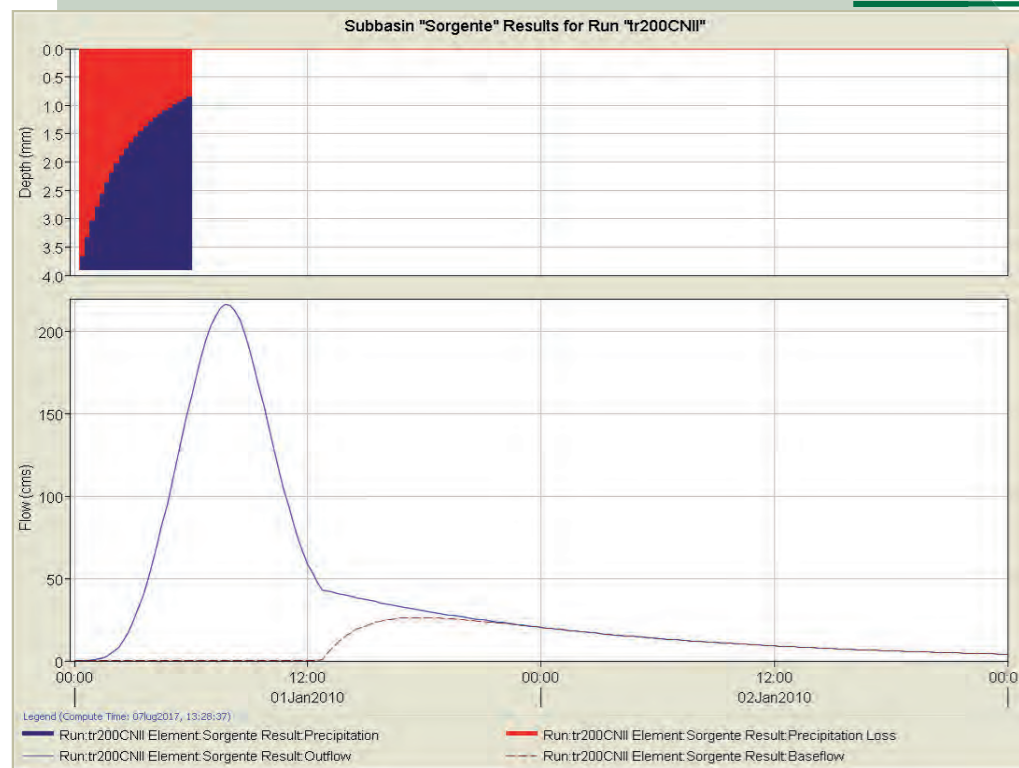
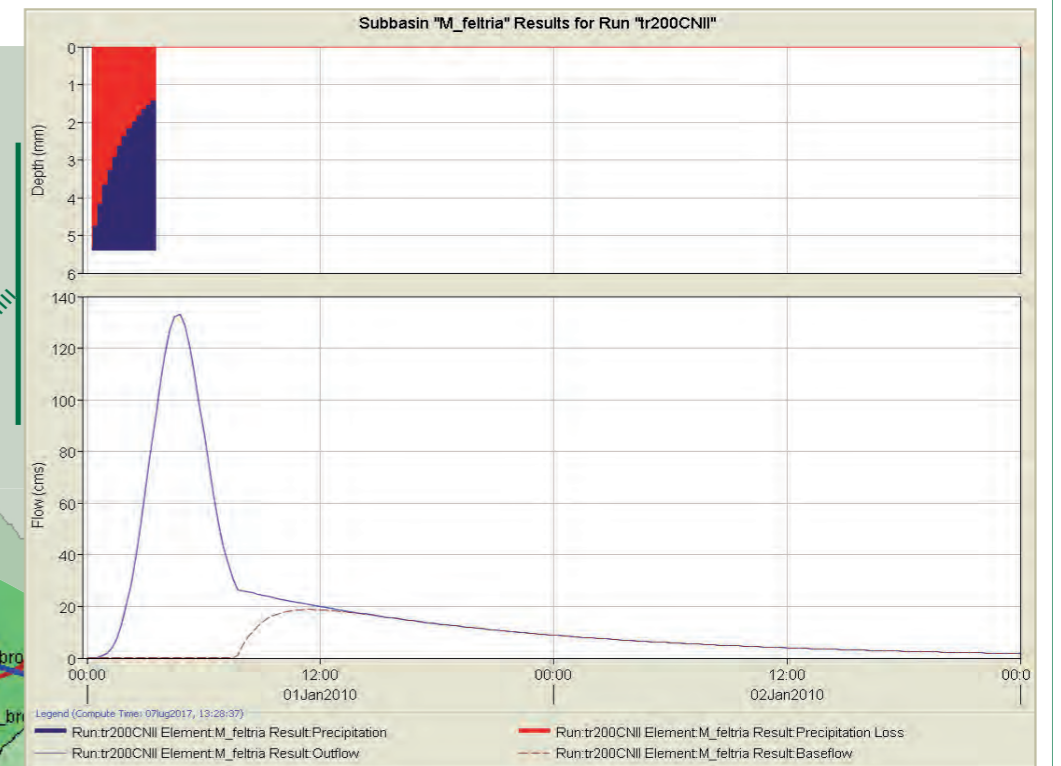
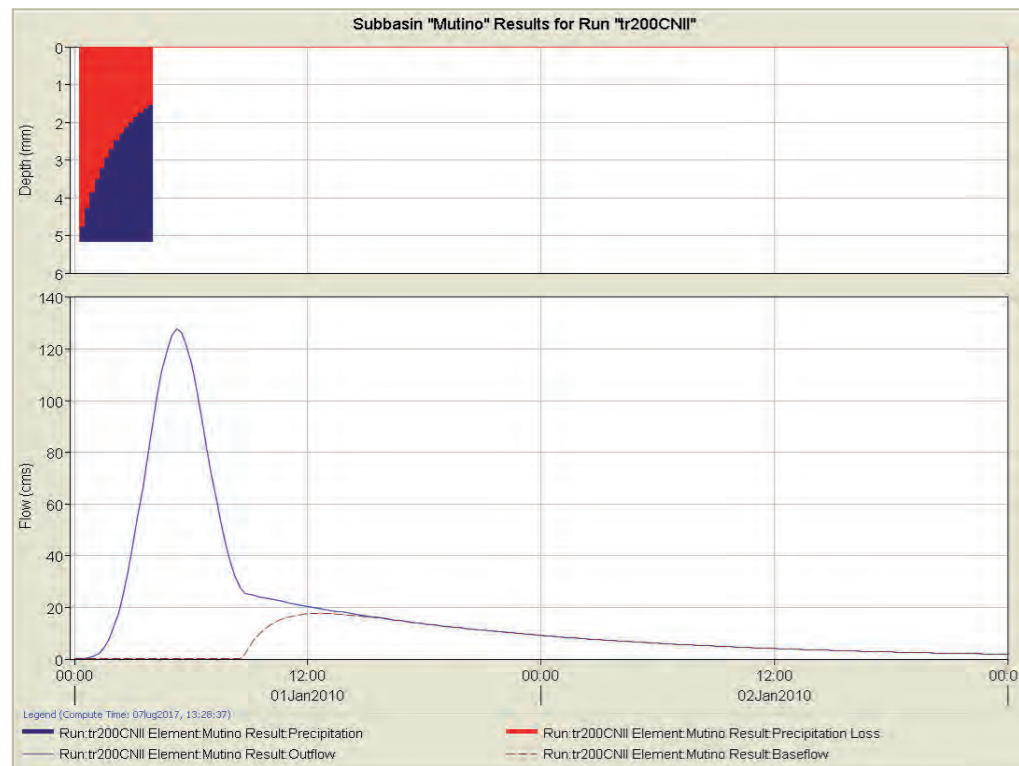


Cod.	Sottobacino	a	n
03-OA	Sorgente	38.32	0.316
03-OB	Mutino	37.67	0.327
