

// NWRM Mediterranean Network

Regional Workshop #2



Turin (Italy), September 11th - 12th, 2014 (from noon to noon)
Regione Piemonte, Direzione Ambiente, Via Principe Amedeo 17, 10123 Torino

Organized by

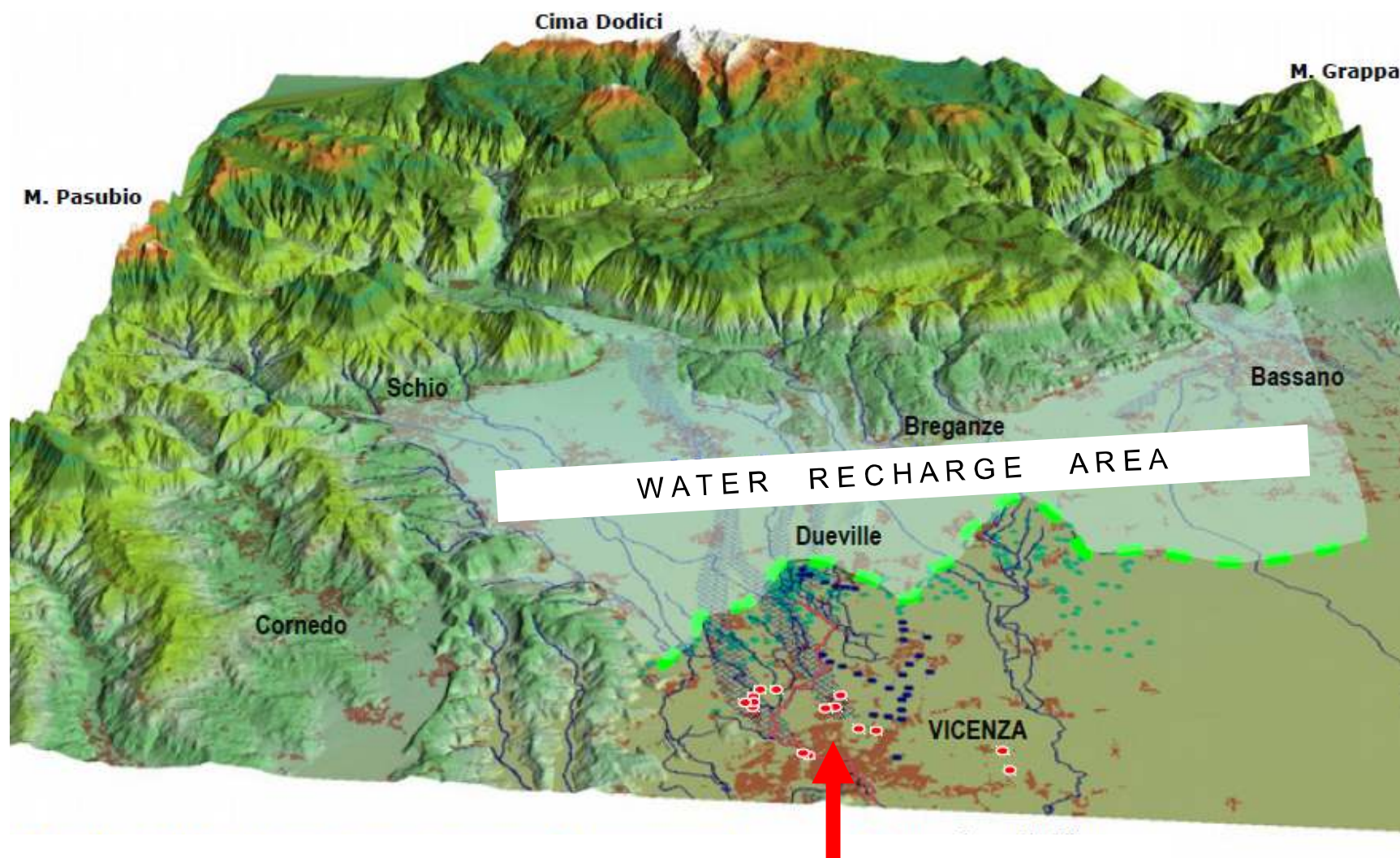


Supported by



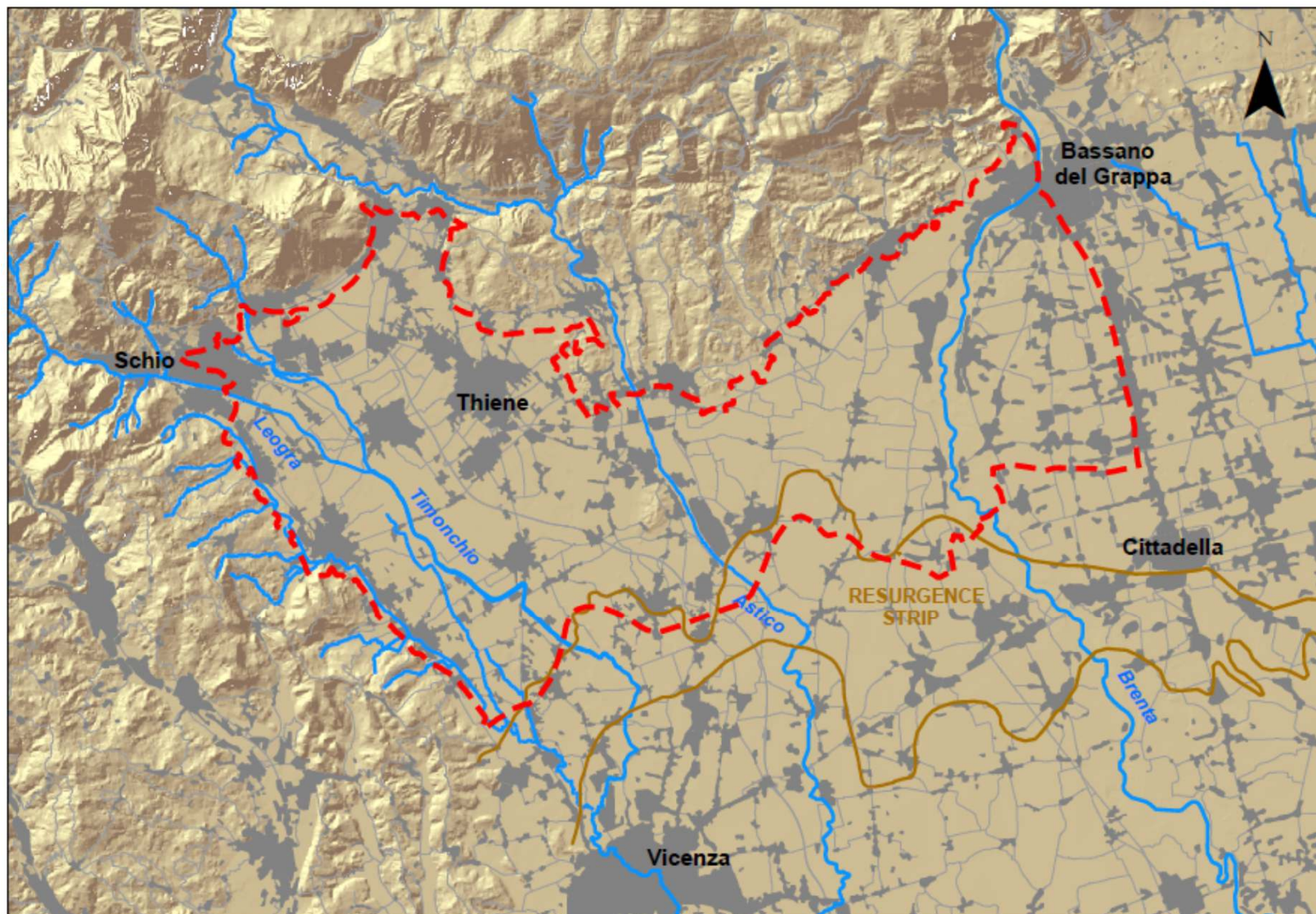
WATER BANKING THROUGH MANAGED AQUIFER RECHARGE

Giancarlo Gusmaroli
ENVIRONMENTAL ENGINEER
Technical-Scientific Coordinator



PUBLIC WELLS

WHERE ?



**ABOUT
300
KM²**

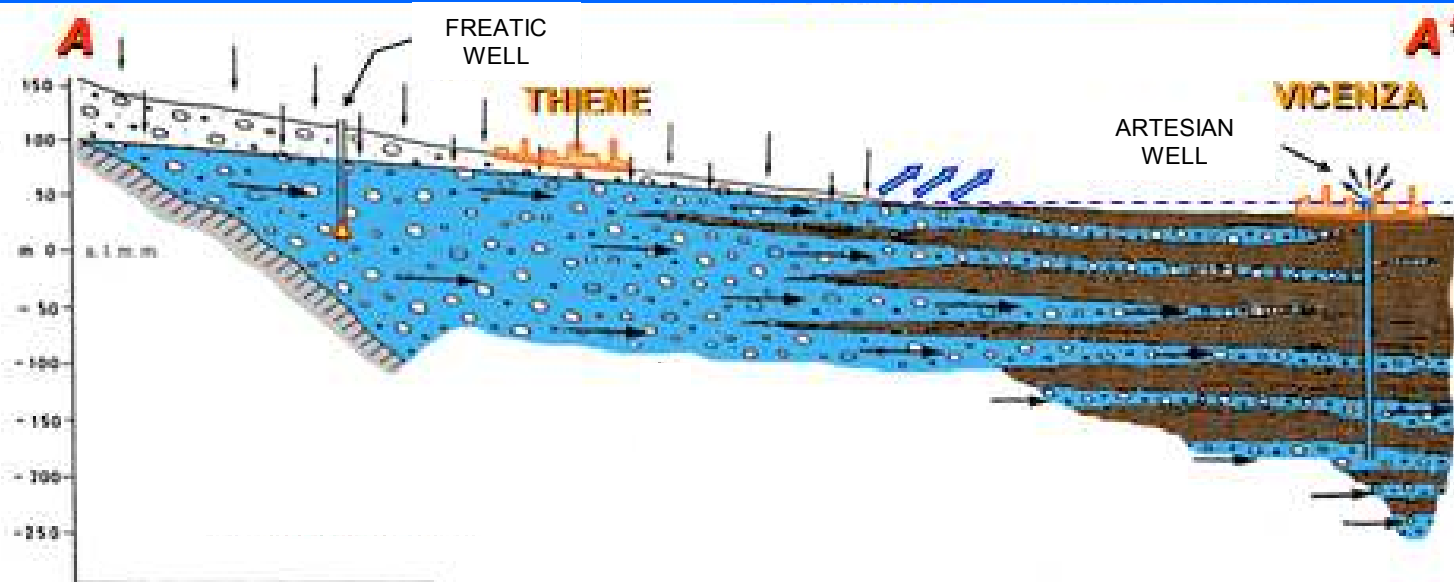
WHERE ?

HIDROGEOLOGICAL PROFILE

RECHARGE

RESURGENCE

STORAGE



WHY ?



WHY ?

**WATER WHITDRAWAL
INCREASE
(consumption + waste)**

**ARTIFICIAL CHANGE OF RIVER
SETTING AND MORPHODYNAMISM**

SOIL SEALING

**REVAMPING OF
IRRIGATION SYSTEMS**

HYDROPOWER EXPLOITATION

CLIMATE CHANGE

WHY ?

DEPRESSURIZATION OF FREATIC AQUIFERS AND WATER TABLE DECREASE WITHIN FREATIC AQUIFER



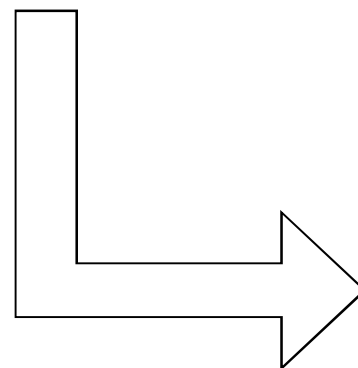
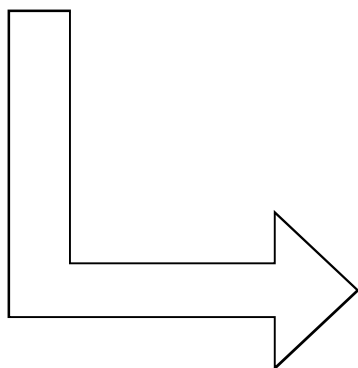
BASEFLOW REDUCTION OF
RESURGENCE WATERCOURSES



BASEFLOW REDUCTION
OF MAIN RIVERS



PUMPING COSTS
INCREASE



BIODIVERSITY
DEPLETION



RECREATIONAL
VALUE DECREASE

WHY ?

WFD-RBMP (2010) ENVIRONMENTAL OBJECTIVES

Water Body name	code	risk	chemical quality target	quantitative status target
ALTA PIANURA VICENTINA EST	APVE	NR	GOOD BY 2015	GOOD BY 2015
ALTA PIANURA VICENTINA OVEST	APVO	PR	GOOD BY 2021	GOOD BY 2015

NR = NOT AT RISK
PR = POSSIBLY AT RISK

(source: RBMP)

WHY ?

TOTAL BUDGET

about 1.800.000 euro

of which

EUROPEAN COMMISSION CO-FUNDING

about 700.000 euro

LOCAL PARTNER CO-FUNDING

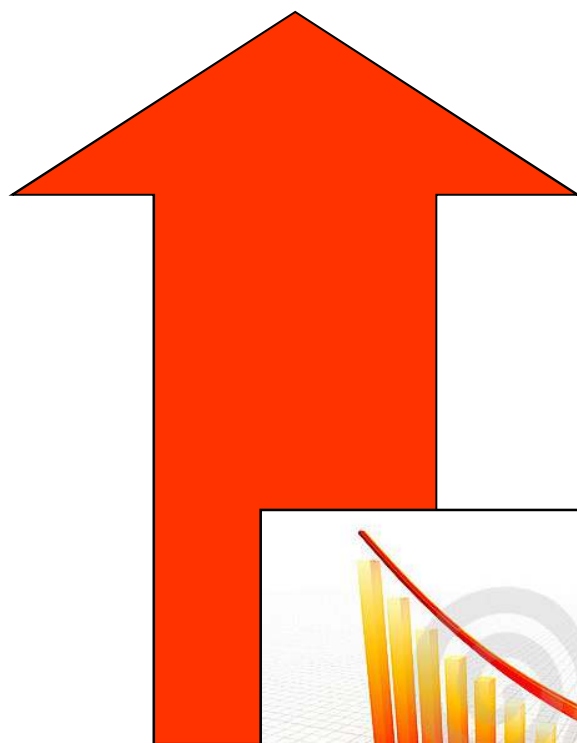
about 1.100.000 euro

HOW MUCH ?

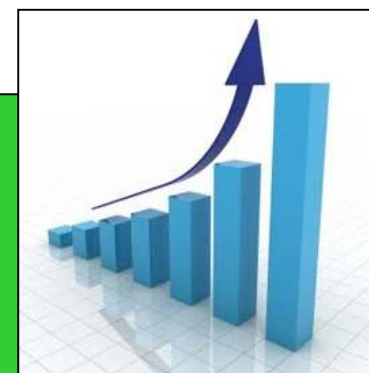
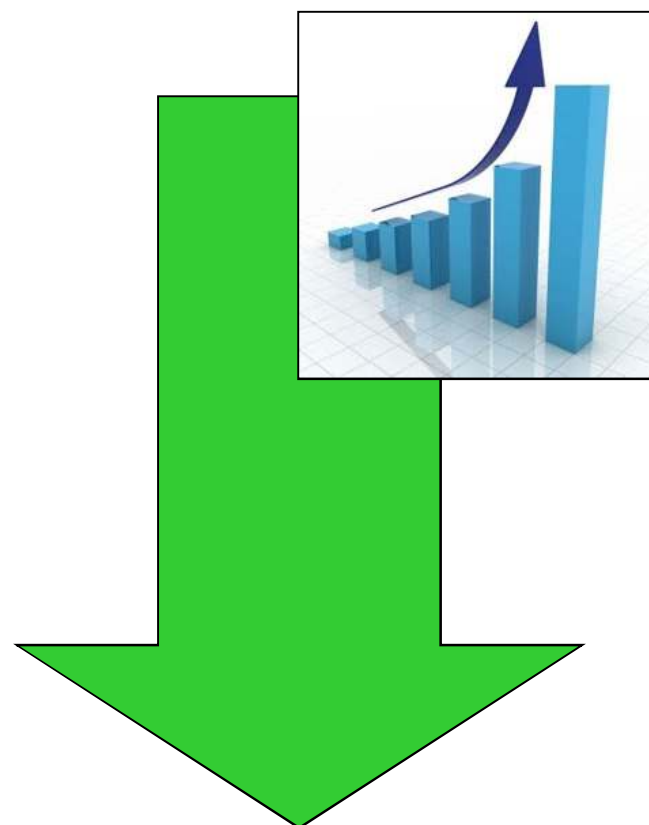
developing an adaptive strategy to the climate changes for the sustainable governance of the upper Vicenza's plain groundwater resources

GENERAL OBJECTIVE

OUTPUT



INPUT



WHAT ?



