

Database on groundwater and surficial water level, temperature and electrical conductivity, meteorological conditions, sea level, pumping station activity in the Italian monitoring area

Deliverable D_3.3.1

Contributing partners:

PP1 – CNR IGG

PP3 – VENETO REGION

LP – UNIPD DICEA

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1. Introduction

This report represents deliverable “Database on groundwater and surficial water level, temperature and electrical conductivity, meteo-climatic conditions, sea level, pumping station activity in the Italian monitoring area (D_3.3.1)”, which is part of the WP3.3 Action of the WP3 “Studying”.

The datasets consisted of three main groups of data:

- Group 1: the dataset files of electrical conductivity, temperature, and water level records acquired in wells MoST1, MoST2, MoST3, MoST4, and MoST5 and in the water column of the Brenta and Bacchiglione rivers, and the Canal Morto (Fig. 1).
- Group 2: the monographs of n. 14 piezometers, which are located in the area near the Italian pilot site;
- Group 3: the database of electrical conductivity, climatic conditions, groundwater level collected in the five monitoring sites established in the farmland



Fig. 1 - Location of MoST wells and monitoring points in the Dead Channel, Bacchiglione and Brenta watercourses.

2. Group 1 dataset

2.1 Groundwater

Data acquisition was made in two ways: a) along vertical profiles by deploying a CTD sensor, b) at a predefined depth by fixing the CTD sensor.

The lists of the file containing log profiles and time series files are reported in Tab. 1 and Tab. 2, respectively.

2.1.1 Electrical Conductivity logs

[log_well name]	day
log_MoST1.txt	03/06/2020
	09/07/2020
	09/09/2020
	12/11/2020
	14/02/2021
	17/03/2021
	06/05/2021
	08/07/2021
log_MoST2.txt	06/10/2021
	03/06/2020
	09/07/2020

[log_well name]	day
log_MoST4.txt	03/06/2020
	09/07/2020
	08/09/2020
	19/11/2020
	14/01/2021
	06/05/2021
	08/07/2021
	06/10/2021
log_MoST5.txt	05/06/2020
	09/07/2020
	19/11/2020

	17/12/8632		14/01/2021
	14/01/2021		06/05/2021
	17/03/2021		08/07/2021
	06/05/2021		06/10/2021
	08/07/2021		
	06/10/2021		
log_MoST3.txt	03/06/2020		
	09/07/2020		
	08/09/2020		
	12/11/2020		
	14/01/2021		
	17/03/2021		
	06/05/2021		
	08/07/2021		
	06/10/2021		

Tab. 1 - List of files with log profiles

2.1.2 Time serie

File name [start.end_well name]

07072021.01082021_MoST1.txt

07072021.01082021_MoST2.txt

07072021.01082021_MoST3.txt

26052022.30062022_MoST3.txt

26052022.30062022_MoST2.txt

26052022.30062022_MoST1.txt

23072020.12082020_MoST1.txt

23072020.12082020_MoST2.txt

23072020.12082020_MoST3.txt

10122021.10022022_MoST1.txt

10122021.10022022_MoST2.txt

10122021.10022022_MoST3.txt

10122021.10022022_MoST4.txt

30112020.30122020_MoST4.txt

30112020.30122020_MoST3.txt

30112020.30122020_MoST1.txt

30112020.30122020_MoST2.txt

Tab. 2 - List of files with time series

2.2 Watercourses

The salinity of water in the Canal Morto, and Brenta and Bacchiglione rivers was measured at Cà Pasqua where a bridge crosses the three streams (Fig. 1). Specifically, EC profile were carried out in the water column by deploying the EC sensor.

File name	Date
Brenta-Bacchiglione-Morto.txt	27/05/2020
Brenta-Bacchiglione-Morto.txt	05/06/2020
Brenta-Bacchiglione-Morto.txt	28/07/2020
Brenta-Bacchiglione-Morto.txt	10/08/2020
Brenta-Bacchiglione-Morto.txt	14/10/2020
Brenta-Bacchiglione-Morto.txt	16/12/2020
Brenta-Bacchiglione-Morto.txt	03/05/2022
Brenta-Bacchiglione-Morto.txt	30/05/2022
Brenta-Bacchiglione-Morto.txt	15/06/2022

Tab. 3 - List of files with EC logs and acquisition date

3. Group 2 dataset

The monographs of n. 14 piezometers, which are located in the area near the Italian pilot site:

- n. 10 piezometers have been restored - with the help of the Land Reclamation Authority Adige Euganeo - and subsequently monitored in the period from July 2020 to March 2022. It is a matter of pre-existing piezometers realized for other projects (ISES) and restored

thanks to the MoST project. The monographs in this annex show the name “MoST” for each piezometer, followed by the number attributed by the ISES project;

- n. 4 piezometers are new and they have been installed in January 2022, after the geognostic surveys (n. 4 geological surveys, granulometric measurements and Lefranc tests) carried out to support the elaboration of the hydro-geomorphological map. These works were made thanks to the MoST project.

Each data sheet shows:

- the identification data of the piezometer;
- the data collected in the monitoring and with the measurements made on each piezometer (level and electrical conductivity) and then elaborated;
- the Lefranc tests results on 4 new piezometers;
- the photographic and cartographic images.