03-OC	Scolante1	34.77	0.324
03-OD	Apsa di Macerata Feltria	35.60	0.326
03-OE	Scolante 2	35.07	0.343
03-OF	Apsa di San Donato	35.81	0.327
03-OG	Scolante 3	36.84	0.326
03-OH	Apsa di Urbino	36.47	0.332
03-OI	Foce	39.23	0.305

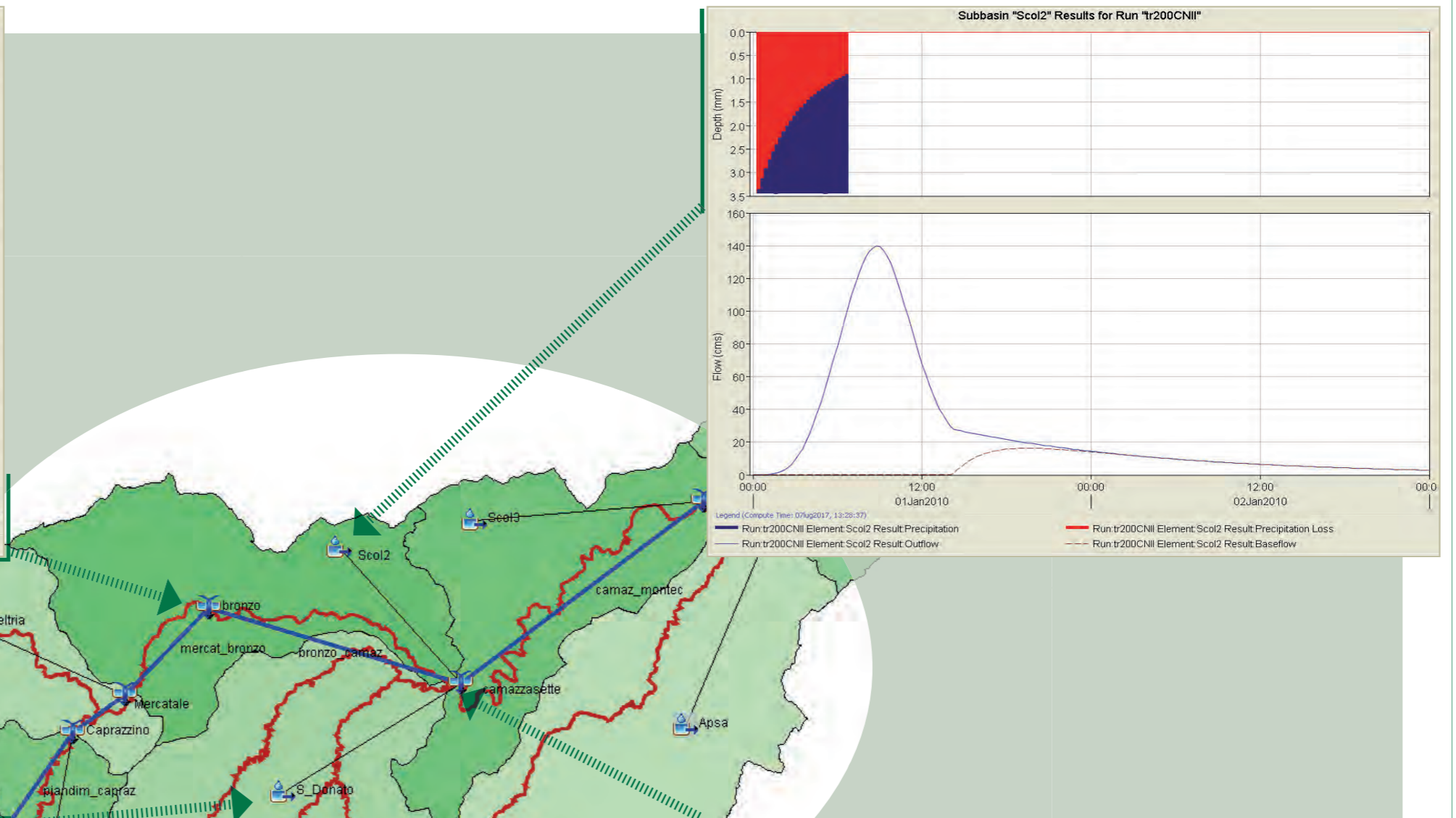
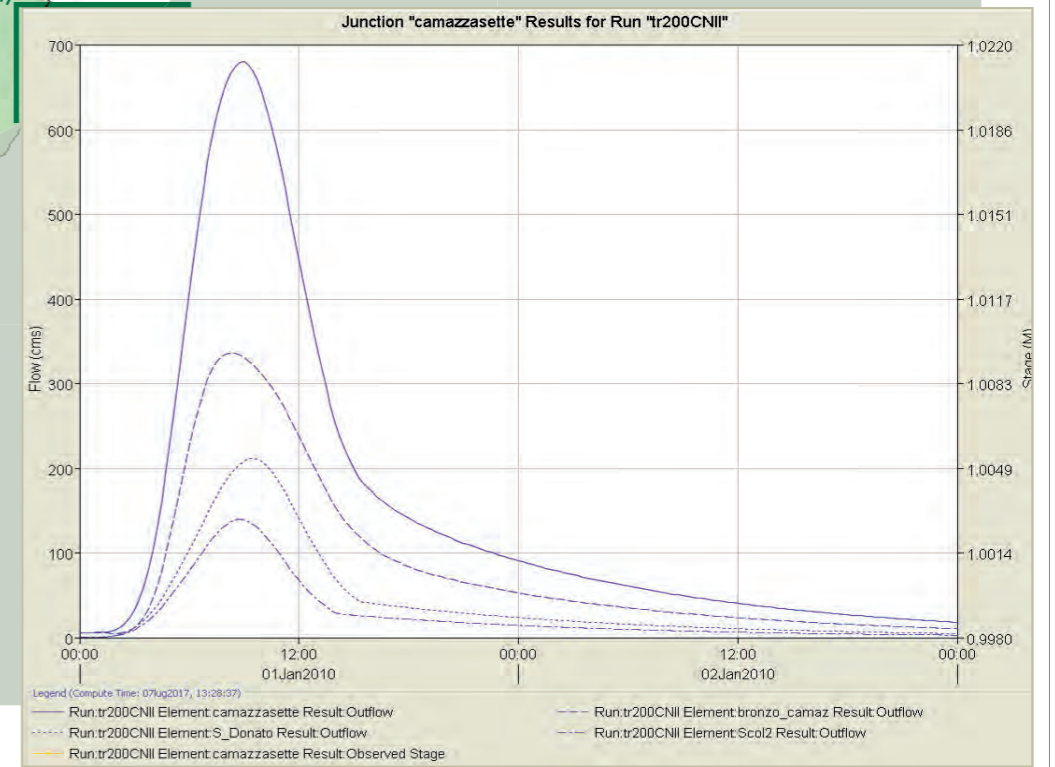
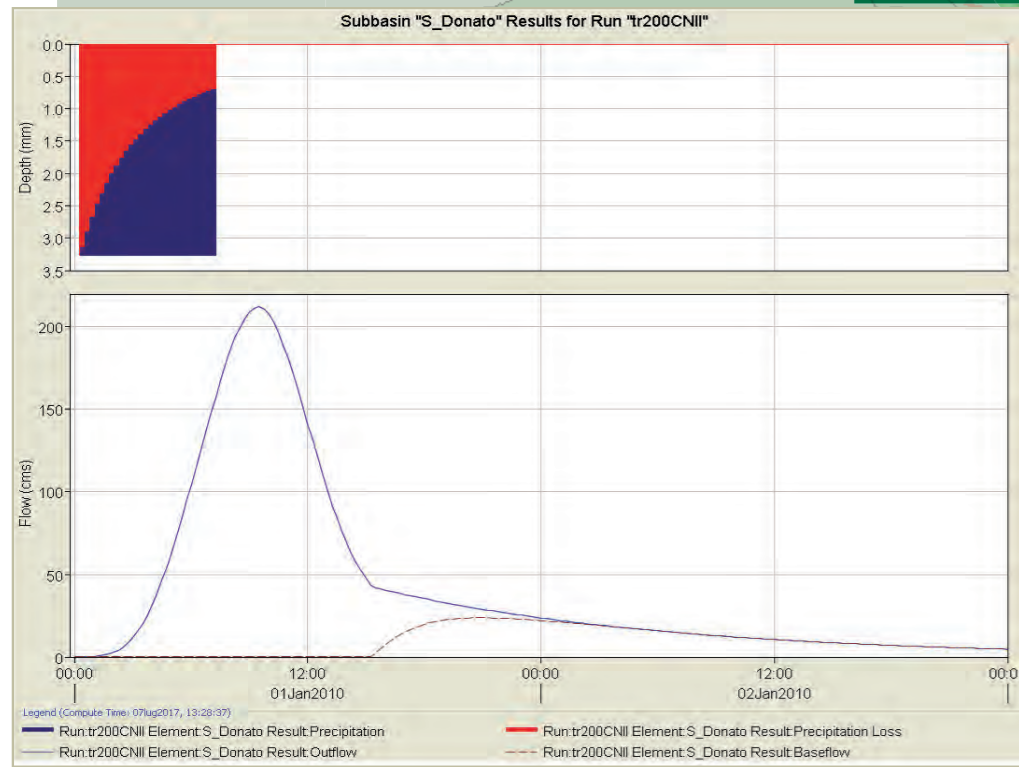
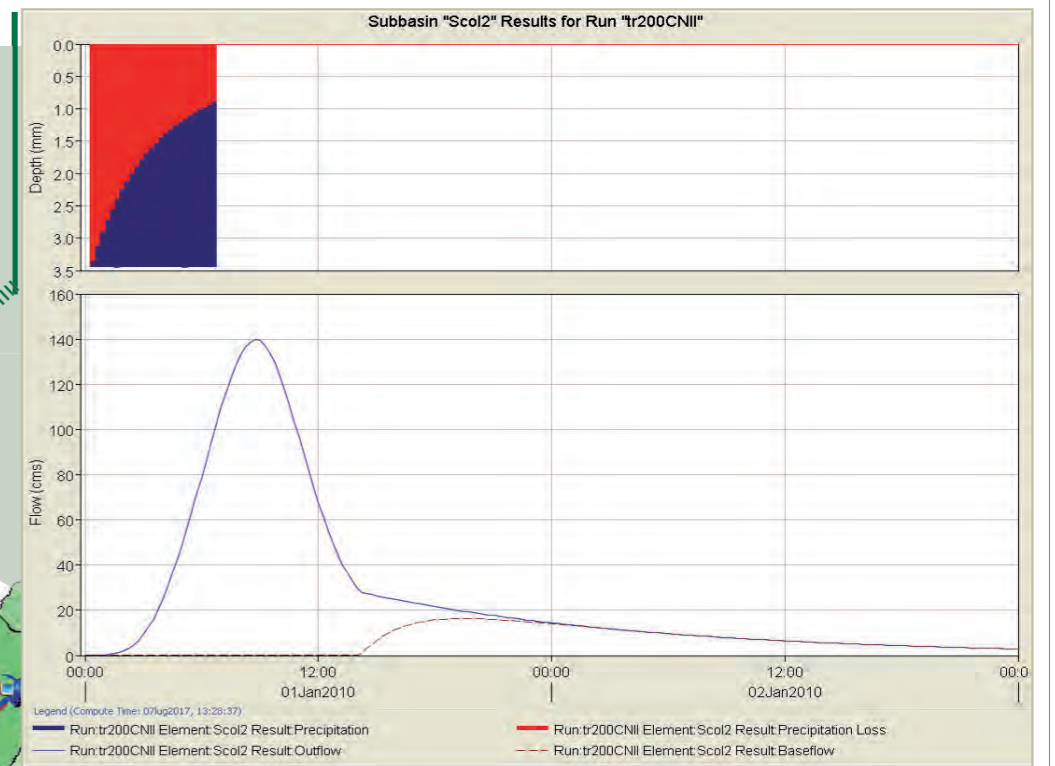