C1

2 infiltration wells

C2

4 infiltration wells

C3

1 infiltration trench

C4

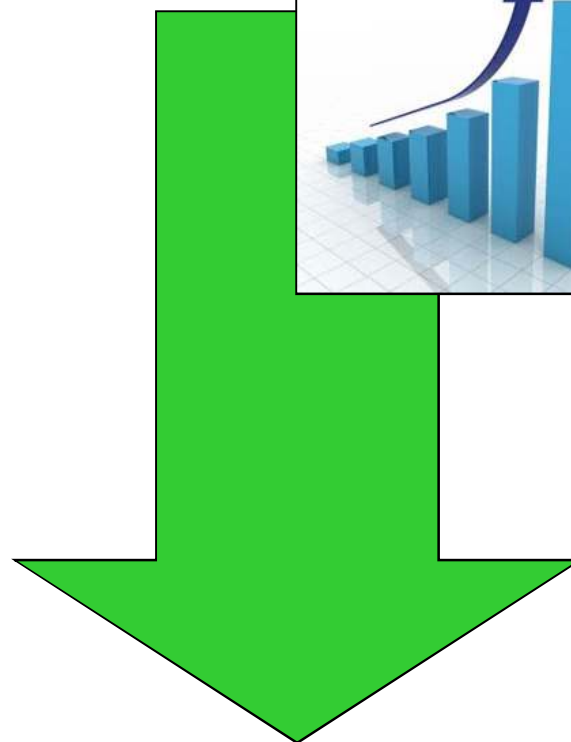
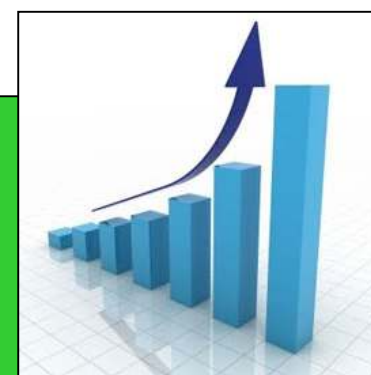
2 forested infiltration area

C5

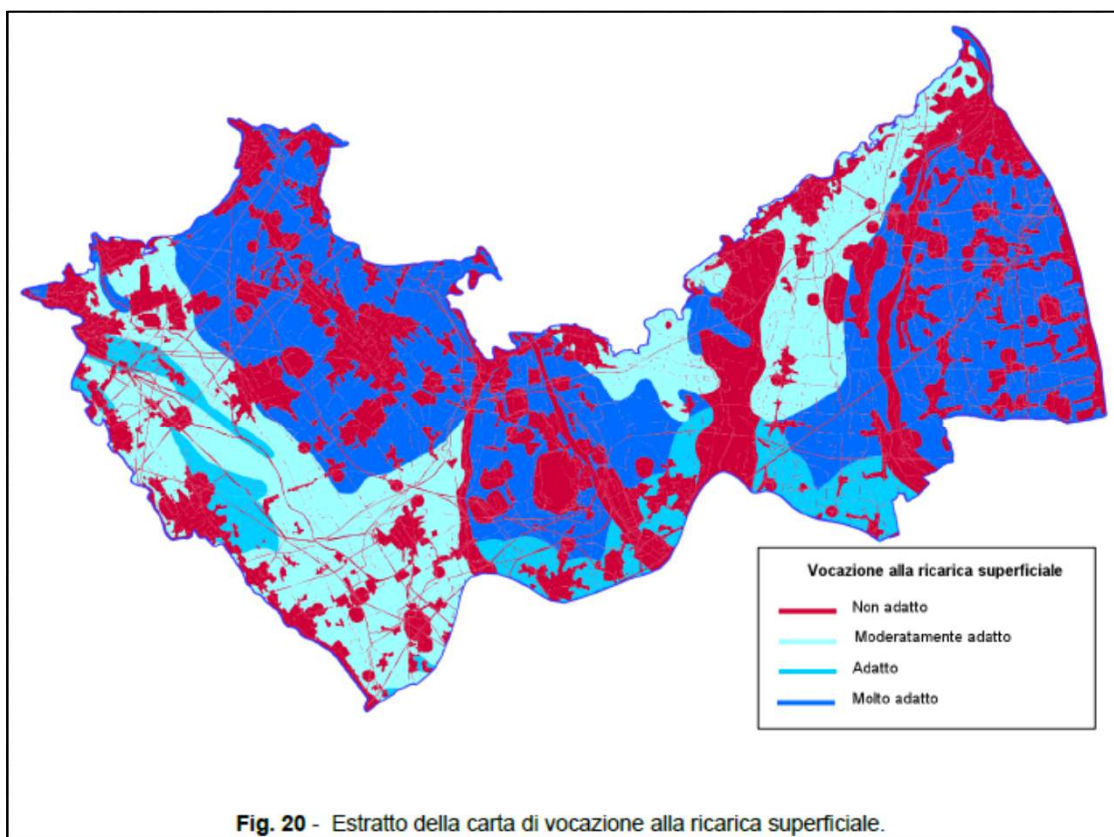
1 infiltration brook (basin)

1 (sub)infiltration field

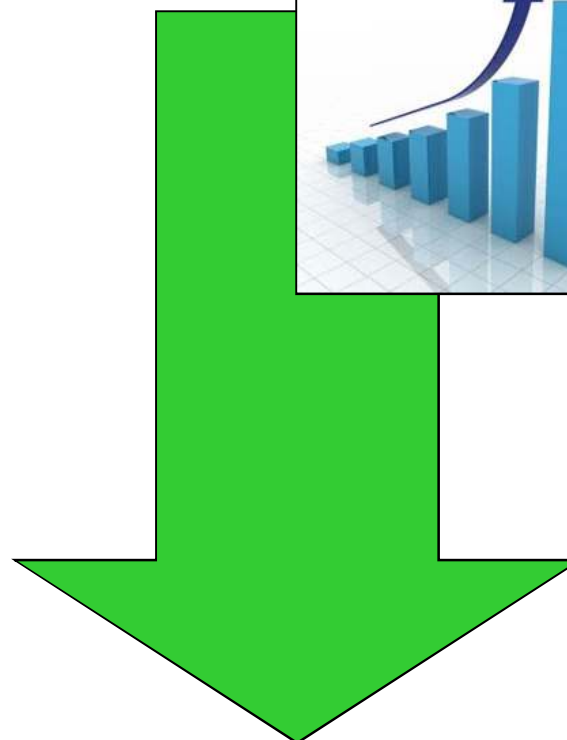
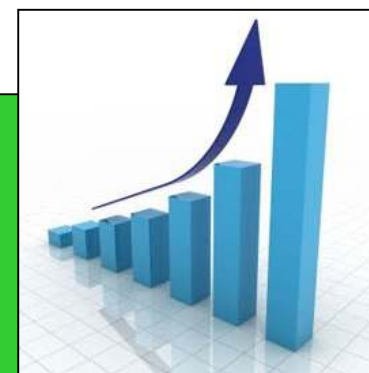
INPUT



WHAT ?



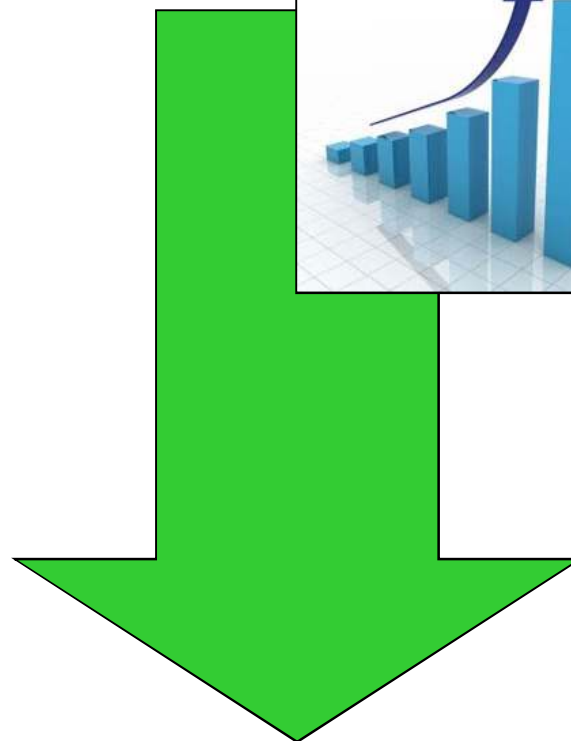
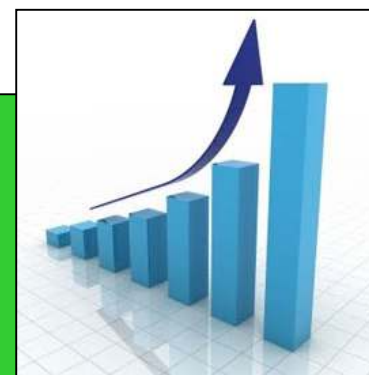
INPUT



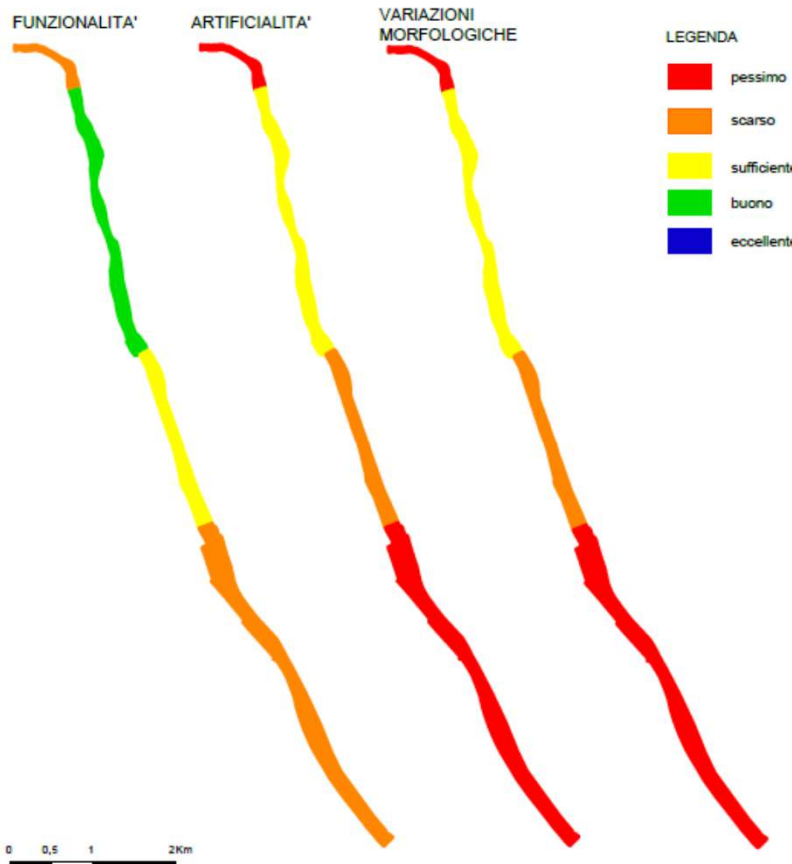
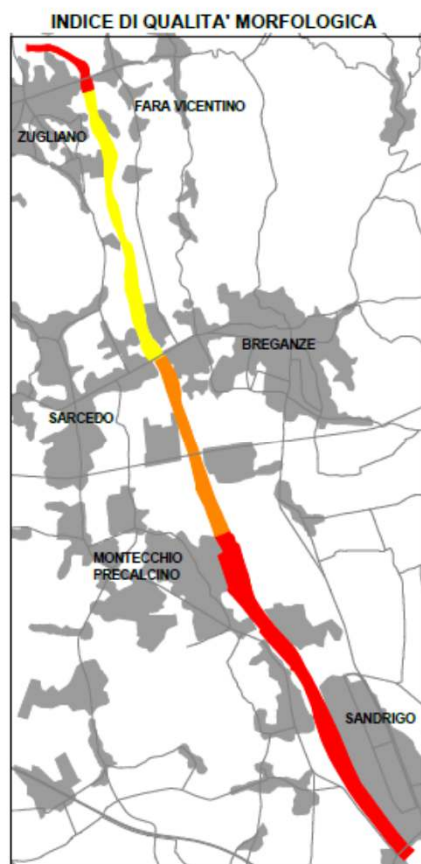
WHAT ?



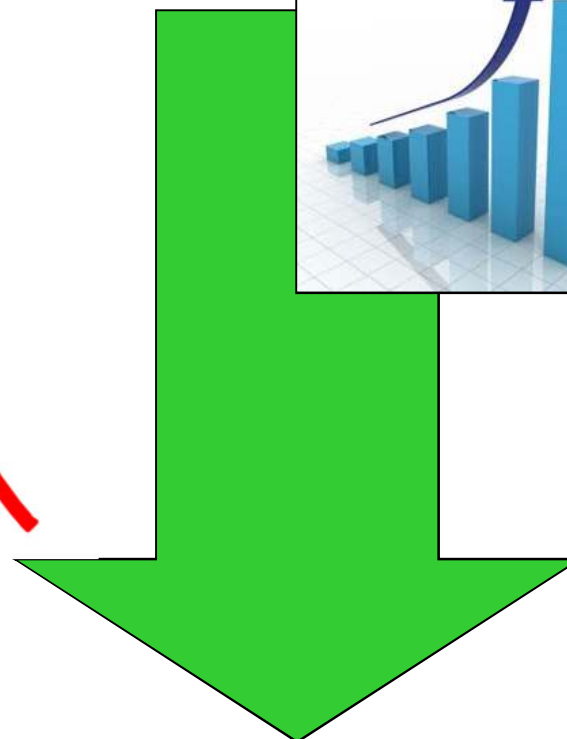
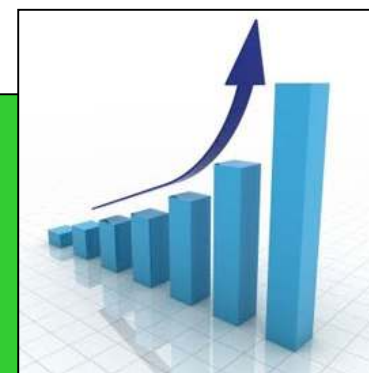
INPUT



WHAT ?



INPUT



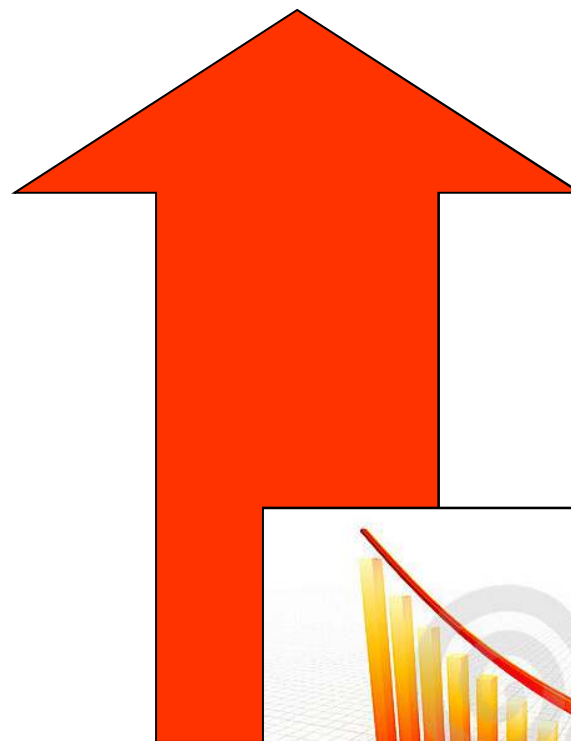
WHAT ?