UPDATED ISES MONOGRAPH - PIEZOMETERS RESTORED IN 2021

ID **MoSTi3**

AREA DATA

Original name **ISES3 (Well P33)**

Coordinate: **12°11'0.28"E, 45°14'44.76"N**

Location: **Via del Groppone, Corte Vallona, Codevigo (PD, Land reclam. Auth. Brenta Bacchiglione)**

WELL DATA

Ground level: **0,52m a.s.l.**

Note: **Easily accessible through public land**

Ground head zero: **-0,10**

Diameter: **80 mm**

Original well deep: **20m**

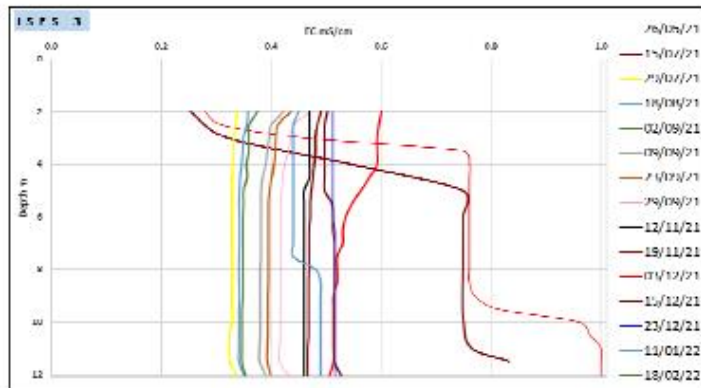
Useful depth: **12,3 m**

Filter deep: **18-21 m**

Slug Test data: **3,36E-06 m/s**

Other note: **Clogged well above the filter**

MEASUREMENT CAMPAIGNS FROM MAY 2021



PIEZOMETERS RESTORED IN 2021 (MoST project)

ID **MoSTi4**

AREA DATA

Original name **ISES4 (Well P68)**

Coordinate: **12°10'2.10"E, 45°13'34.24"N**

Location: **Via Motta 4/13, Corte Aventi, Codevigo da Via Pascolon 13 di Valli (PD, Cons. Brenta Bacchiglione)**

WELL DATA

Ground level: **0,87m a.s.l.**

Note: **PRIVATE land**

Ground head zero: **-0,01m**

Diameter: **50 mm**

Original well deep: **20m**

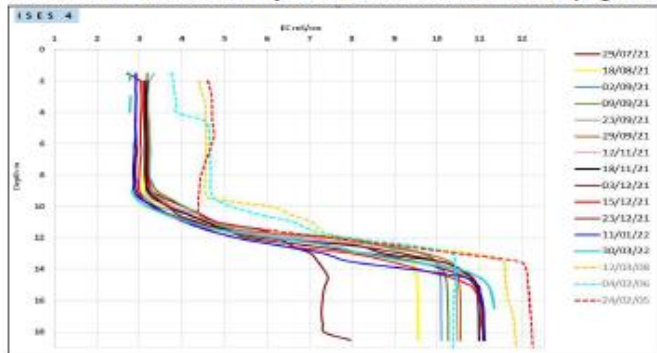
Depth of investigation: **18.95 m**

Filter deep: **0-17 m**

Hydraulic conductivity
(Slug Test): **1,28E-05 m/s**

Other note: **Excellent state of conservation**

Trend of electrical conductivity in the various measurement campaigns and photos:



MEASUREMENT CAMPAIGNS FROM MAY 2021

Georeferencing on aerial map:



PIEZOMETERS RESTORED IN 2021 (MoST project)

ID **MoSTi5**

AREA DATA

Original name: **ISES5 (Well P71)** Coordinate: **12°13'03.94"E,45°12'19.67"N**

Location: **Idrovora delle Trezze**

WELL DATA

Ground level.: **0,19m a.s.l.** Note: **PRIVATE land (Bacchiglione Land Reclamation Authority)**

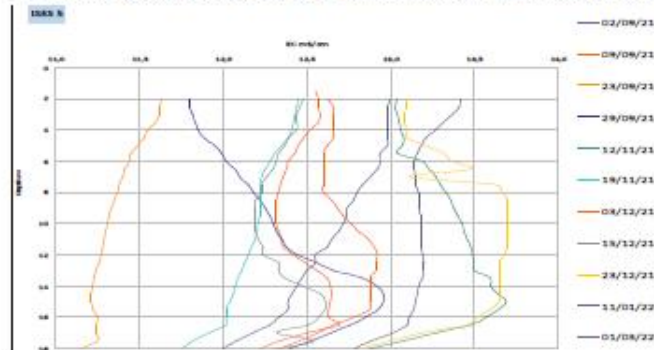
Ground head zero: **0,00m** Diameter: **50 mm**

Original well deep: **20m** Depth of investigation: **19.05 m**

Filter deep: **0-20 m** Hydraulic conductivity (Slug Test): **3,99E-06 m/s**

Other note: **Excellent state of conservation**

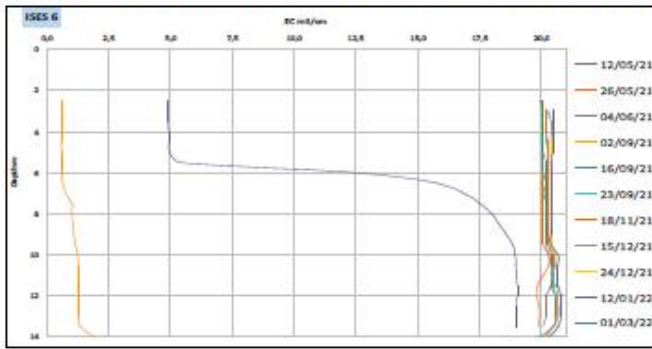


Trend of electrical conductivity in the various measurement campaigns and photos:

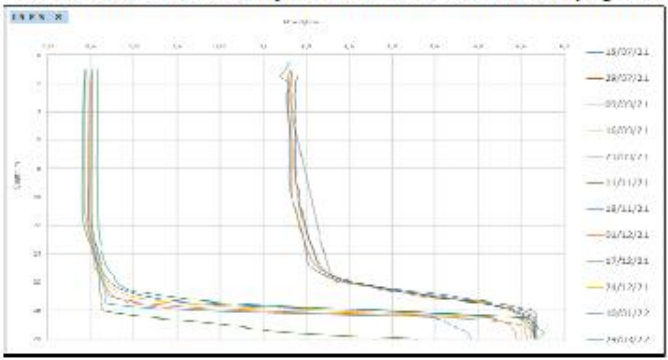

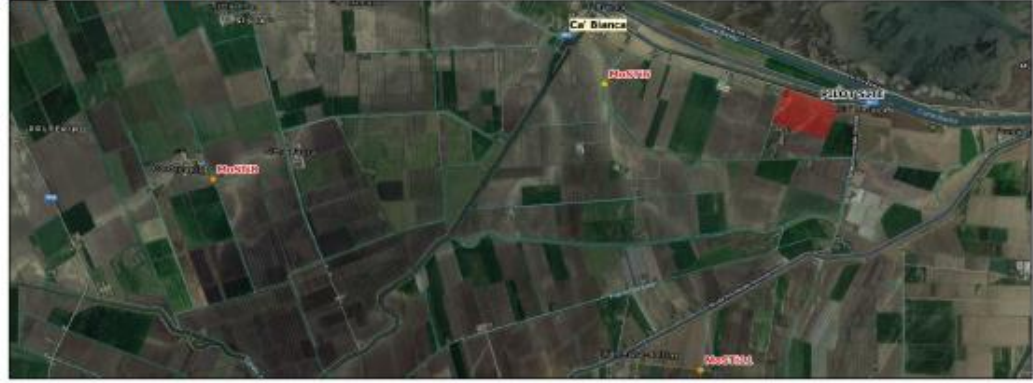


MEASUREMENT CAMPAIGNS FROM MAY 2021

Georeferencing on aerial map:



PIEZOMETERS RESTORED IN 2021 (MoST project)	
ID MoSTi6	
AREA DATA	Original name ISES6 (Well P75) Coordinate: 12°12'08.54E, 45°11'06.96"N
	Location: Cà Bianca (Chioggia)
WELL DATA	Ground level.: -0,31m b.s.l. Note: Easily accessible through public land
	Ground head zero: 0,00m Diameter: 50 mm
	Original well deep: 19m Depth of investigation: 14.8 m
	Filter deep: 0-19 m Hydraulic conductivity (Slug Test): 1,88E-05 m/s
Other note: Clogged well at 14,8m depth but actually monitored with high salinity values fairly stable with depth	
MEASUREMENT CAMPAIGNS FROM MAY 2021	<p>Trend of electrical conductivity in the various measurement campaigns and photos:</p>  
	<p>Georeferencing on aerial map:</p> 

NEW PIEZOMETERS DRILLED IN 2022 (MoST project)	
ID MoSTi8	
AREA DATA	Original name ISES8 (Well P64) Coordinate: 12°13'3.77"E, 45°12'19.38"N
	Location: Cordenazzo
WELL DATA	Ground level.: 0,65m a.s.l. Note: Accessible through often close private road
	Ground head zero: 0,00m Diameter: 80 mm
	Original well deep: 25m Depth of investigation: 20 m
	Filter deep: 18-25 m Hydraulic conductivity (Slug Test): 2,97E-05 m/s
	Other note: Excellent state of conservation
MEASUREMENT CAMPAIGNS	<p>Trend of electrical conductivity in the various measurement campaigns and photos:</p>  
	<p>Georeferencing on aerial map:</p> 

NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **MoSTi9**

AREA DATA

Original name **ISES9 (Well P54)** Coordinate: **12°07'17.69"E, 45°12'5.03"N**

Location: **Cantarana**

WELL DATA

Ground level: **-1,91m b.s.l.** Note: **Easily accessible through public land**

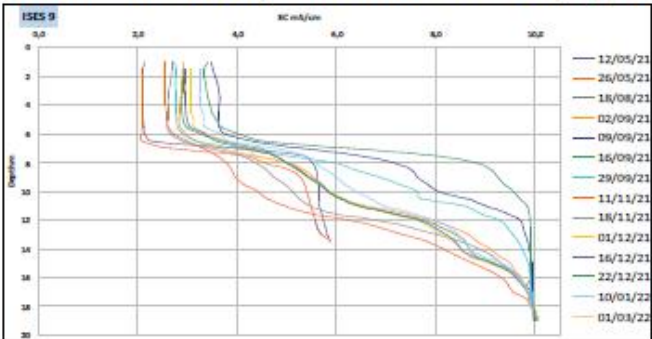

Ground head zero: **-0,19m** Diameter: **50 mm**

Original well deep: **20m** Depth of investigation: **19.5 m**

Filter deep: **0-20 m** Hydraulic conductivity (Slug Test): **5,27E-06 m/s**


Other note: **Excellent state of conservation**

Trend of electrical conductivity in the various measurement campaigns and photos:

MEASUREMENT CAMPAIGNS

Georeferencing on aerial map:



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **MoSTi10**

AREA DATA

Original name **ISES10 (Well P112)** Coordinate: **12°11'42.62"E, 45°07'25.73"N**

Location: **Punta Pettorina, nr.1, San Pietro di Cavarzere (VE, Cons. Adige Po)**

WELL DATA

Ground level.: **-1,68m b.s.l.** Note: **Accessible through private road**

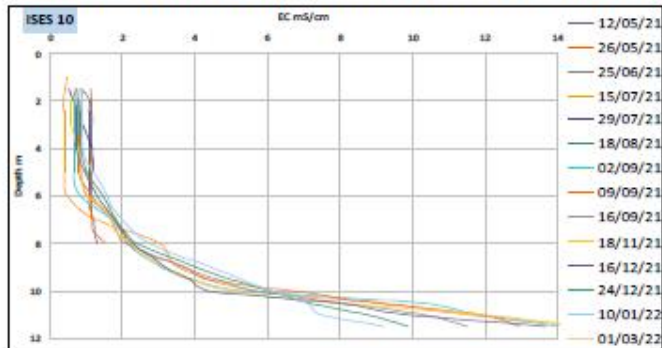
Ground head zero: **0,00m** Diameter: **50 mm**