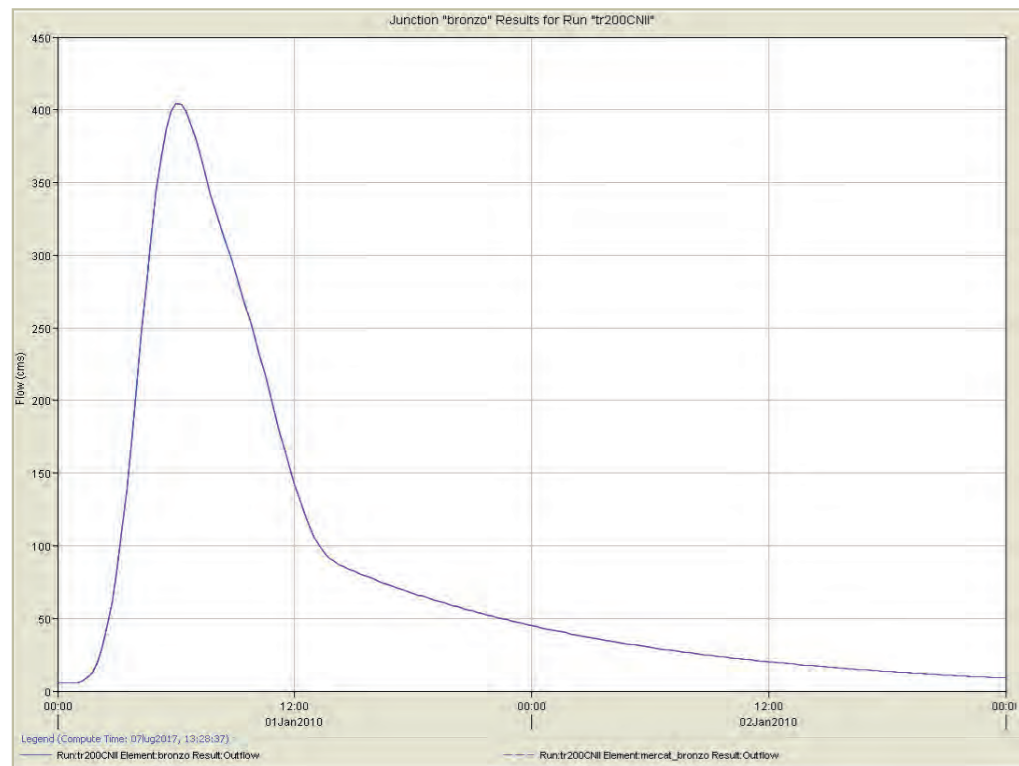


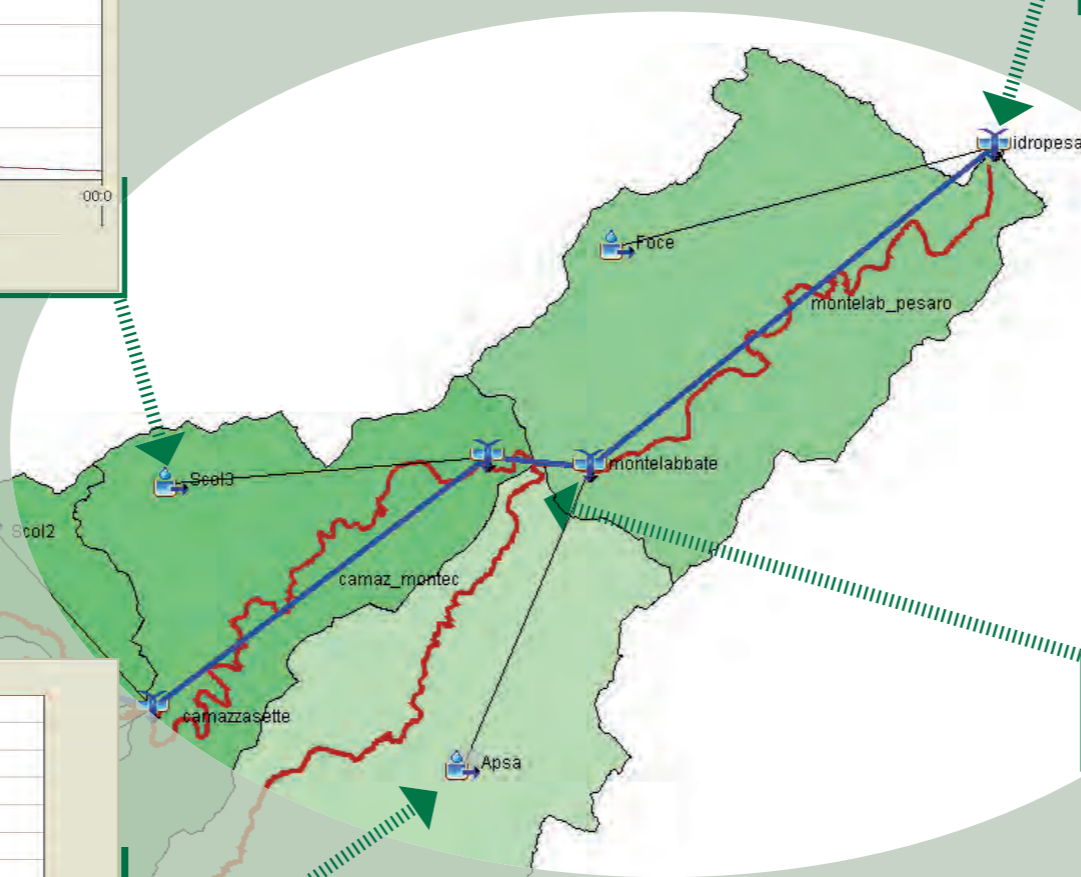
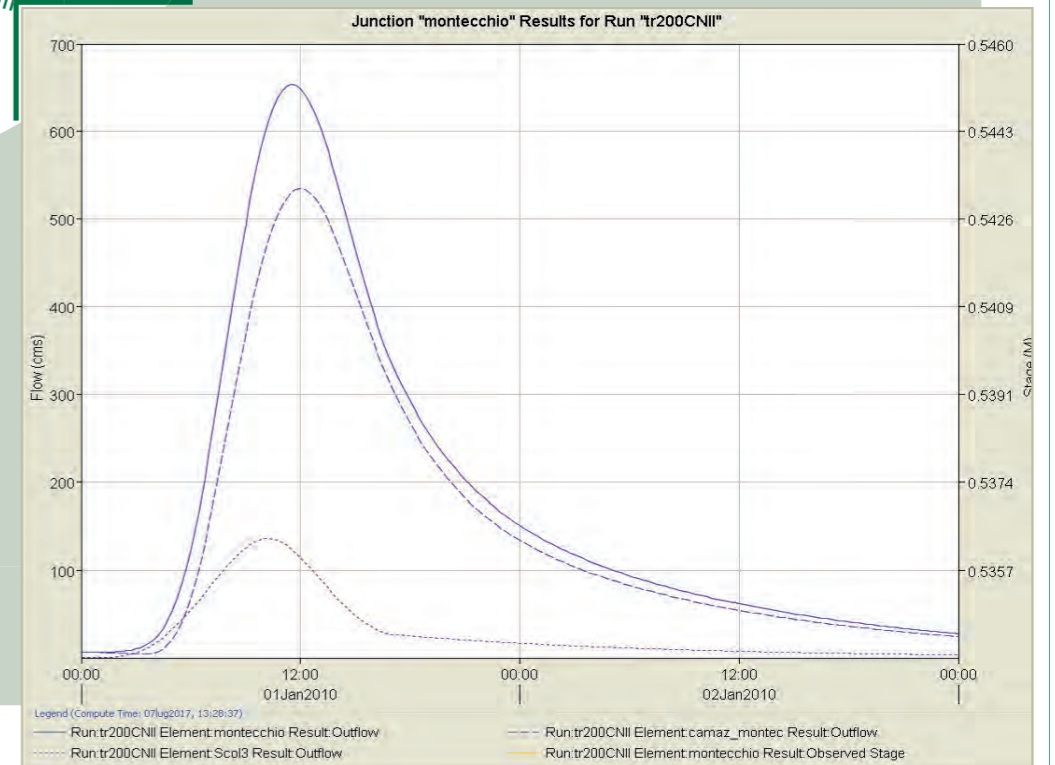
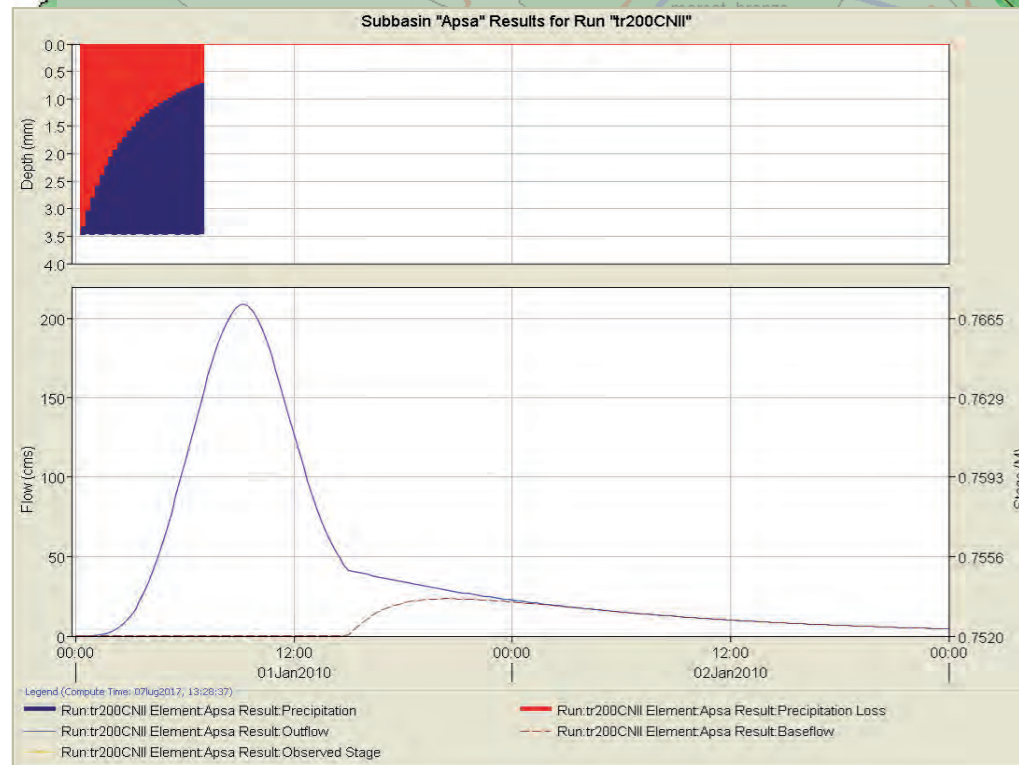
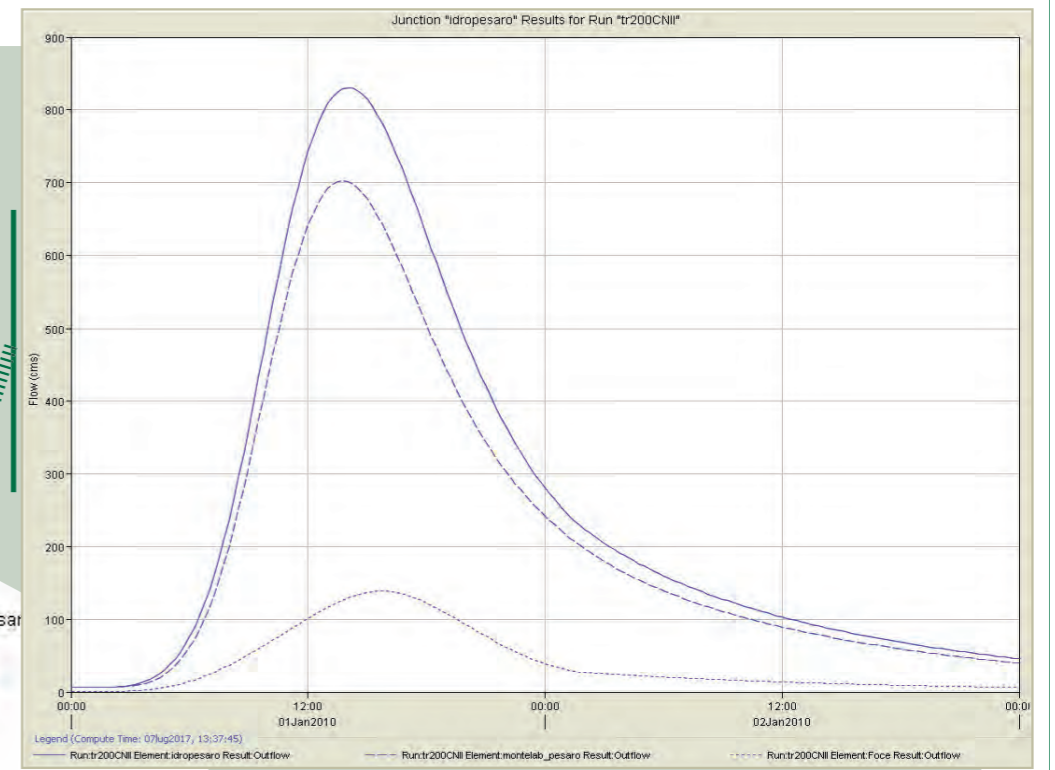