WATER SAVING



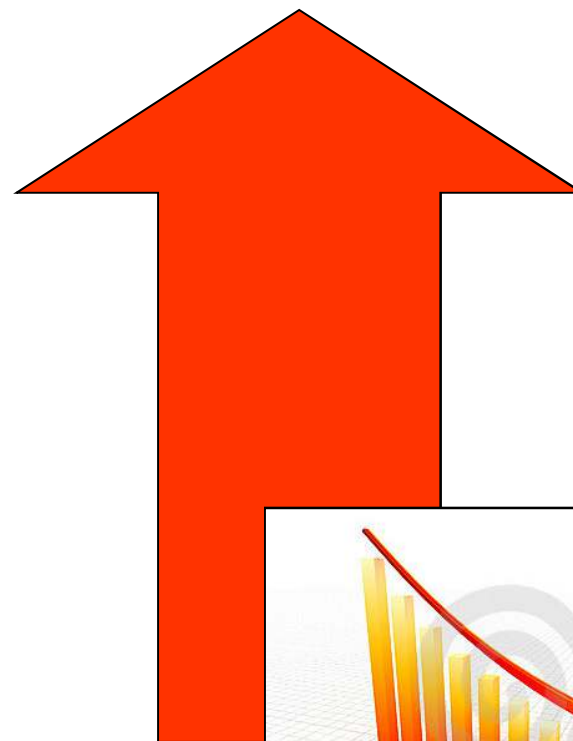
OUTPUT



WHAT ?



OUTPUT



WHAT ?



INIZIATIVA
NELL'AMBITO DI PROGETTI
FINANZIATI DAL PROGRAMMA
LIFE+ DELL'UNIONE EUROPEA

PROGETTO LIFE10 ENV/IT/380

IMPLEMENTAZIONE DI UNA
STRATEGIA PARTECIPATA DI
RISPARMIO IDRICO E RICARICA
ARTIFICIALE PER IL REQUILIBRIO
QUANTITATIVO DELLE FALDE
DELL'ALTA PIANURA VICENTINA
www.vicenzanatura.org

PROGETTO LIFE08 INF/IT/308

Water Against Climate Change
con il finanziamento di

www.wataclie.eu

**PROVINCIA
DI VICENZA** & **AMBIENTEITALIA**

PROMUOVONO

GIORNATA DI FORMAZIONE

IL RISPARMIO IDRICO NELLA PIANIFICAZIONE TERRITORIALE

soluzioni per la gestione sostenibile delle acque
attraverso strumenti urbanistici e norme edilizie

22 marzo 2012

Auditorium di ACQUE VICENTINE SPA
c/o sede centrale in via dell'Industria, 23 - VICENZA

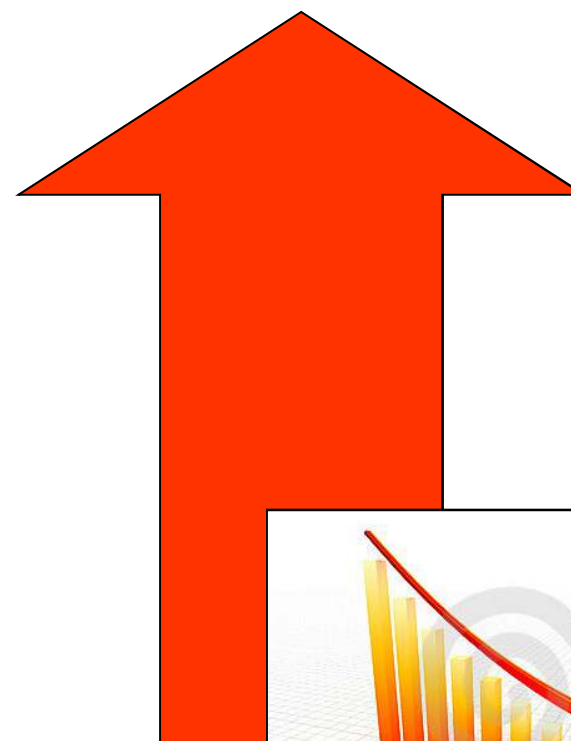
coordinamento scientifico e organizzativo

**STUDIO ECO
INGEGNO**
ambiente & territorio

PARTNER LIFE+ AQUOR

PARTNER LIFE+ WATACLIC

OUTPUT



WHAT ?

GOVERNANCE TOOL

TOWARDS A GROUNDWATER CONTRACT

voluntary agreements amongst
public and private subjects
variously involved and/or committed
into local water body issues, aimed
at the **ecological restoration** and
socioeconomic regeneration of
watersheds through a **participative
process**



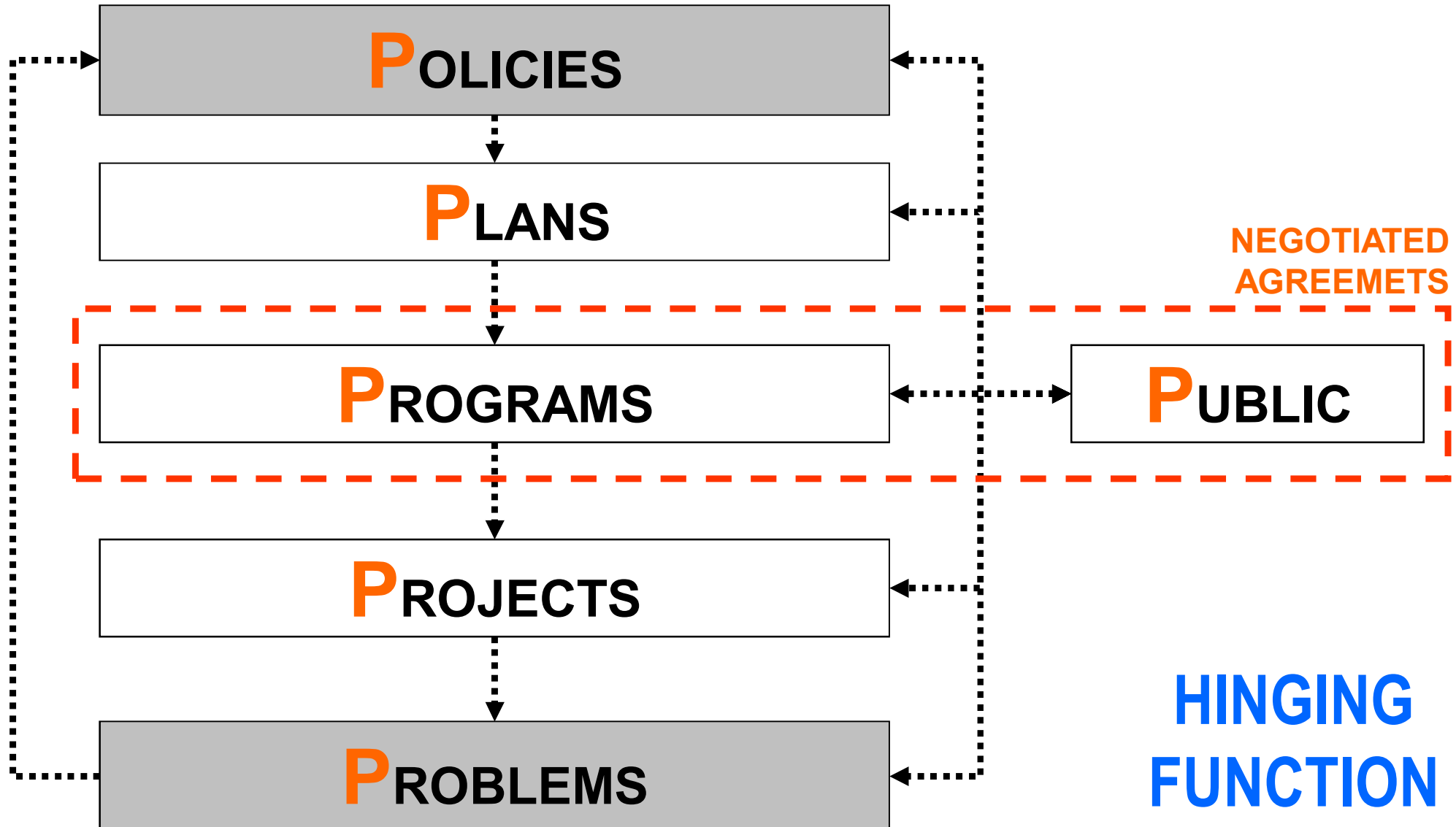
WFD

Water Framework Directive
(annex VI, part B)

Negotiated Environmental Agreements (NEA)

supplementary measure that may be adopted by District Authorities at river basin scale within respective RBMPs (PoMs)

GOVERNANCE “ P_s ”





WHAT?

WHY?

WHO?

WHEN?

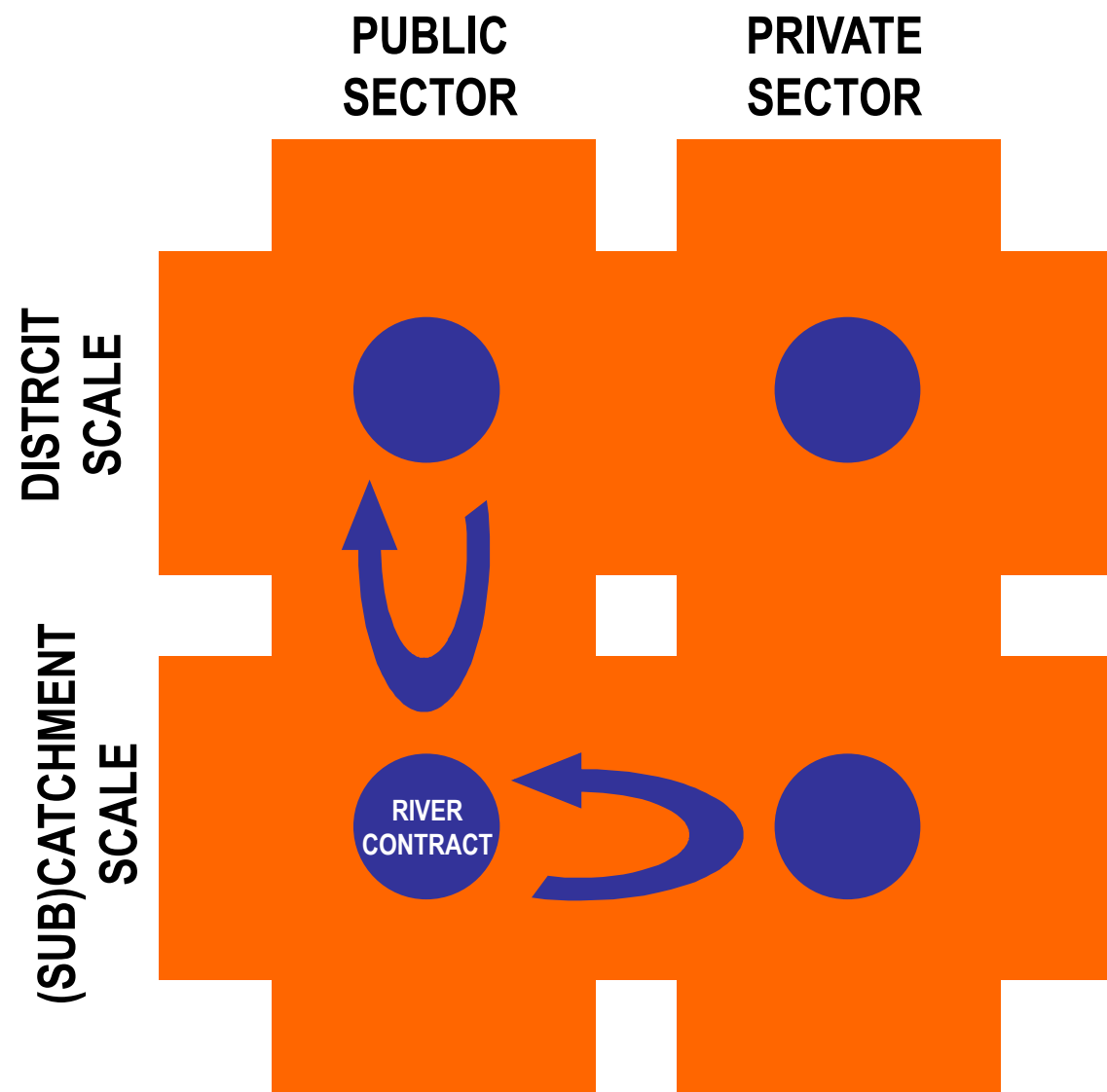
HOW (MUCH)?

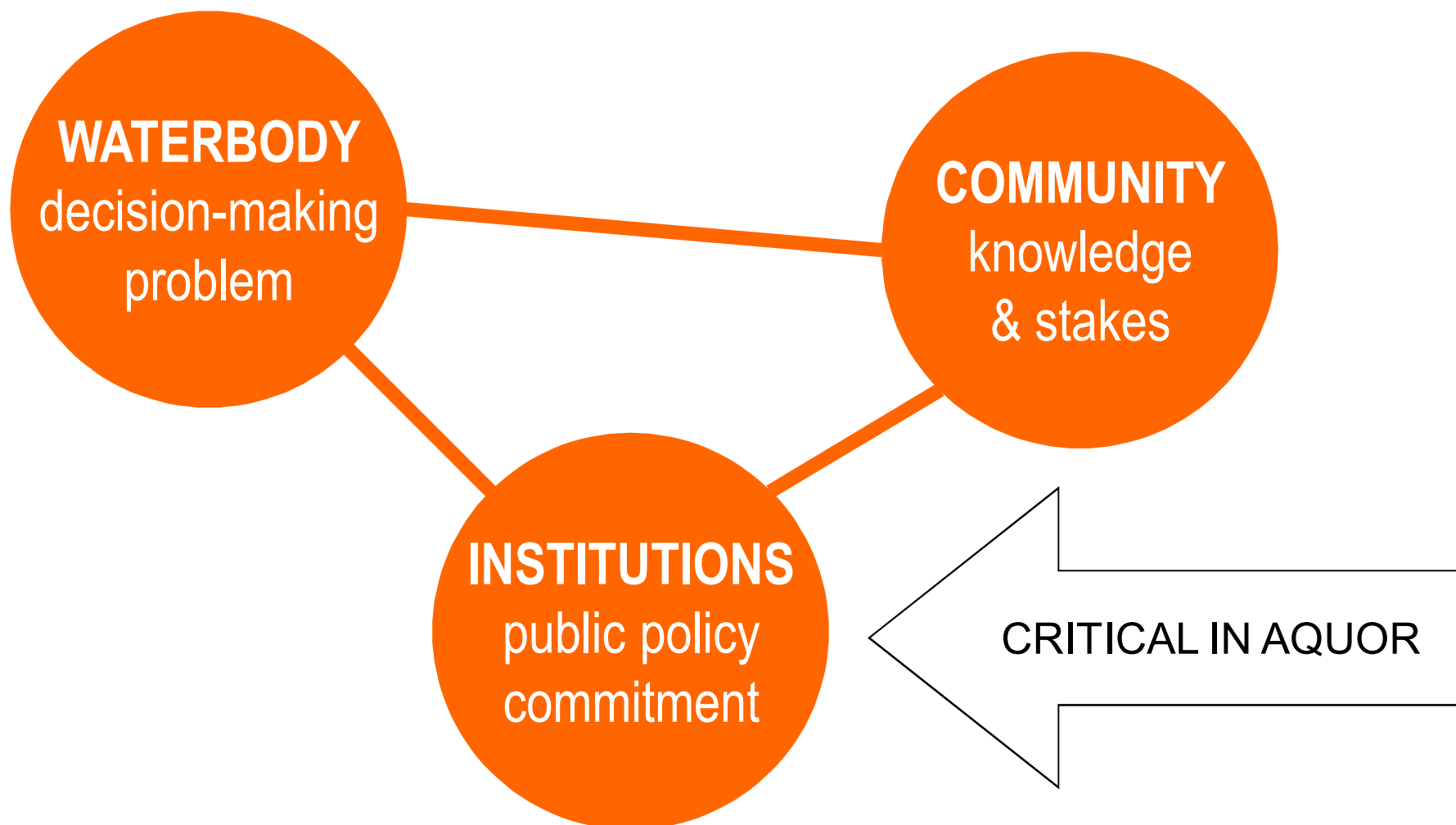


Lake (or any other water body)
Contracts as unofficial
consultations adopted (OECD,
2013)

(a) when actual implementation
of environmental measures falls
under the authority of bodies
other than River Basin
Authorities