Original well deep: **12m** Depth of investigation: **11.7 m**

Filter deep: **0-12 m** Hydraulic conductivity (Slug Test): **3,00E-06 m/s**

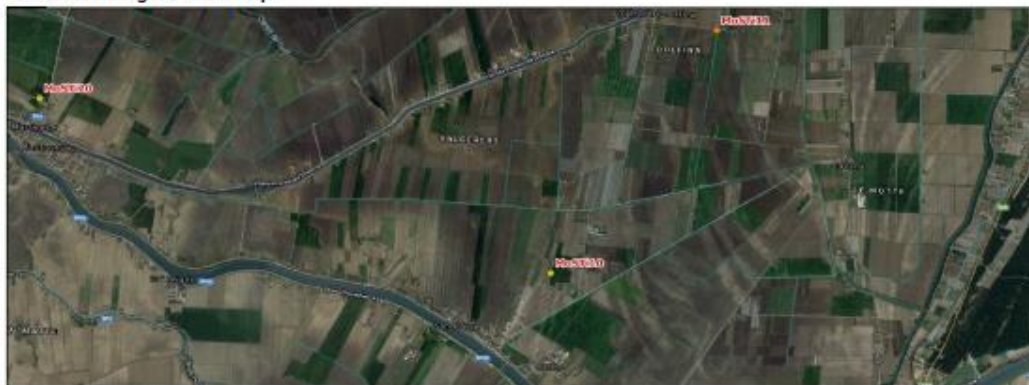
Other note: **Clogged well at 11,7m depth but actually monitored with progressively higher salinity values with depth**

Trend of electrical conductivity in the various measurement campaigns and photos:



MEASUREMENT CAMPAIGNS

Georeferencing on aerial map:



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **MoSTi11**

AREA DATA

Original name **ISES11 (Well P106)** Coordinate: **12°13'04.91"E, 45°09'08.52"N**

Location: **Valcerere Dolcina (Cavarzere)**

WELL DATA

Ground level: **-2,17m b.s.l.** Note: **Accessible through public road**

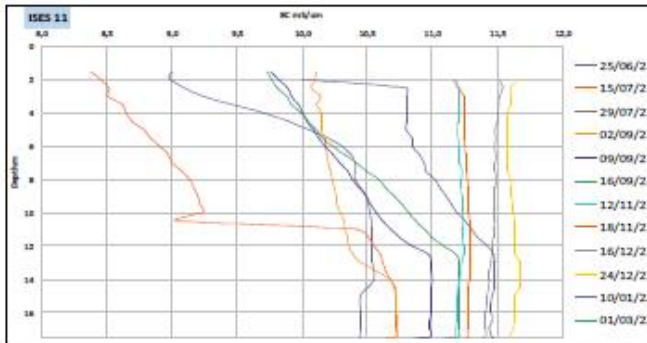
Ground head zero: **0,00m** Diameter: **50 mm**

Original well deep: **20m** Depth of investigation: **18.6 m**

Filter deep: **0-20 m** Hydraulic conductivity (Slug Test): **1,16E-06 m/s**

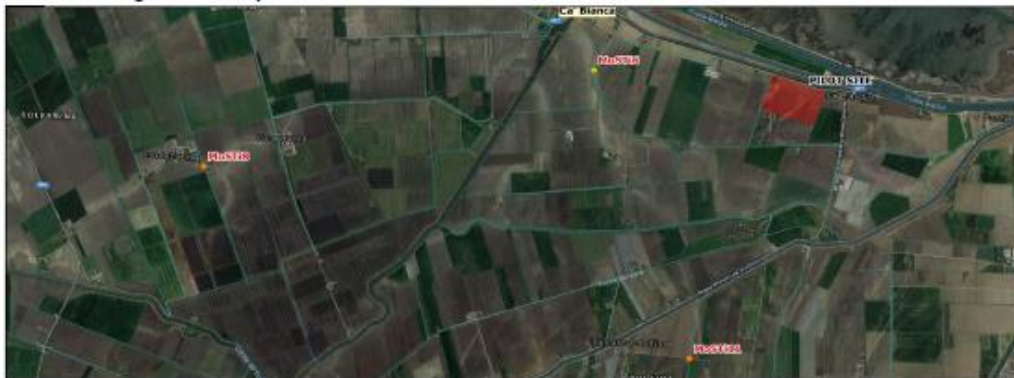
Other note: **Excellent state of conservation**

Trend of electrical conductivity in the various measurement campaigns and photos:



MEASUREMENT CAMPAIGNS

Georeferencing on aerial map:



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **MoSTi16**

AREA DATA

Original name **ISES16 (Well P137)**

Coordinate: **12°17'41.92"E, 45°11'28.68"N**

Location: **Sottomarina Orti (Chioggia)**

WELL DATA

Ground level.: **1,80m a.s.l.**

Note: **Easily accessible through public land**

Ground head zero: **-0,23m**

Diameter: **50 mm**

Original well deep: **21m**

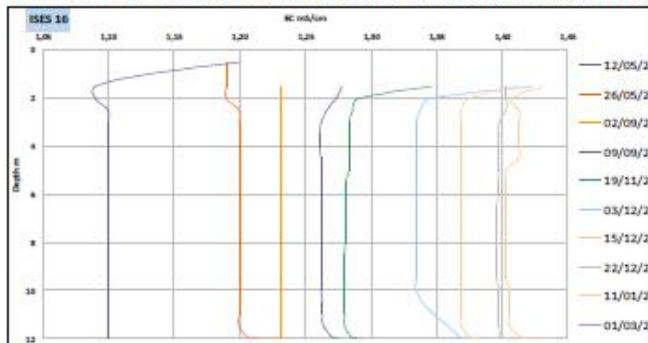
Depth of investigation: **12.8 m**

Filter deep: **0-21 m**

Hydraulic conductivity
(Slug Test): **2,40E-06 m/s**

Other note: **Clogged well at 12,8m depth but actually monitored with low salinity values fairly stable with depth**