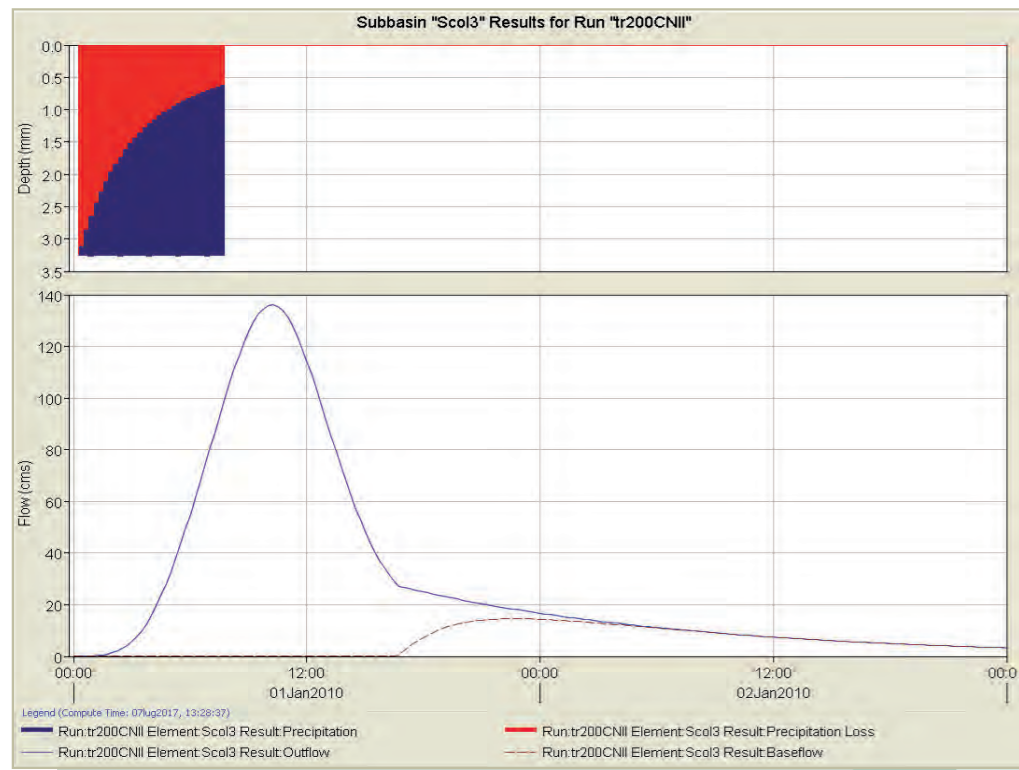






Ricostruzione idrogramma SCS-CN per il Tr = 200 anni





Riepilogo portate attese con  $Tr = 50 - 100 - 200$  anni vari metodi

Cod.	Sottobacino	SCS-CN			Met. Razionale			Regionalizzazione		
		tr50	tr100	tr200	tr50	tr100	tr200	tr50	tr100	tr200
O3-OA	Sorgente	162	191	221	151	182	215	512	571	602
O3-OB	Mutino	94	112	131	83	101	121	237	267	281
O3-OC	Scolante1	238	282	329	234	283	336	810	905	960
O3-OD	Apsa di Macerata Feltria	99	117	137	89	108	128	173	189	205
O3-OE	Scolante 2	301	357	417	323	391	464	630	705	790
O3-OF	Apsa di San Donato	155	183	212	149	179	211	310	342	364
O3-OG	Scolante 3	520	616	716	469	566	671	716	839	900
O3-OH	Apsa di Urbino	154	182	211	146	175	207	435	479	512
O3-OI	Foce	654	783	895	566	682	808	904	1080	1270