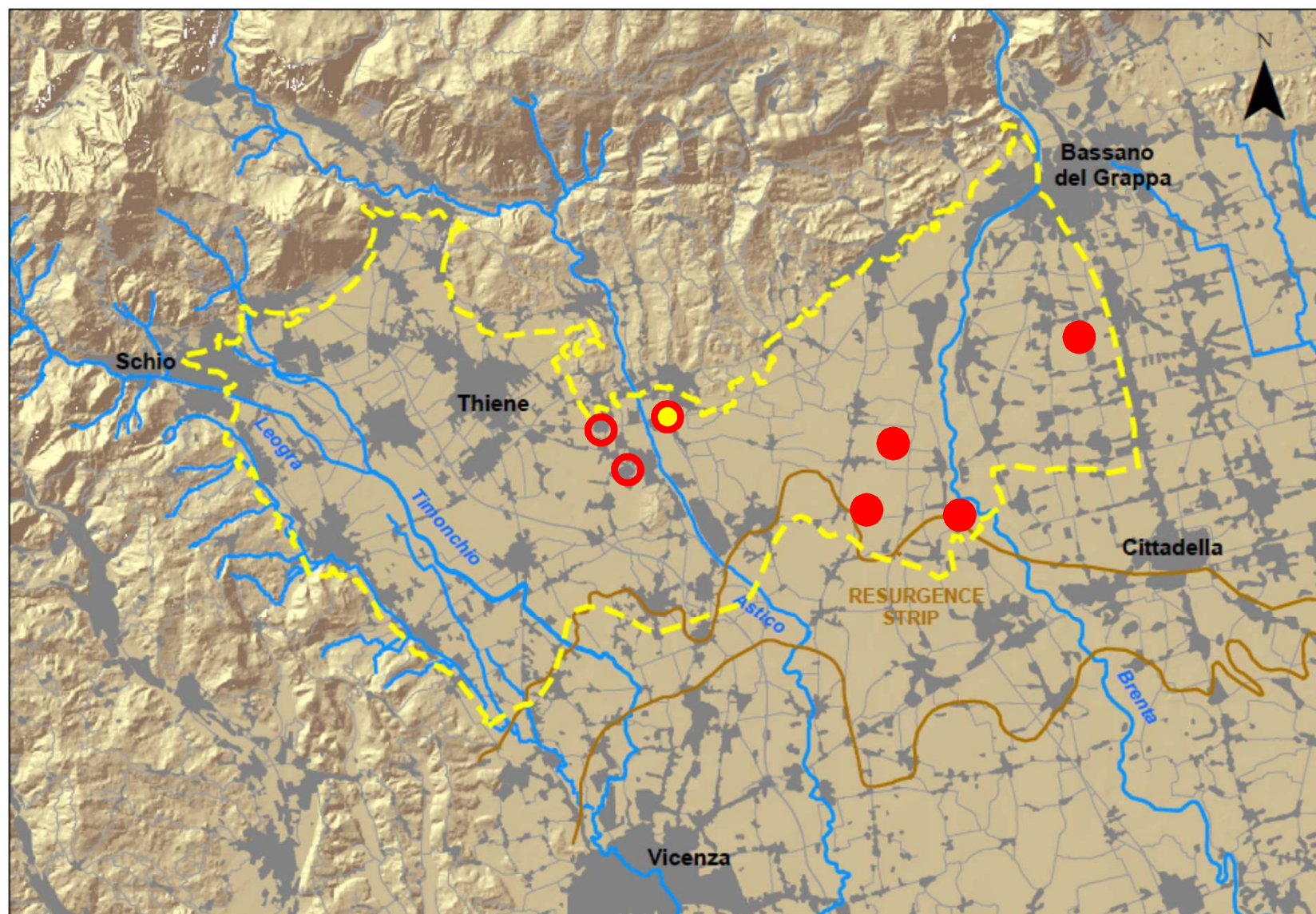
(b) in order to reach agreements
between public administrations
and private actors.





START-UP ISSUES

AN OVERLOOK AT DEMONSTRATIVE MAR MEASURES



● ACTION RESPONSIBLE:
CONSORZIO BONIFICA BRENTA

○ ACTION RESPONSIBLE:
CONSORZIO BONIFICA APV

● ACTION RESPONSIBLE:
ALTO VICENTINO SERVIZI

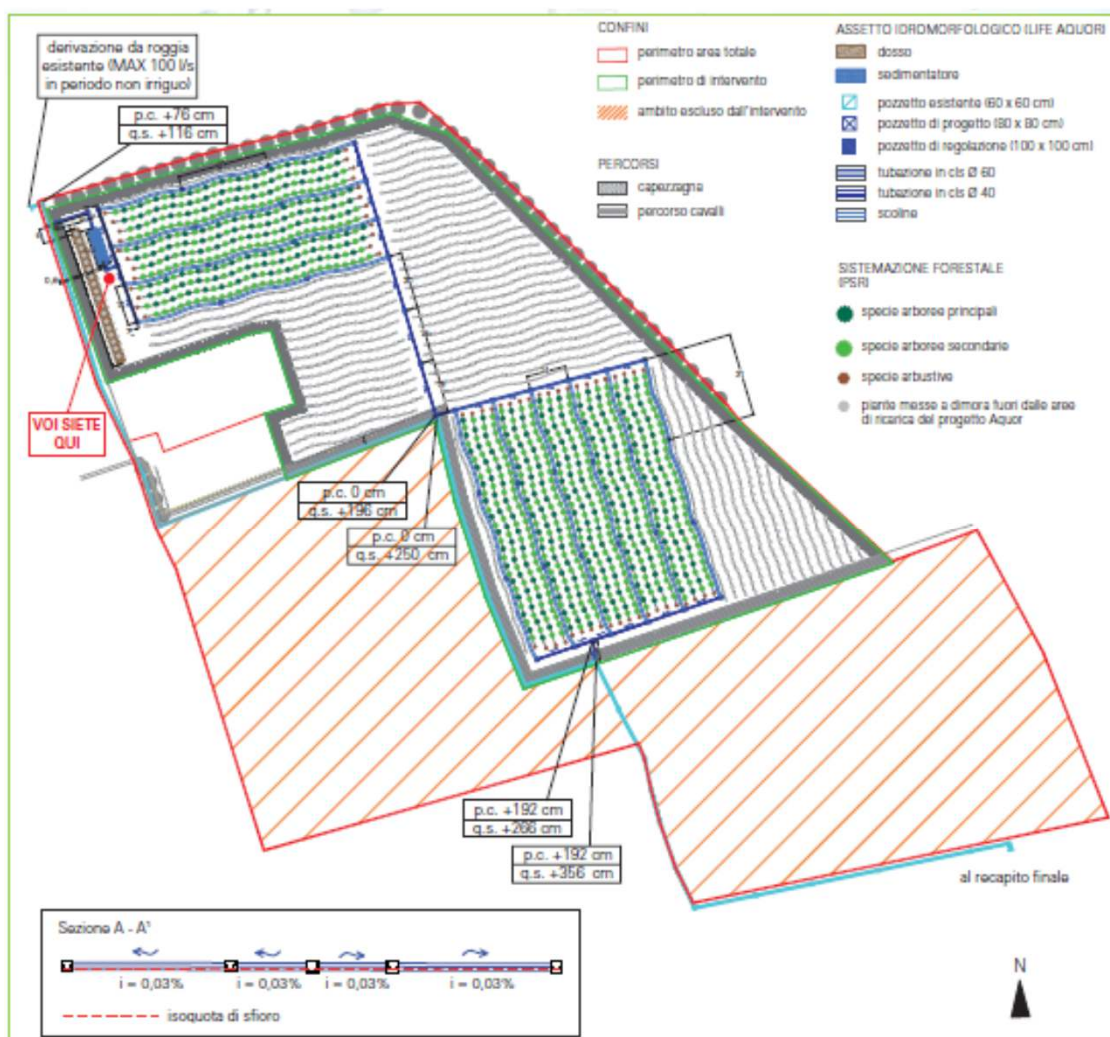
FORESTED INFILTRATION AREA

Carmignano (PD)



FORESTED INFILTRATION AREA

Carmignano (PD)



FORESTED INFILTRATION AREA Carmignano (PD)



FASI DI REALIZZAZIONE

FORESTED INFILTRATION AREA

Carmignano (PD)



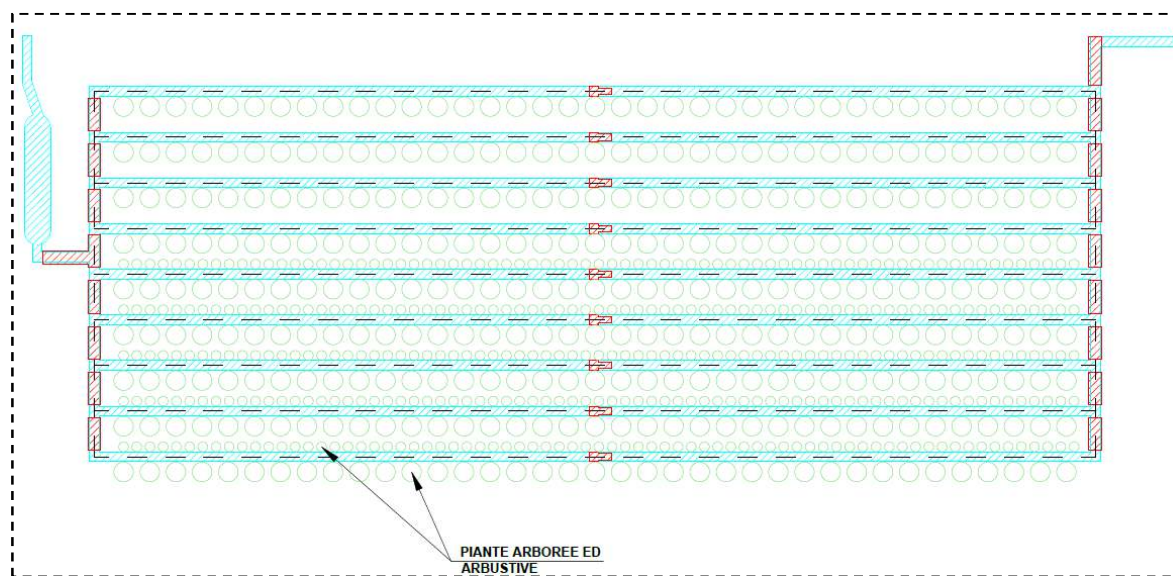
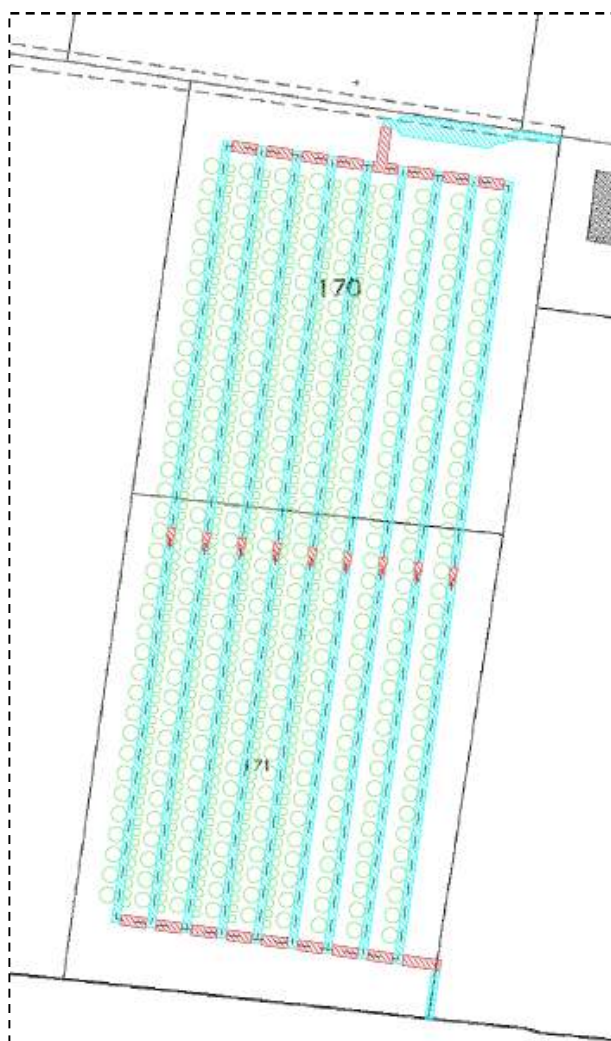
FORESTED INFILTRATION AREA

Schiavon (VI)



FORESTED INFILTRATION AREA

Schiavon (VI)



FORESTED INFILTRATION AREA Schiavon (VI)



FORESTED INFILTRATION AREA Schiavon (VI)



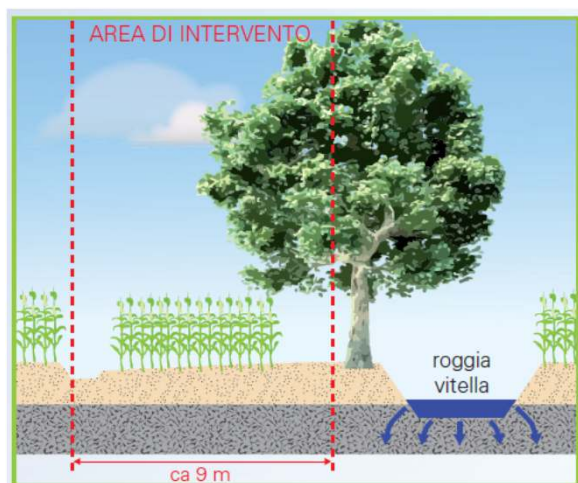
INFILTRATION BROOK (BASIN)

Ancignano di Sandrigo (VI)

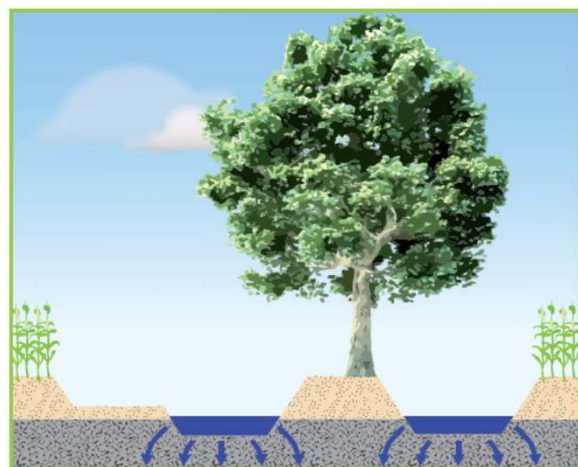


INFILTRATION BROOK (BASIN)