Trend of electrical conductivity in the various measurement campaigns and photos:



MEASUREMENT CAMPAIGNS

Georeferencing on aerial map:



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **MoSTi20**

AREA DATA

Original name **ISES20 (Well P89)** Coordinate: **12°07'11.26"E, 45°08'31.65"N**

Location: **Via IV Novembre 58, Loc. Boscochiaro di Cavarzere (VE, Cons. Adige Po)**

WELL DATA

Ground level.: **-0,73m b.s.l.** Note: **PRIVATE road and land**

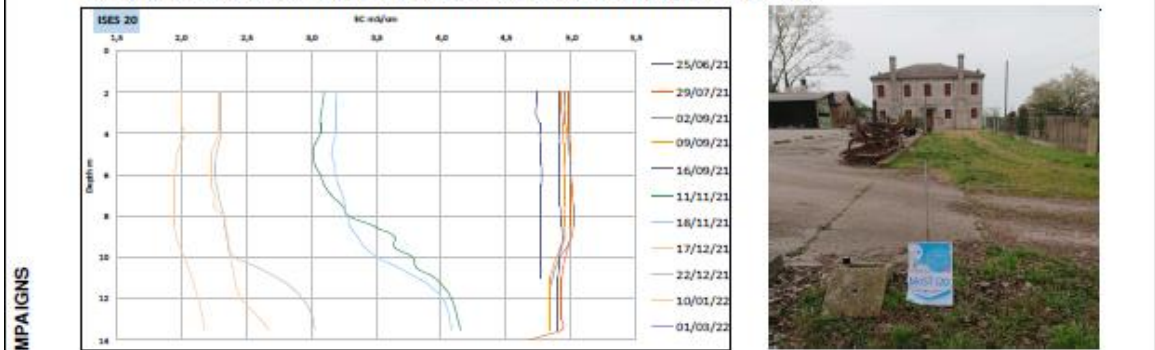
Ground head zero: **0,00m** Diameter: **50 mm**

Original well deep: **15m** Depth of investigation: **14 m**

Filter deep: **0-15 m** Hydraulic conductivity (Slug Test): **1,61E-06 m/s**

Other note: **Excellent state of conservation**

Trend of electrical conductivity in the various measurement campaigns and photos:



Georeferencing on aerial map:



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **Most N**

AREA DATA

Original name **Most N** Coordinate: 12°14'14.60"E, 45°11'07.00"N
 Location: **Via Ca' Grassl, 28a, Loc. Ca' Pasqua**

WELL DATA

Ground level: **2,07m a.s.l.** Note:
 Ground head zero: **0,16m** Diameter: **101.6 mm**
 Original well deep: **18m** Depth of investigation: **18 m**
 Filter deep: **4-16.5 m** Hydraulic conductivity (Slug Test): **2,73E-07 m/s**
 Other note: **Recently built and in excelent state of conservation**

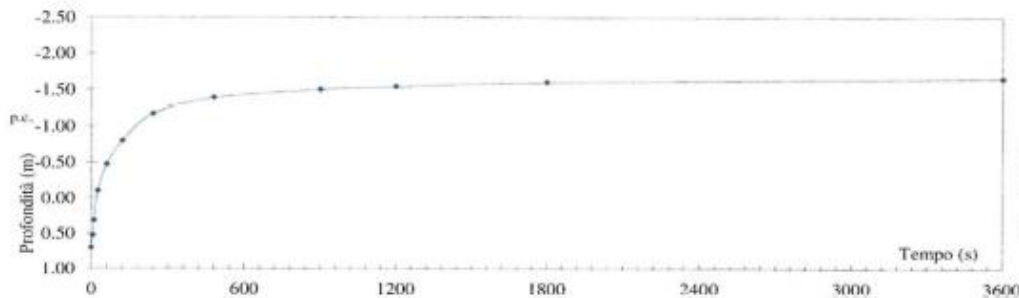
MEASUREMENT CAMPAIGNS

Georeferencing on aerial map and photo:



Lefranc test (AGI 1977) onsite:

$$\text{Coefficiente di Permeabilita' (K)} = \left(\frac{A}{C_1(h_2 - h_1)} \ln \frac{h_1}{h_2} \right) = 1.98E-04 \text{ m/s}$$



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **mSOUTH**

AREA DATA

Original name **mSOUTH**

Coordinate: **12°13'39.70"E, 45°10'37.20"N**

Location: **Azienda agricola Smeraldi**

WELL DATA

Ground level: **-2,30m b.s.l.**

Note:

Ground head zero: **0,06m**

Diameter: **101.6 mm**

Original well deep: **13m**

Depth of investigation: **13 m**

Filter deep: **1-12 m**

Hydraulic conductivity
(Slug Test): **6,32E-05 m/s**

Other note: **Recently built and in excelent state of conservation**

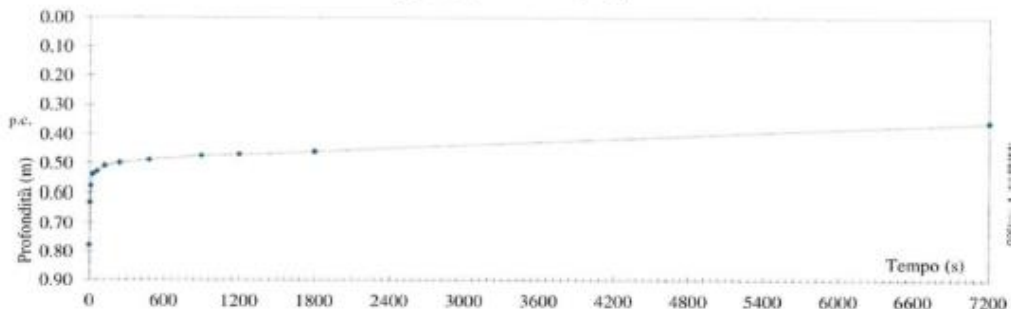
Georeferencing on aerial map and photo:



MEASUREMENT CAMPAIGNS

Lefranc test (AGI 1977) onsite:

$$\text{Coefficiente di Permeabilita' (K)} = \left(\frac{A}{C_s(t_2-t_1)} \ln \frac{h_1}{h_2} \right) = 7.96E-06 \text{ m/s}$$



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **mEAST**

AREA DATA

Original name **mEAST** Coordinate: **12°14'41.80"E, 45°10'48.90"N**
 Location: **Loc. Ca' Pasqua (east to Gas Station)**

WELL DATA

Ground level.: **-1,81m b.s.l.** Note:
 Ground head zero: **0,08m** Diameter: **101.6 mm**
 Original well deep: **6m** Depth of investigation: **6 m**
 Filter deep: **1-6 m** Hydraulic conductivity (Slug Test): **1,27E-04 m/s**
 Other note: **Recently built and in excelent state of conservation**

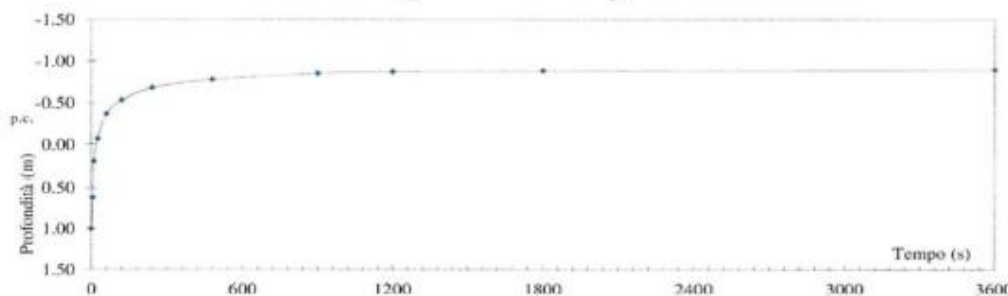
MEASUREMENT CAMPAIGNS

Georeferencing on aerial map and photo:



Lefranc test (AGI 1977) onsite:

$$\text{Coefficiente di Permeabilita' (K)} = \left(\frac{A}{C_1(t_2-t_1)} \ln \frac{h_1}{h_2} \right) = 2.22E-04 \text{ m/s}$$



NEW PIEZOMETERS DRILLED IN 2022 (MoST project)

ID **mWEST**

AREA DATA

Original name **mWEST** Coordinate: **12°13'14.50"E, 45°11'04.90"N**
 Location: **Azlena Corazzin (S.P. 7 Rebosola)**

WELL DATA

Ground level: **-1,83m b.s.l.** Note:
 Ground head zero: **0,06m** Diameter: **101.6 mm**
 Original well deep: **6m** Depth of investigation: **6 m**
 Filter deep: **2-5.5 m** Hydraulic conductivity (Slug Test): **1,51E-04 m/s**
 Other note: **Recently built and in excelent state of conservation**

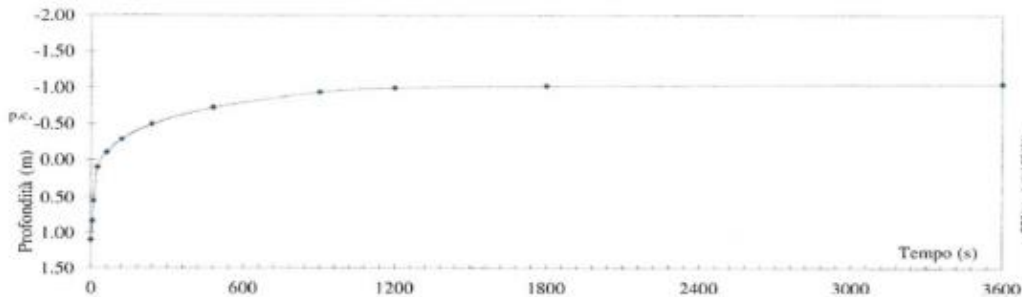
Georeferencing on aerial map and photo:



MEASUREMENT CAMPAIGNS

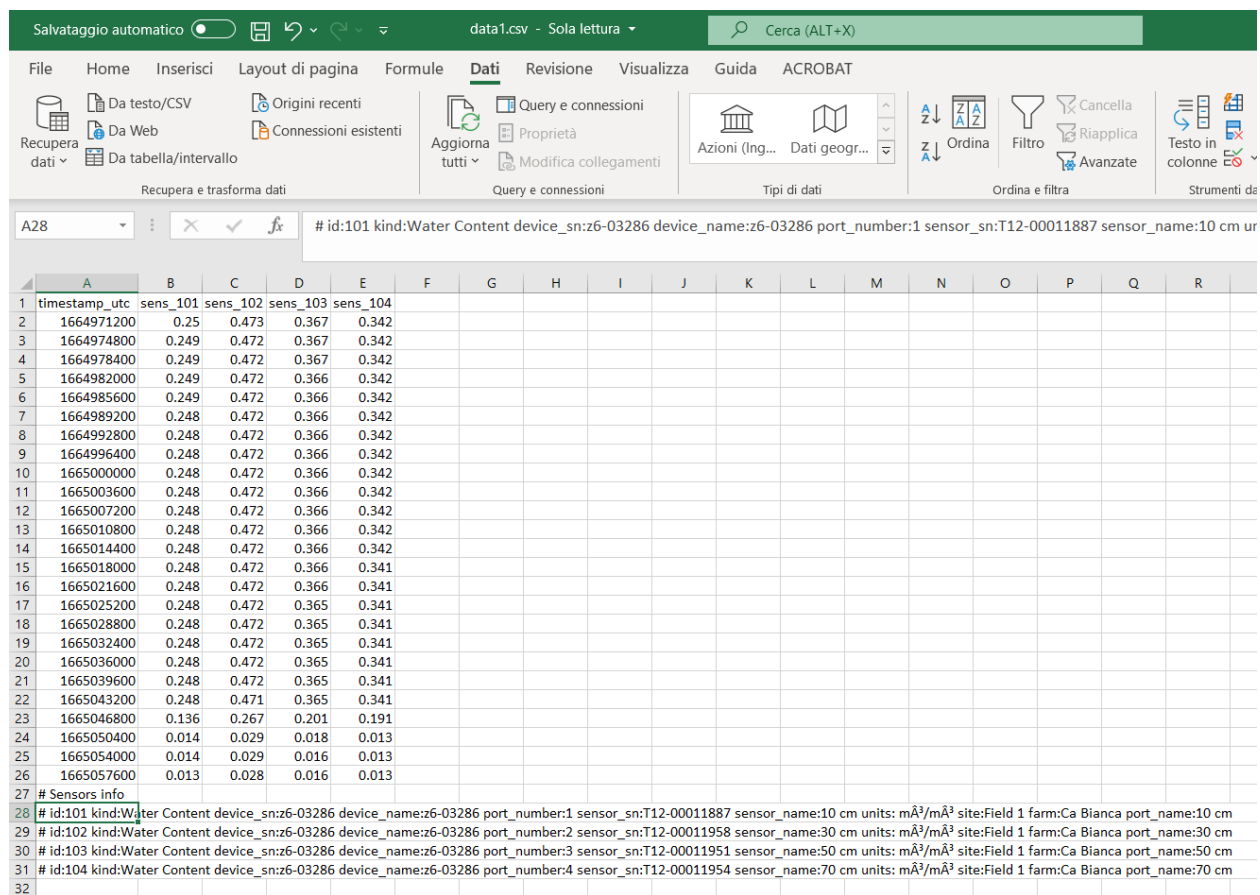
Lefranc test (AGI 1977) onsite:

$$\text{Coefficiente di Permeabilita' (K)} = \left(\frac{A}{C_1(t_2-t_1)} \ln \frac{h_1}{h_2} \right) = 1.27E-04 \text{ m/s}$$