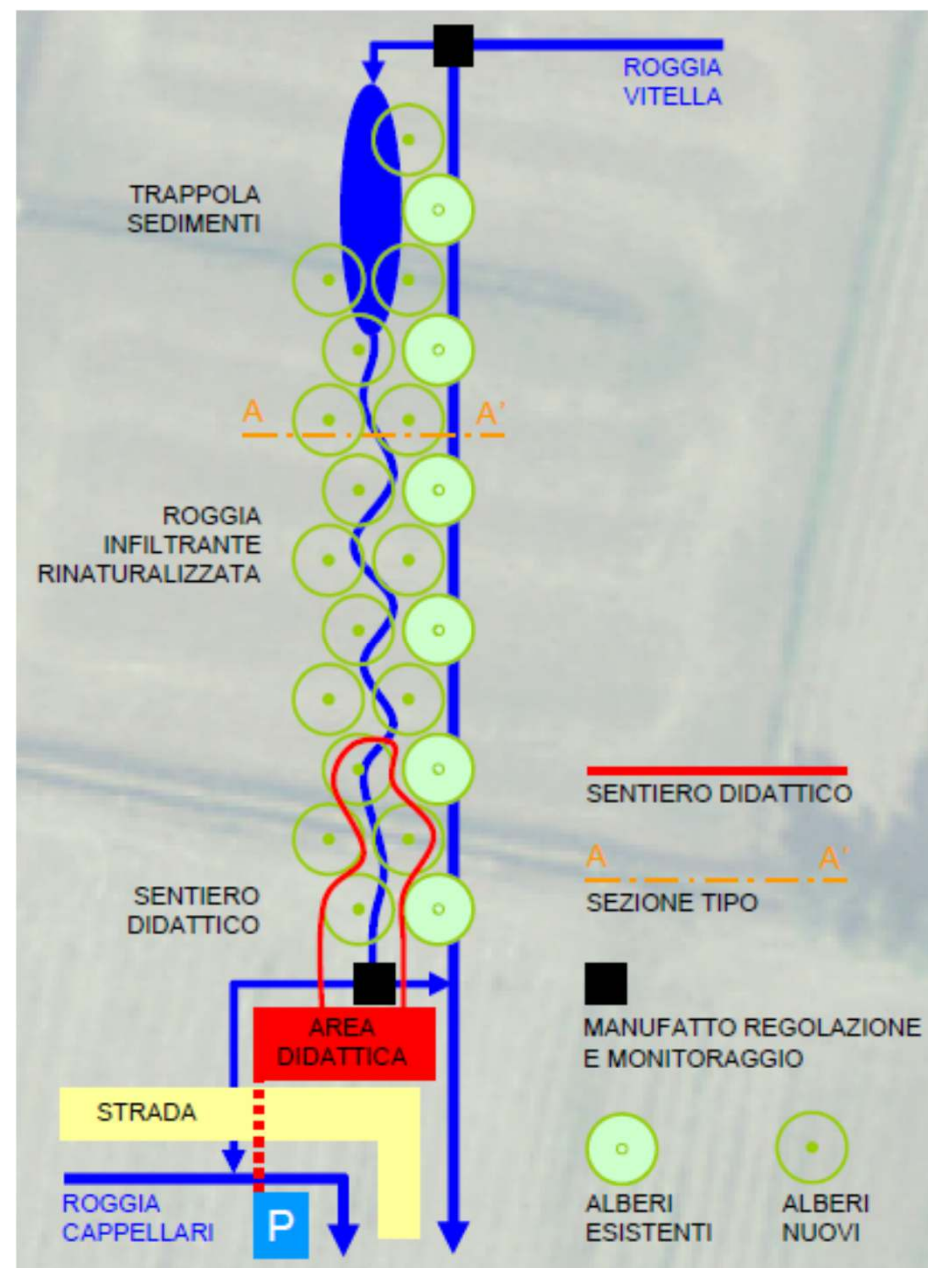
Ancignano di Sandrigo (VI)



PRIMA



DOPO



INFILTRATION BROOK (BASIN)

Ancignano di Sandrigo (VI)



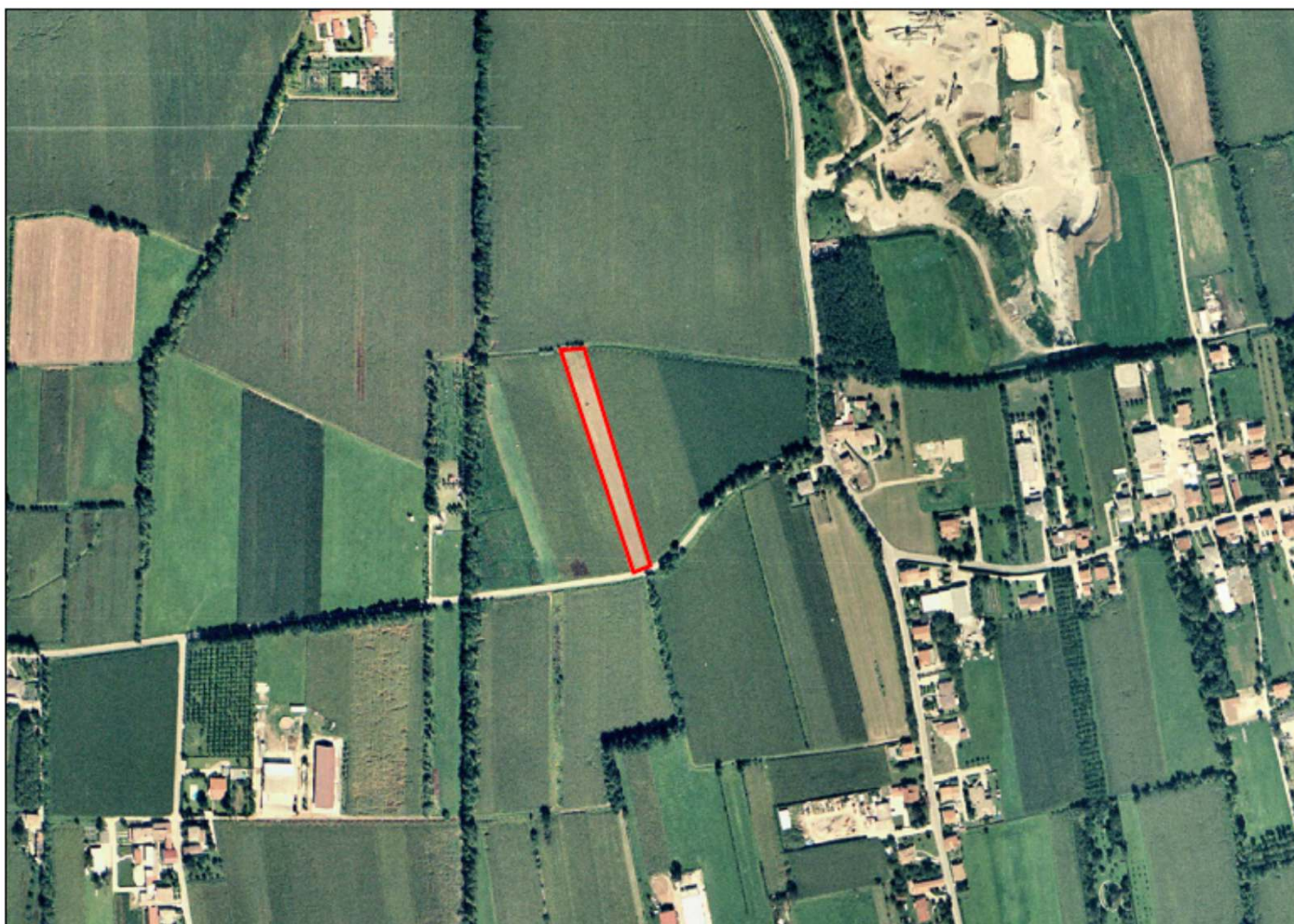
INFILTRATION BROOK (BASIN)

Ancignano di Sandrigo (VI)

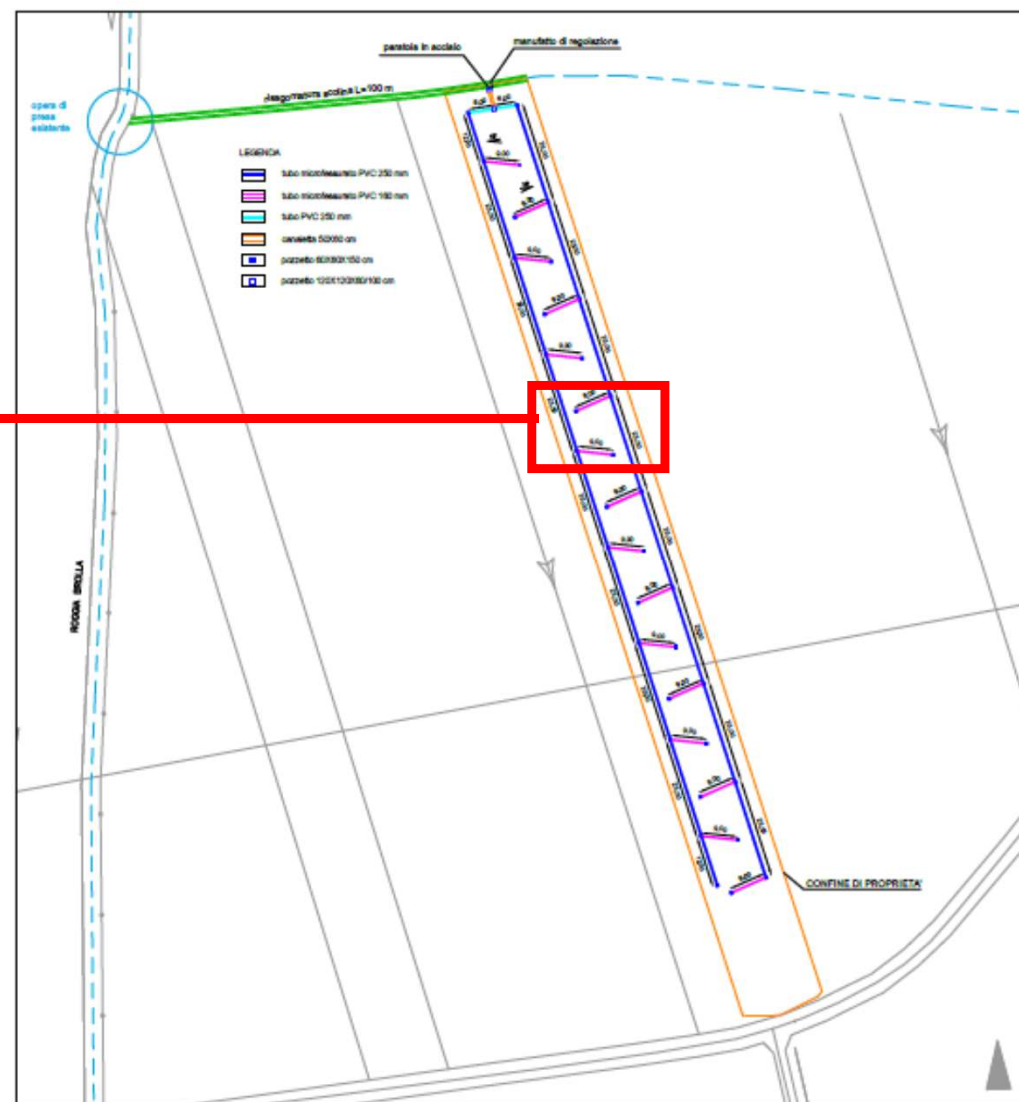


(SUB)INFILTRATION FIELD

Rosà (VI)



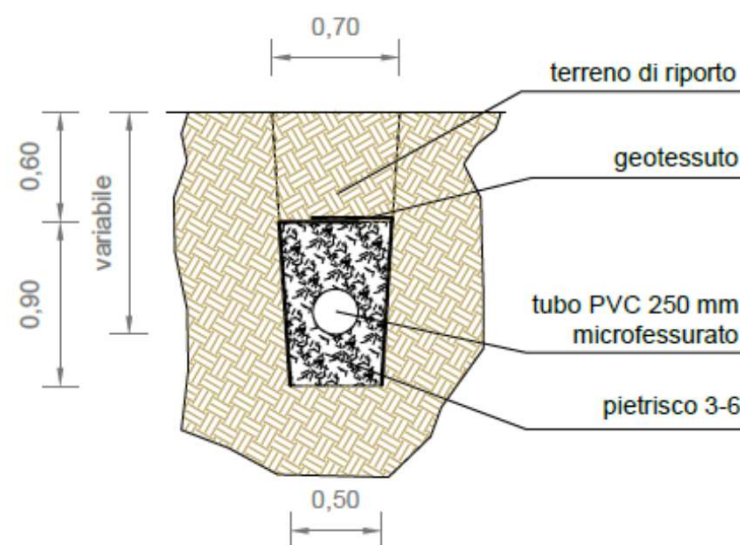
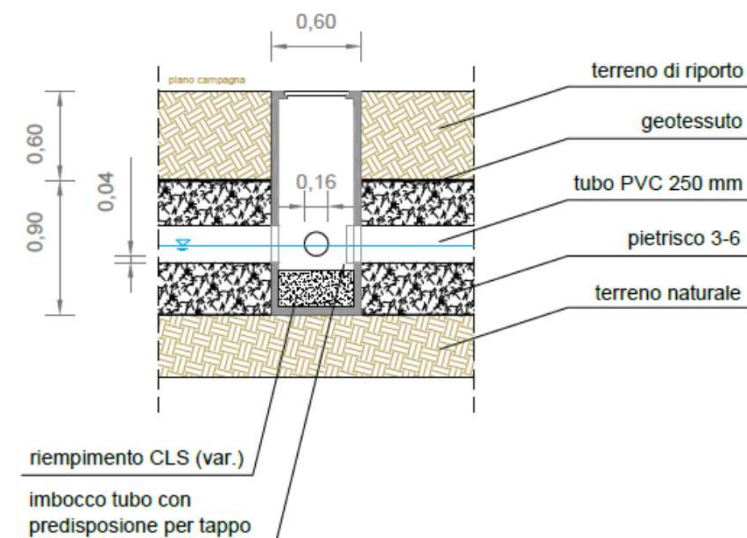
(SUB)INFILTRATION FIELD Rosà (VI)



PARTICOLARE

(SUB)INFILTRATION FIELD

Rosà (VI)