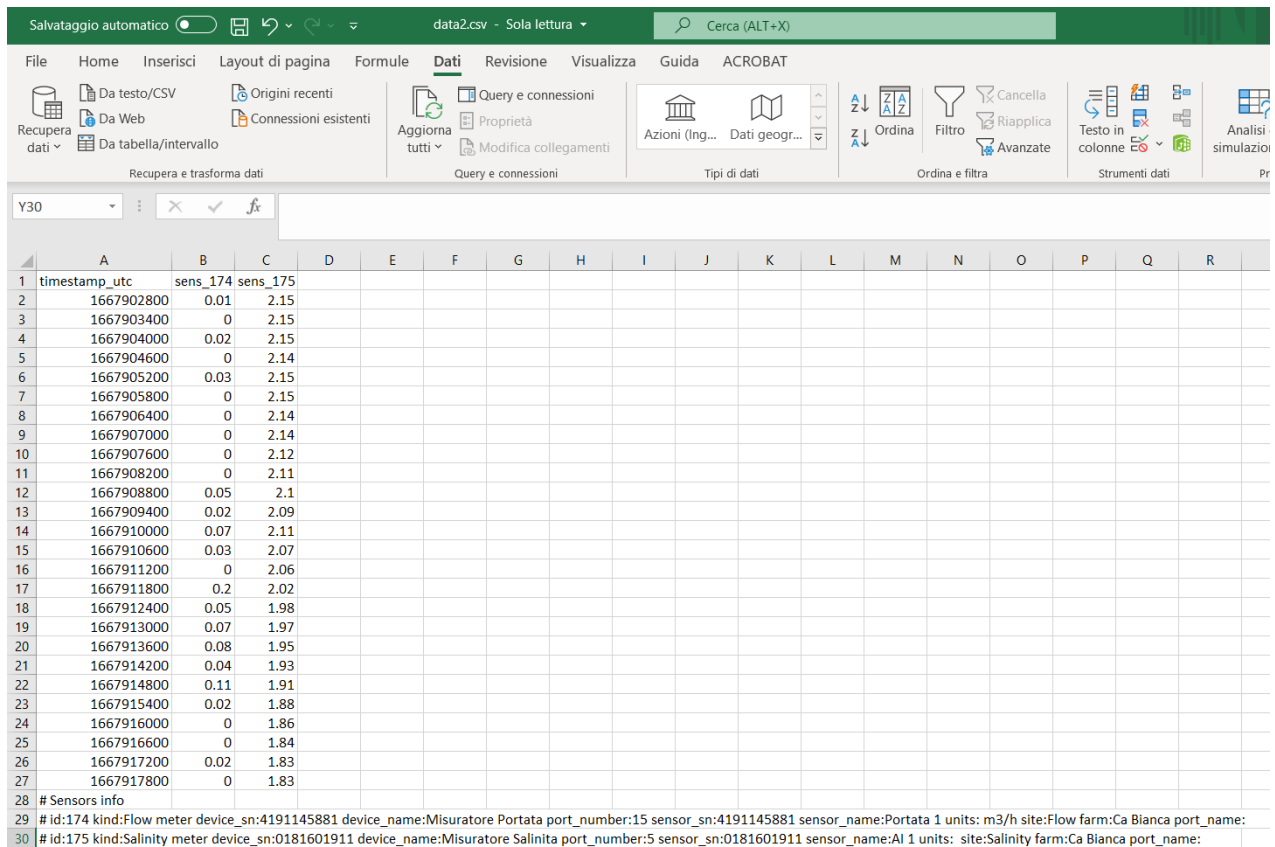
4. Group 3 dataset

All the data collected in the 5 field sites established in the farmland are stored in the App MoST (Deliverable D_5.2.5) and can be query form the MoST Webtool (Deliverable D_5.2.6). Here we report below a couple of examples (Fig. 2 and Fig. 3).



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	timestamp_utc	sens_101	sens_102	sens_103	sens_104													
2	1664971200	0.25	0.473	0.367	0.342													
3	1664974800	0.249	0.472	0.367	0.342													
4	1664978400	0.249	0.472	0.367	0.342													
5	1664982000	0.249	0.472	0.366	0.342													
6	1664985600	0.249	0.472	0.366	0.342													
7	1664989200	0.248	0.472	0.366	0.342													
8	1664992800	0.248	0.472	0.366	0.342													
9	1664996400	0.248	0.472	0.366	0.342													
10	1665000000	0.248	0.472	0.366	0.342													
11	1665003600	0.248	0.472	0.366	0.342													
12	1665007200	0.248	0.472	0.366	0.342													
13	1665010800	0.248	0.472	0.366	0.342													
14	1665014400	0.248	0.472	0.366	0.342													
15	1665018000	0.248	0.472	0.366	0.341													
16	1665021600	0.248	0.472	0.366	0.341													
17	1665025200	0.248	0.472	0.365	0.341													
18	1665028800	0.248	0.472	0.365	0.341													
19	1665032400	0.248	0.472	0.365	0.341													
20	1665036000	0.248	0.472	0.365	0.341													
21	1665039600	0.248	0.472	0.365	0.341													
22	1665043200	0.248	0.471	0.365	0.341													
23	1665046800	0.136	0.267	0.201	0.191													
24	1665050400	0.014	0.029	0.018	0.013													
25	1665054000	0.014	0.029	0.016	0.013													
26	1665057600	0.013	0.028	0.016	0.013													
27	# Sensors info																	
28	# id:101 kind:Water Content device_sn:z6-03286 device_name:z6-03286 port_number:1 sensor_sn:T12-00011887 sensor_name:10 cm units: m ³ /m ³ site:Field 1 farm:Ca Bianca port_name:10 cm																	
29	# id:102 kind:Water Content device_sn:z6-03286 device_name:z6-03286 port_number:2 sensor_sn:T12-00011958 sensor_name:30 cm units: m ³ /m ³ site:Field 1 farm:Ca Bianca port_name:30 cm																	
30	# id:103 kind:Water Content device_sn:z6-03286 device_name:z6-03286 port_number:3 sensor_sn:T12-00011951 sensor_name:50 cm units: m ³ /m ³ site:Field 1 farm:Ca Bianca port_name:50 cm																	
31	# id:104 kind:Water Content device_sn:z6-03286 device_name:z6-03286 port_number:4 sensor_sn:T12-00011954 sensor_name:70 cm units: m ³ /m ³ site:Field 1 farm:Ca Bianca port_name:70 cm																	
32																		

Fig. 2 – Example of dataset collected at the S1 station and containing the water content at 10, 30, 50 and 70 cm depth. The first column provides time in seconds from 1/1/1970"



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	timestamp_utc	sens_174	sens_175															
2	1667902800	0.01	2.15															
3	1667903400	0	2.15															
4	1667904000	0.02	2.15															
5	1667904600	0	2.14															
6	1667905200	0.03	2.15															
7	1667905800	0	2.15															
8	1667906400	0	2.14															
9	1667907000	0	2.14															
10	1667907600	0	2.12															
11	1667908200	0	2.11															
12	1667908800	0.05	2.1															
13	1667909400	0.02	2.09															
14	1667910000	0.07	2.11															
15	1667910600	0.03	2.07															
16	1667911200	0	2.06															
17	1667911800	0.2	2.02															
18	1667912400	0.05	1.98															
19	1667913000	0.07	1.97															
20	1667913600	0.08	1.95															
21	1667914200	0.04	1.93															
22	1667914800	0.11	1.91															
23	1667915400	0.02	1.88															
24	1667916000	0	1.86															
25	1667916600	0	1.84															
26	1667917200	0.02	1.83															
27	1667917800	0	1.83															
28	# Sensors info																	
29	# id:174 kind:Flow meter device_sn:4191145881 device_name:Misuratore Portata port_number:15 sensor_sn:4191145881 sensor_name:Portata 1 units:m3/h site:Flow farm:Ca Bianca port_name:																	
30	# id:175 kind:Salinity meter device_sn:0181601911 device_name:Misuratore Salinita port_number:5 sensor_sn:0181601911 sensor_name:Al 1 units: site:Salinity farm:Ca Bianca port_name:																	

Fig. 3 – Example of dataset collected at the drain pipe intake and containing the pipe discharge and the Morto channel salinity. The first column provides time in seconds from 1/1/1970"