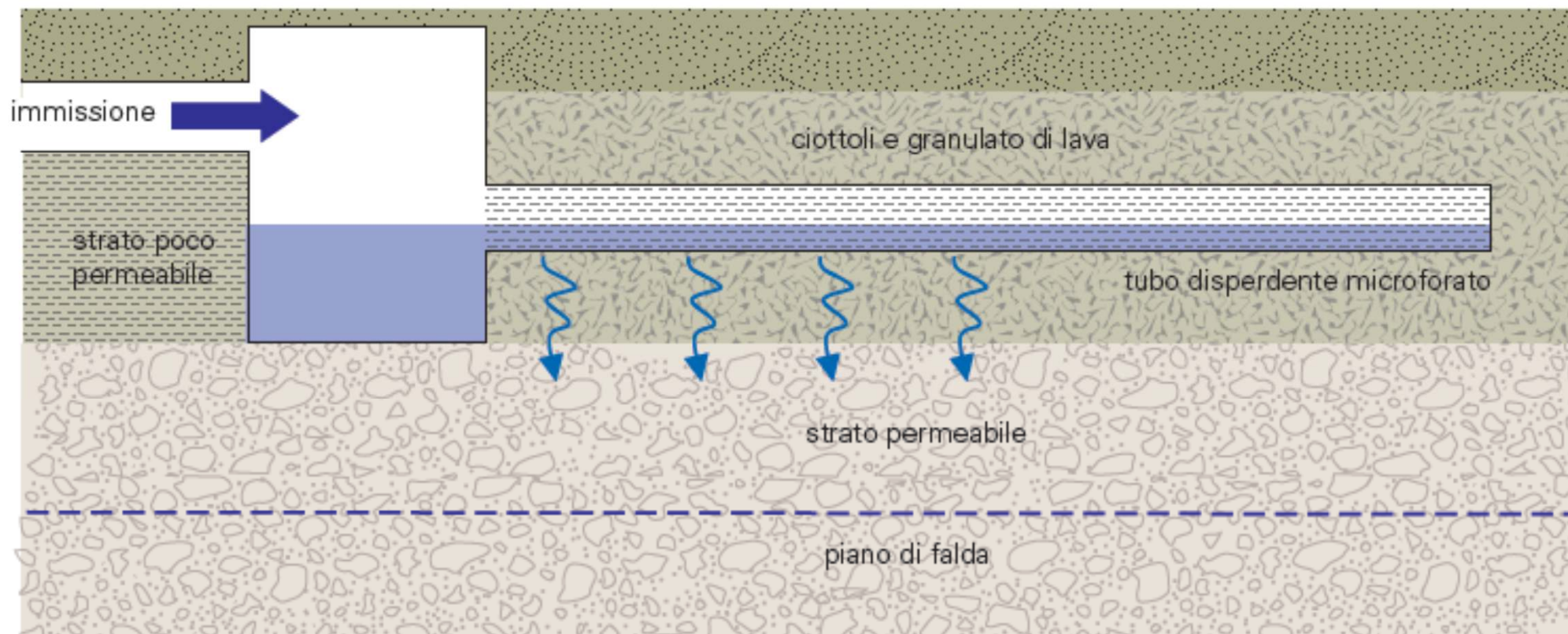


FASI DI REALIZZAZIONE

INFILTRATION TRENCH

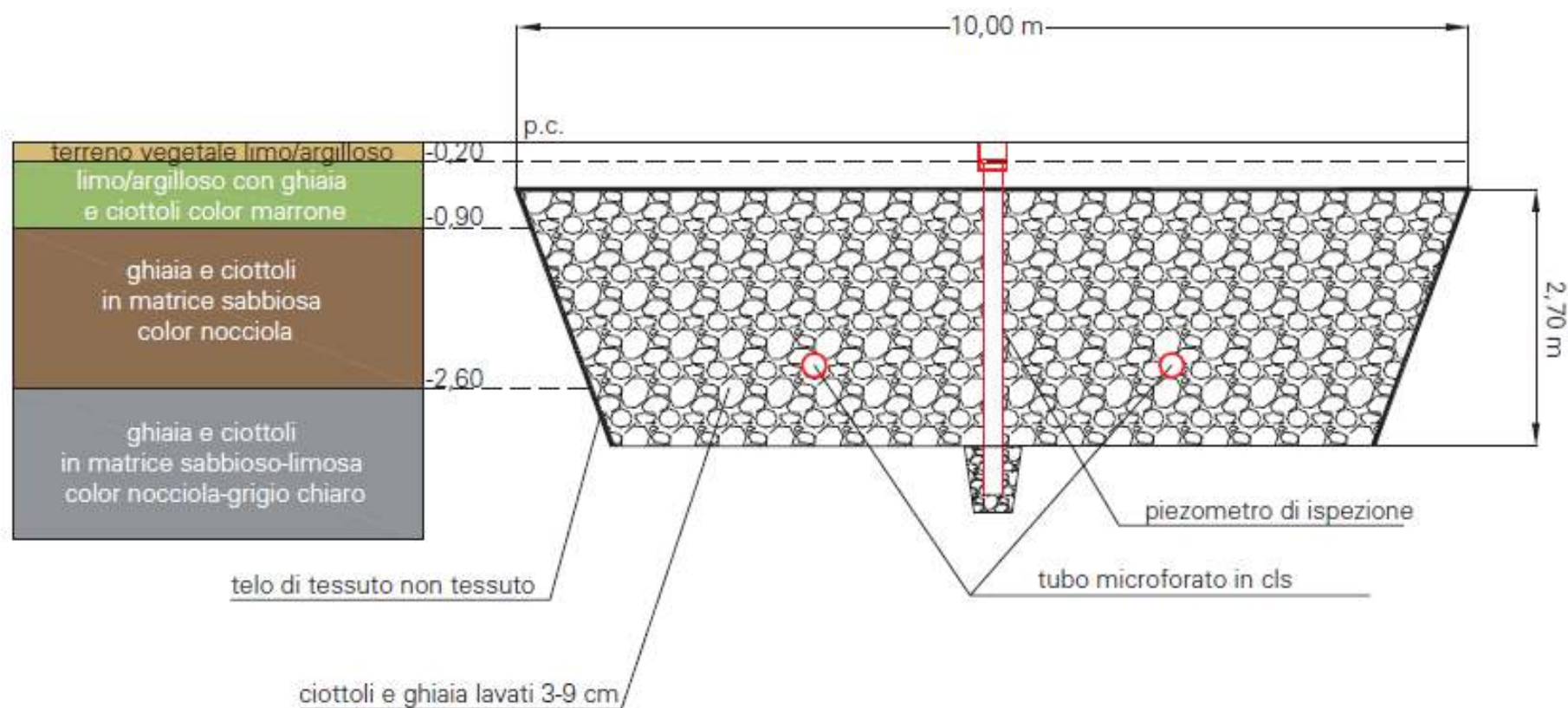
Sarcedo (VI)

pozzetto di
distribuzione



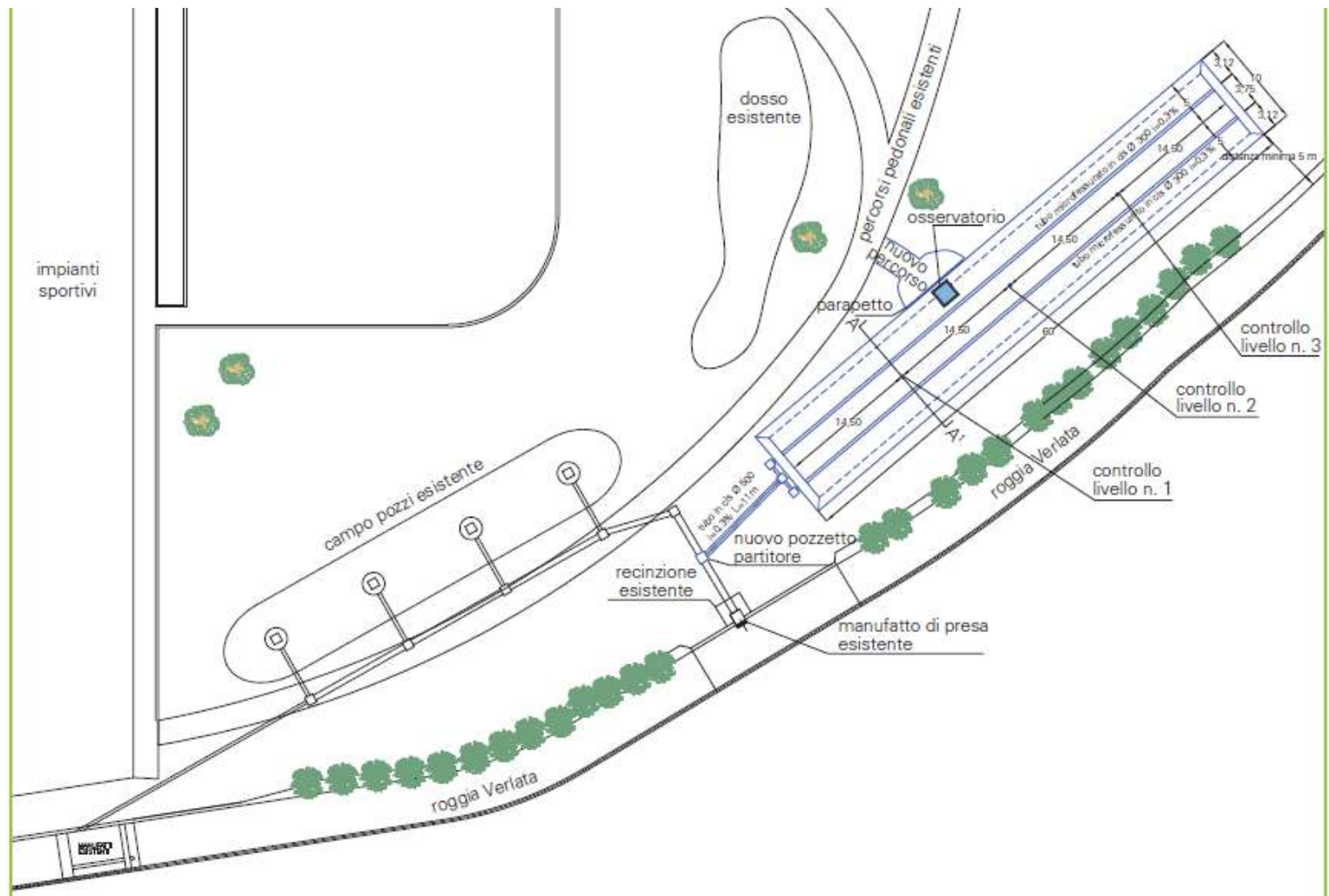
INFILTRATION TRENCH

Sarcedo (VI)



INFILTRATION TRENCH

Sarcedo (VI)



INFILTRATION TRENCH

Sarcedo (VI)



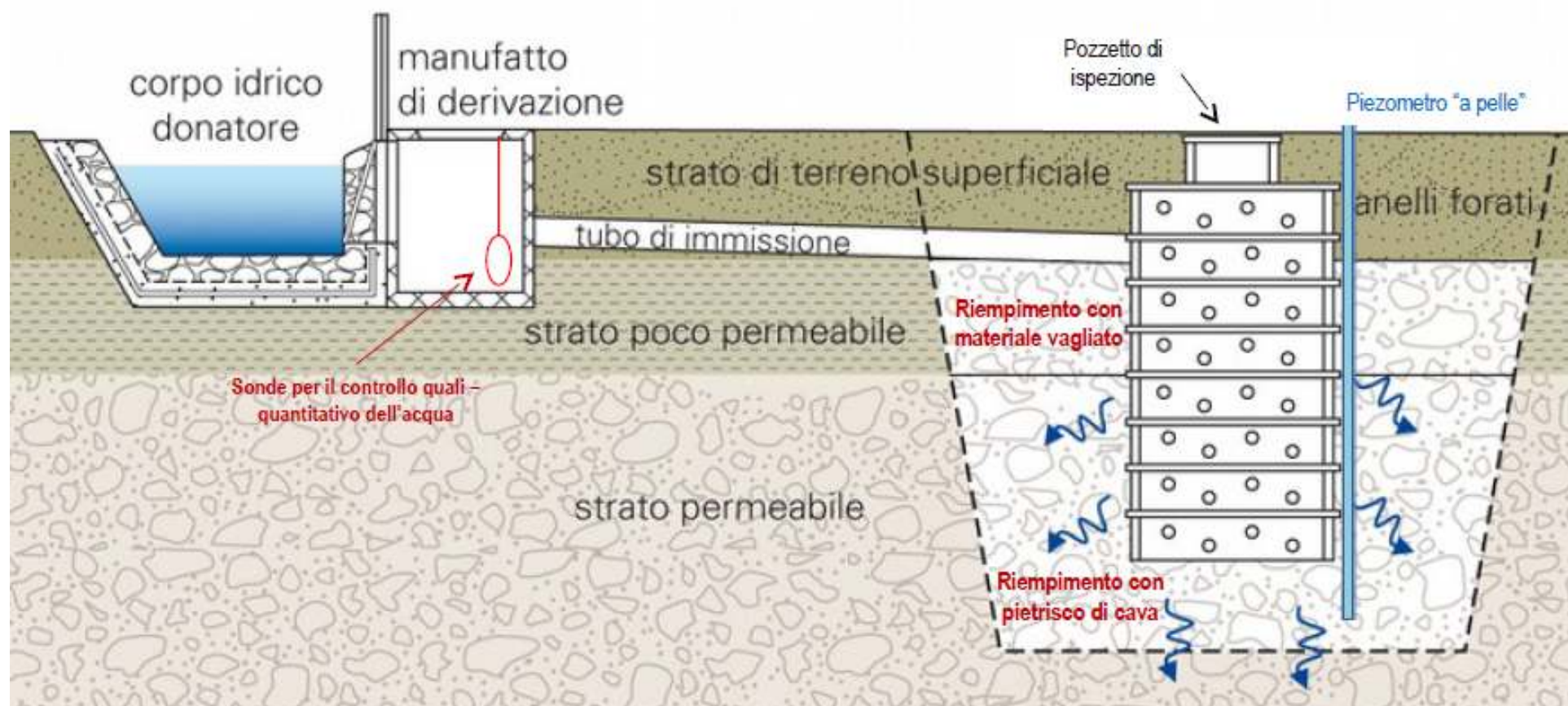
INFILTRATION TRENCH

Sarcedo (VI)



INFILTRATION WELL

Monecchio (VI)



INFILTRATION WELL

Monecchio (VI)



INFILTRATION WELL

Monecchio (VI)

Tipologia costruttiva dei pozzi realizzati:

tutti i pozzi realizzati in calcestruzzo del diametro di 2 metri ed hanno altezza complessiva di 5 - 6 metri



il fondo è aperto e posa su un "materasso" di ghiaia o pietrisco per favorire la dispersione dell'acqua immessa

INFILTRATION WELL

Monecchio (VI)



INFILTRATION WELL

Monecchio (VI)



UPSTREAM (DONOR) WATERCOURSES

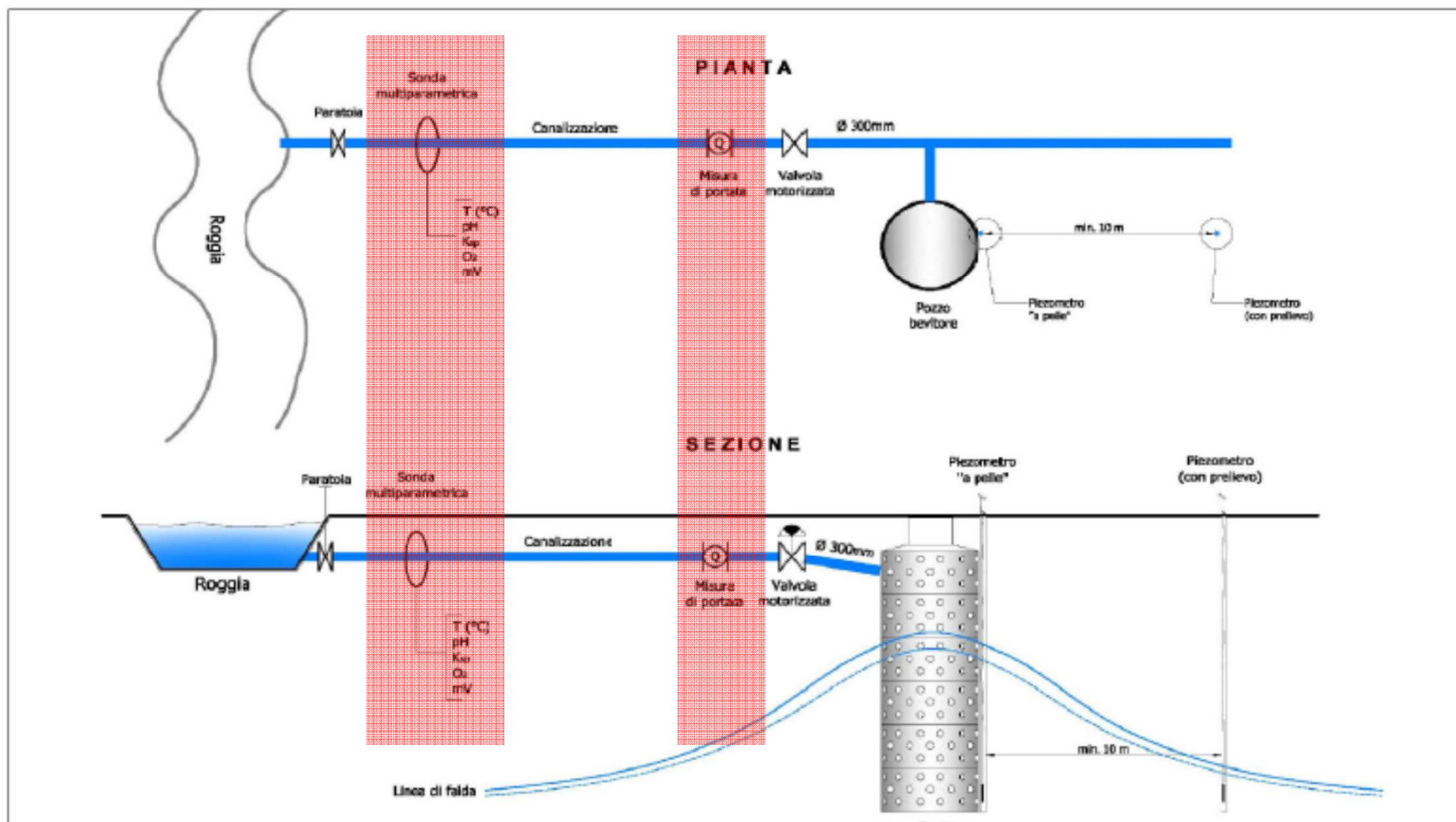


MOSS BAGS



WATER SAMPLING

MONITORING



MONITORING



**CHEMICAL-PHYSICAL
PARAMETERS**



**WATER
LEVEL**

**CONTROL
PANEL**



MONITORING



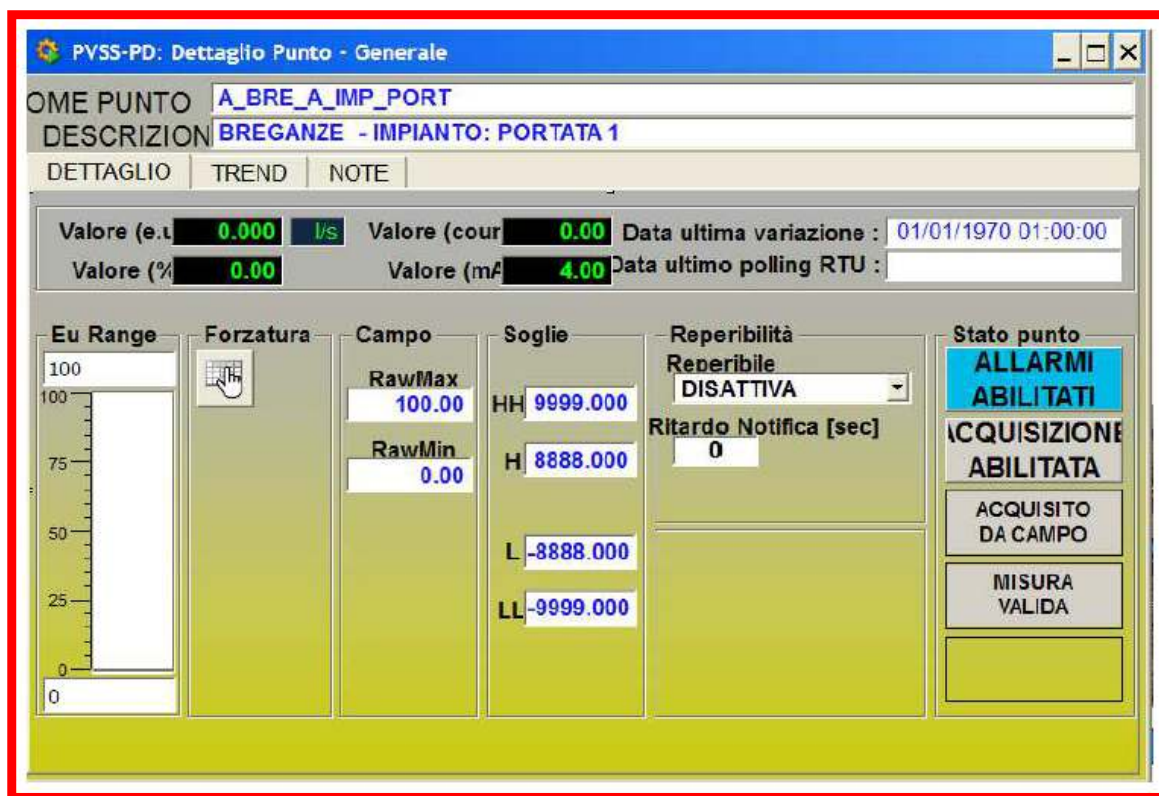
CALIBRATION

MONITORING



MONITORING

EARLY WARNING SYSTEM



MONITORING

CODE	PLANT	MUNICIPALITY	RECHARGE SEASON		
			start	timespan	end up
1	N. 4 INFILTRATION WELLS	BREGANZE (VI)	21/10/2013	131	28/02/2014
2	N. 1 INFILTRATION TRENCH	SARCEDO (VI)	28/10/2013	94	29/01/2014
3	N. 2 INFILTRATION WELLS	MONTECCHIO P.NO (VI)	29/10/2013	94	30/01/2014
4	N. 1 FORESTED INFILTRATION AREA	SCHIAVON (VI)	01/10/2013	148	25/02/2014
5	N. 1 INFILTRATION BROOK (basin)	SANDRIGO (VI)	22/10/2013	127	25/02/2014
6	N. 1 FORESTED INFILTRATION AREA	CARMIGNANO (VI)	17/10/2013	122	15/02/2014
7	N. 1 (SUB)INFILTRATION FIELD	ROSA' (VI)	22/10/2013	119	17/02/2014

TOT

835

OUTPUTS

CODE	PLANT	MUNICIPALITY	MEASUREMENT SPOT	PEAK DISCHARGE [l/s]	
				DESIGNED	MEASURED
1	N. 4 INFILTRATION WELLS	BREGANZE (VI)	INLET	200	205,8
2	N. 1 INFILTRATION TRENCH	SARCEDO (VI)	INLET	200	226,0
3	N. 2 INFILTRATION WELLS	MONTECCHIO P.NO (VI)	INLET	200	214,4
4	N. 1 FORESTED INFILTRATION AREA	SCHIAVON (VI)	INLET	100	130,6
5	N. 1 INFILTRATION BROOK (basin)	SANDRIGO (VI)	INLET	100	83,4
			OUTLET	0	38,4
			DELTA	-	-
6	N. 1 FORESTED INFILTRATION AREA	CARMIGNANO (VI)	INLET	200	140,8
			OUTLET	0	0,0
			DELTA	-	-
7	N. 1 (SUB)INFILTRATION FIELD	ROSA' (VI)	INLET	50	50,1

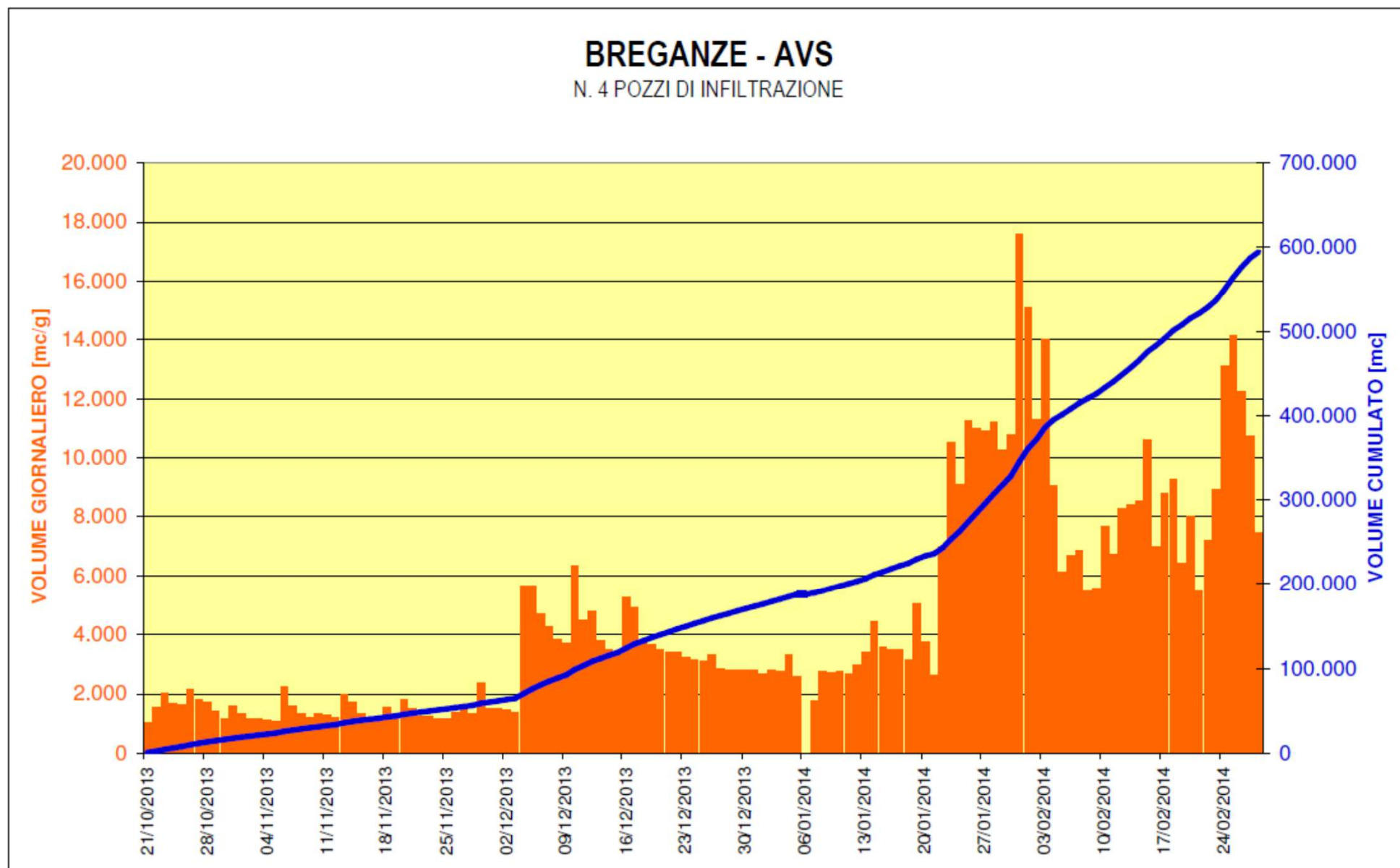
MONITORING

CODE	PLANT	MUNICIPALITY	MEASUREMENT SPOT	INFILTRATION OUTPUTS			
				TOTAL			
				inf. vol. [mc x 1.000]	rech. days	daily average inf. rate [mc x 1.000]	average infiltration discharge [l/s]
1	N. 4 INFILTRATION WELLS	BREGANZE (VI)	INLET	599,1	130	5	53,34
2	N. 1 INFILTRATION TRENCH	SARCEDO (VI)	INLET	125,7	73	2	19,94
3	N. 2 INFILTRATION WELLS	MONTECCHIO P.NO (VI)	INLET	80,5	53	2	17,58
4	N. 1 FORESTED INFILTRATION AREA	SCHIAVON (VI)	INLET	234,7	116	2	23,42
5	N. 1 INFILTRATION BROOK (basin)	SANDRIGO (VI)	INLET	-	-	-	-
			OUTLET	-	-	-	-
			DELTA	133,8	92	1	16,83
6	N. 1 FORESTED INFILTRATION AREA	CARMIGNANO (VI)	INLET	-	-	-	-
			OUTLET	-	-	-	-
			DELTA	555,3	99	6	64,92
7	N. 1 (SUB)INFILTRATION FIELD	ROSA' (VI)	INLET	144,4	88	2	18,99

TOT

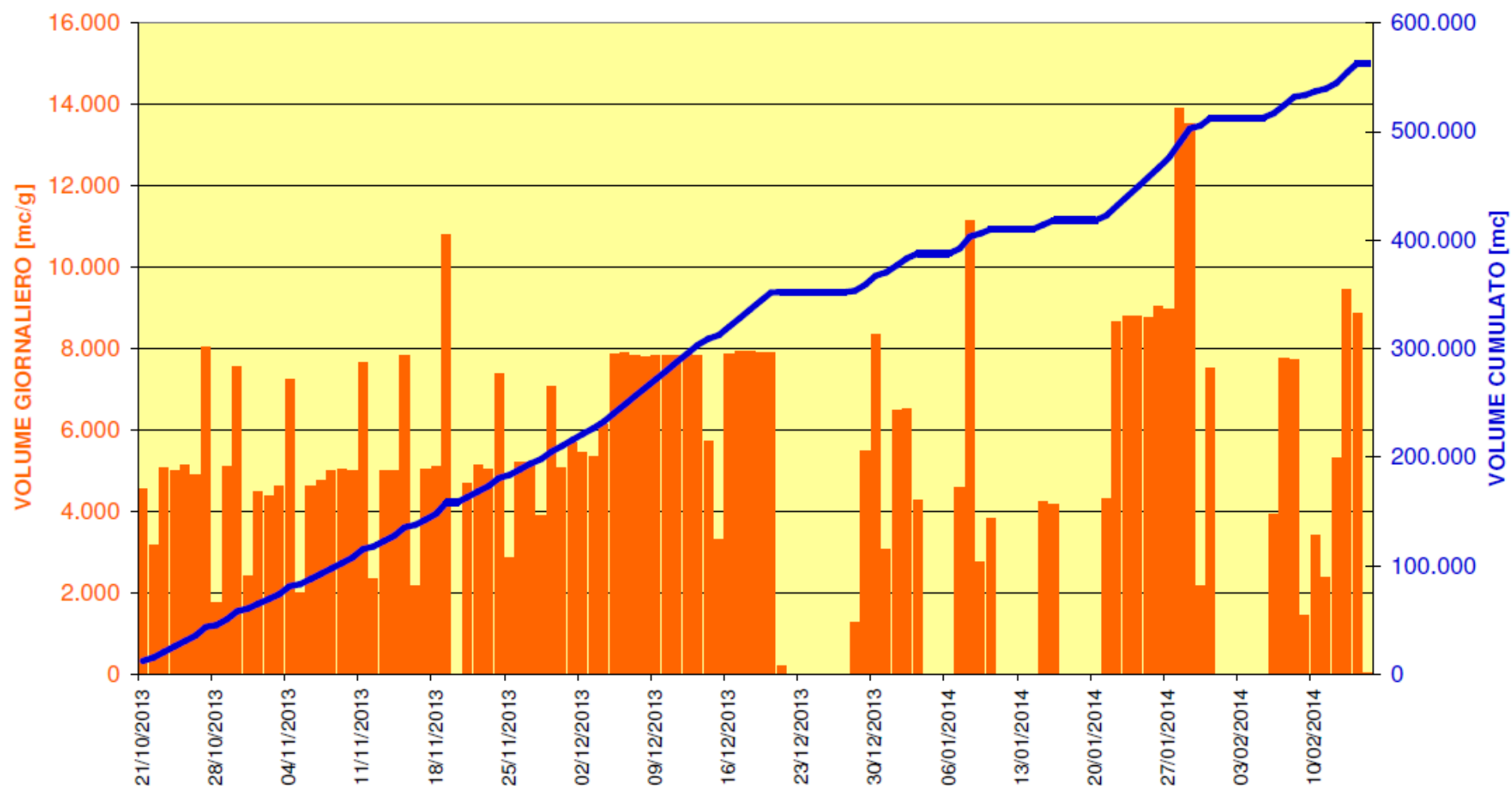
1873,6

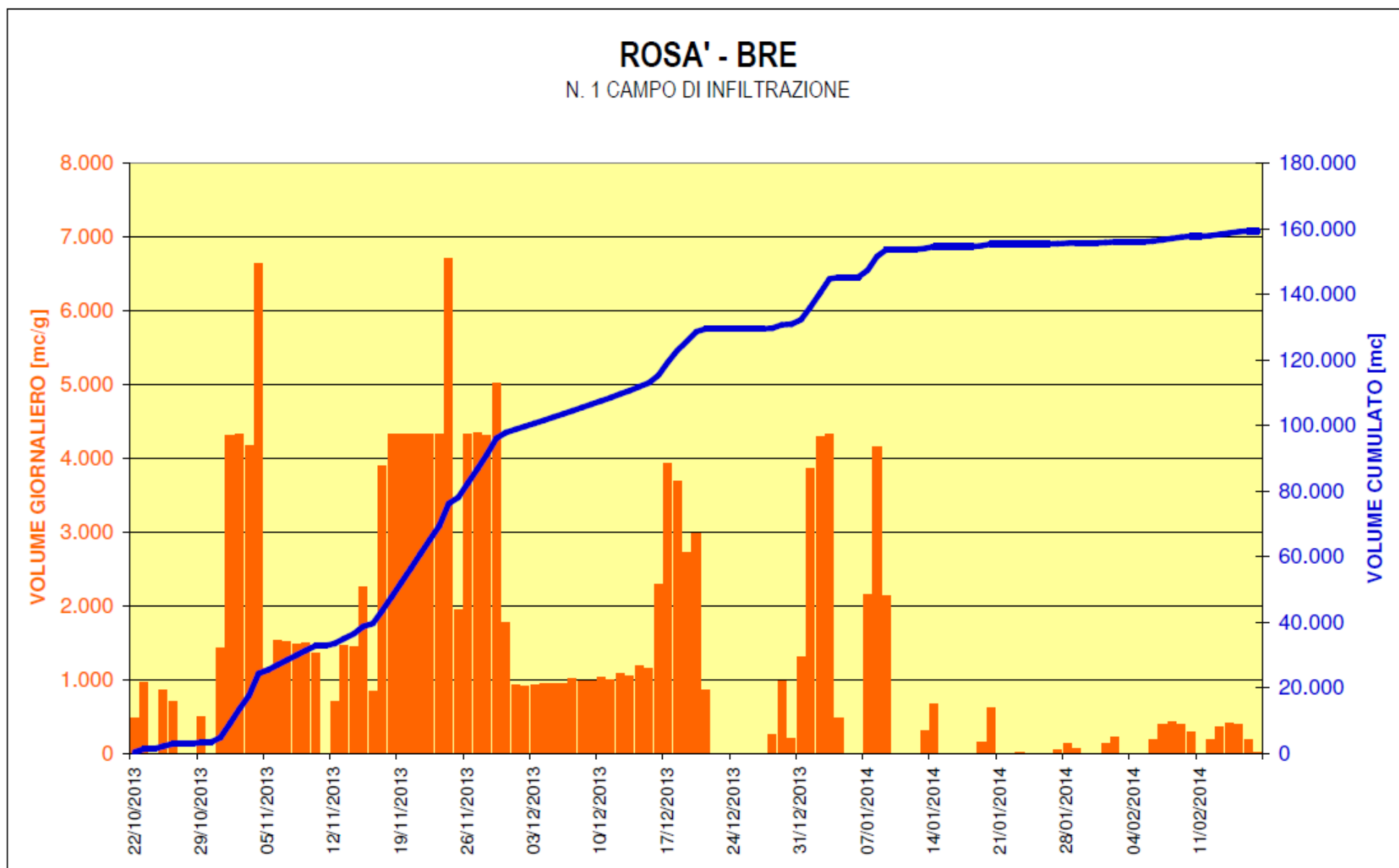
MONITORING



CARMIGNANO - BRE

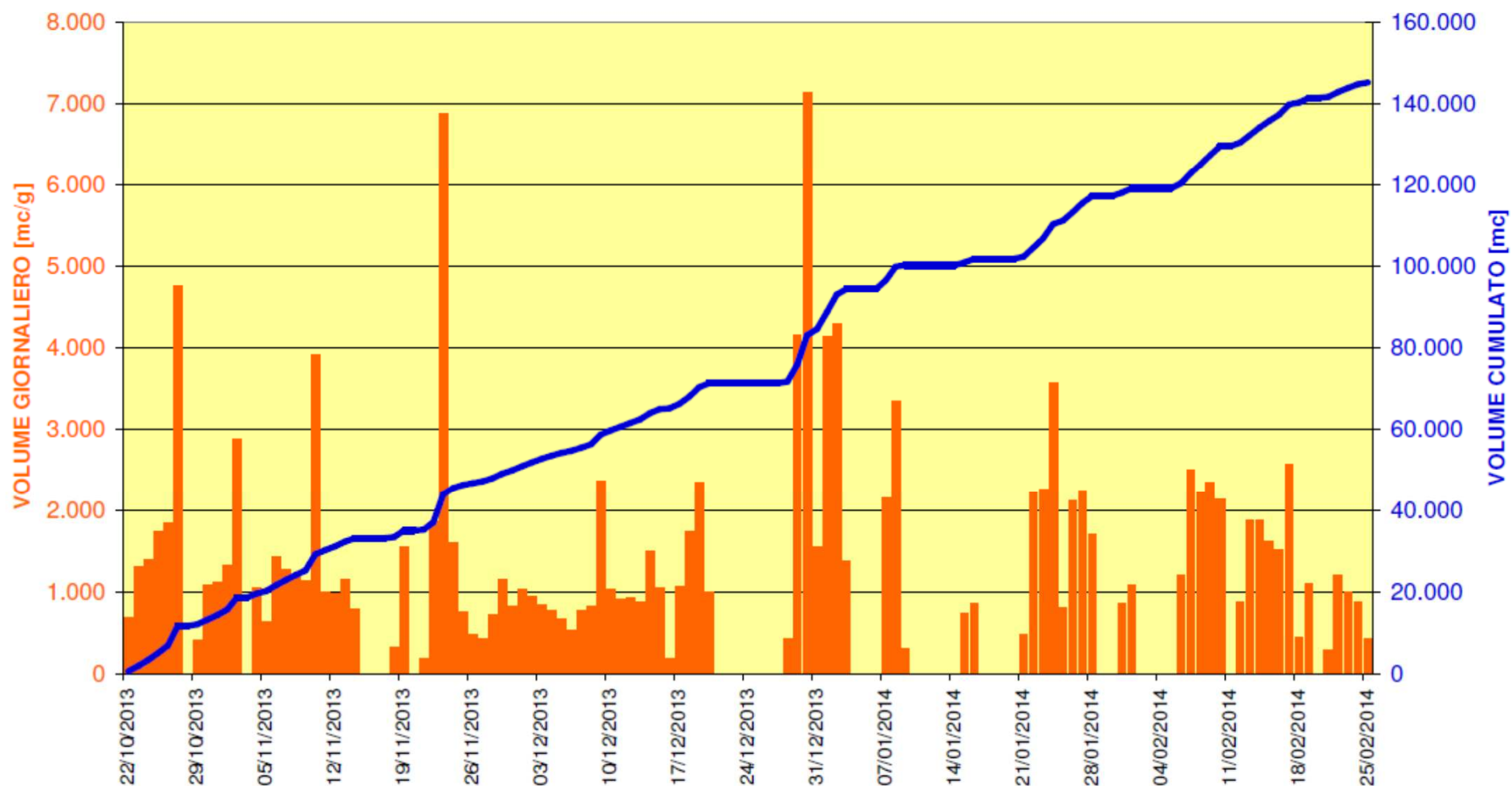
N. 1 AREA FORESTALE DI INFILTRAZIONE





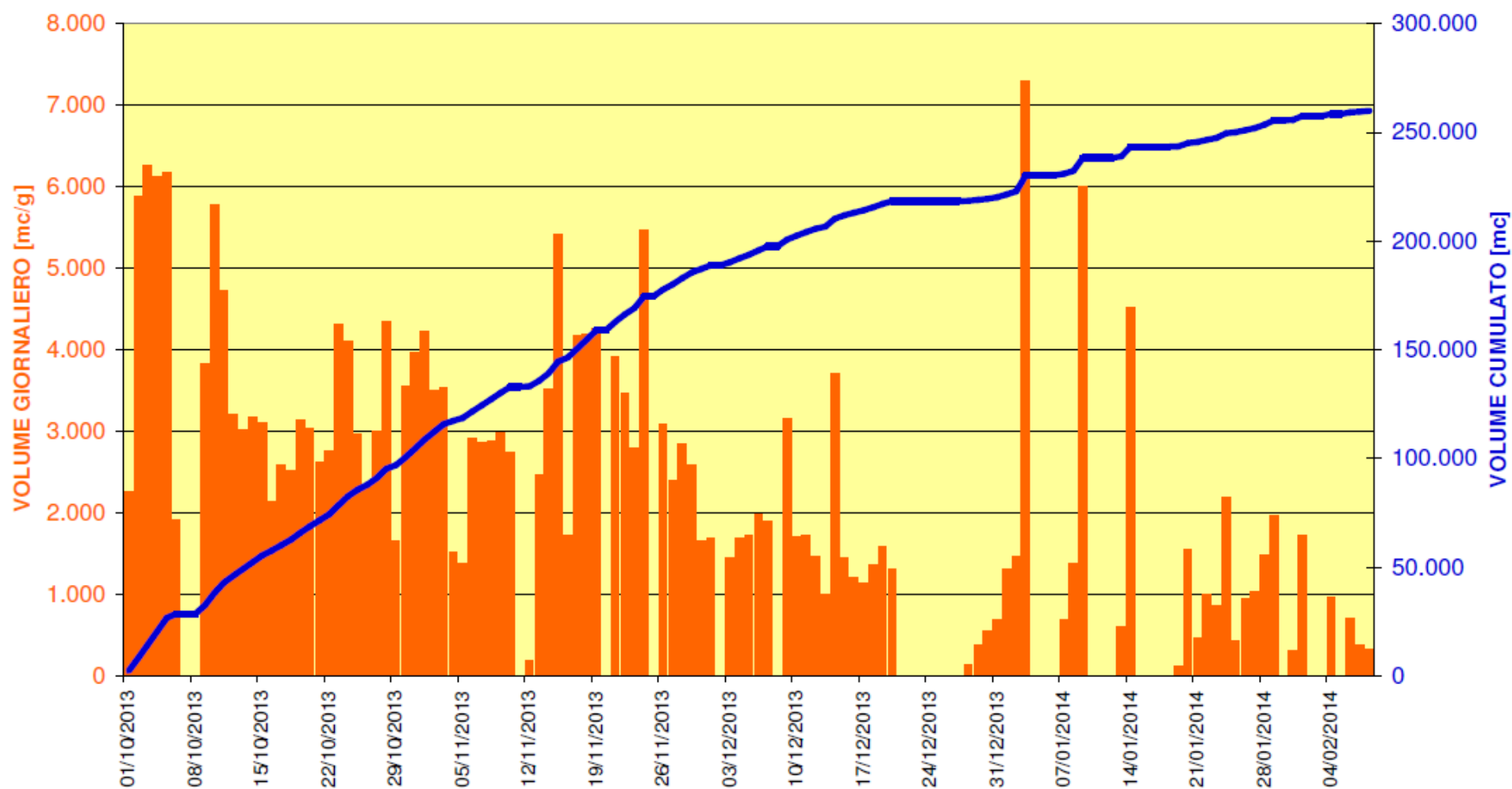
SANDRIGO - BRE

N. 1 ROGGIA DI INFILTRAZIONE



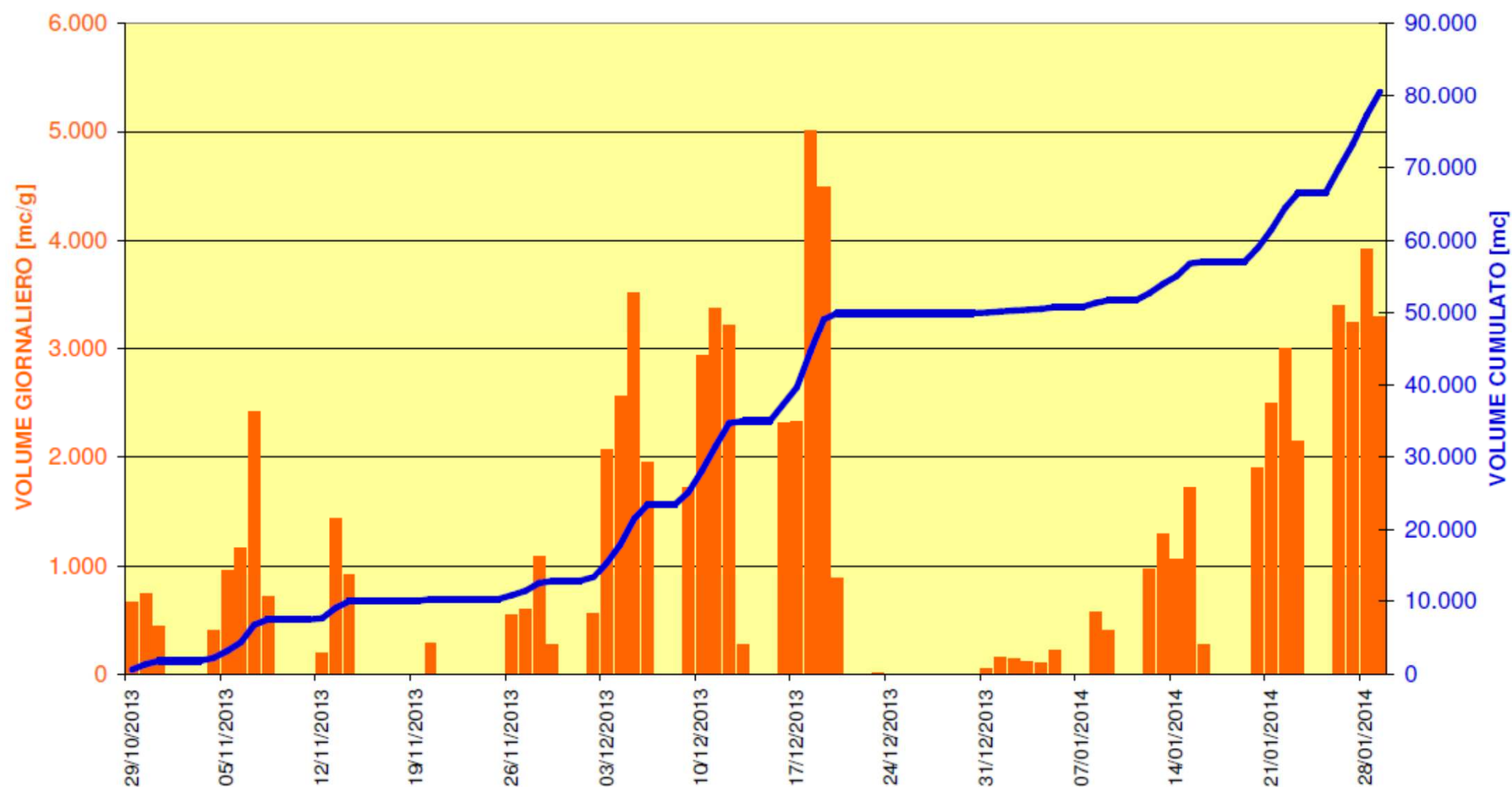
SCHIAVON - BRE

N. 1 AREA FORESTALE DI INFILTRAZIONE



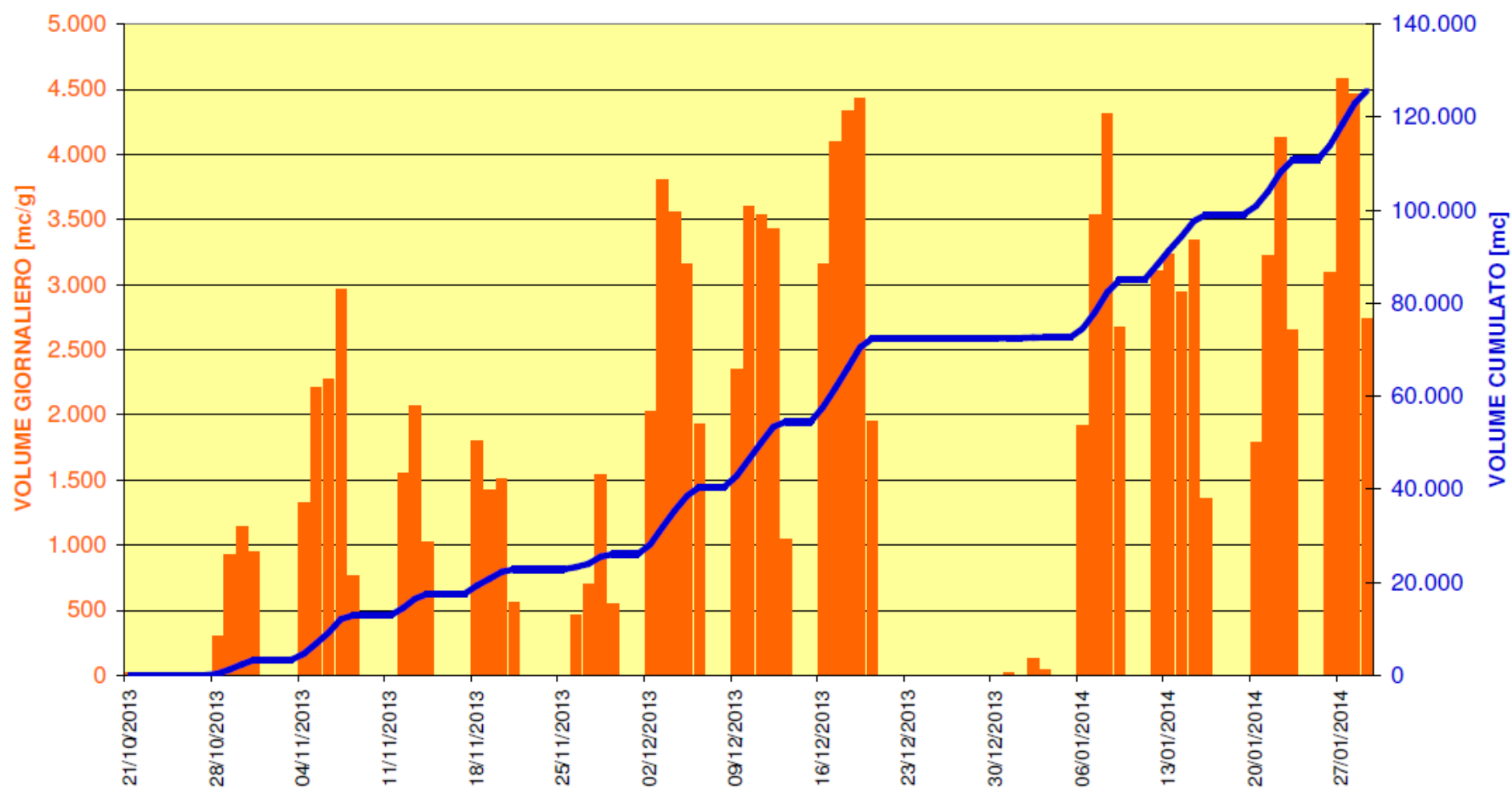
MONTECCHIO - APV

N. 2 POZZI DI INFILTRAZIONE



SARCEDO - APV

N. 1 TRINCEA DI INFILTRAZIONE





**THANK YOU
FOR YOUR ATTENTION**

CONTATTI

www.lifeaquor.org

Provincia di Vicenza - Servizio Risorse Idriche
Palazzo Nievo, contrà Gazzolle n. 1 - 36100 Vicenza

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e-mail: muraro.teresa@provincia.vicenza.it
tel. 0444.908310 - fax. 0444.908538



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STUDIO **ECO**
INGEGNO
ambiente & territorio