Geological report at the seismic station IT.PTV – Pontevico (BS)

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Subject: **Final report illustrating the geological setting for station IT.PTV**	

Convenzione DPC-INGV 2018, Allegato B2: Obiettivo 1 - TASK B: "Caratterizzazione siti accelerometrici" (Coord. G. Cultrera, F. Pacor)

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1. INTRODUCTION

The geological description is related to the site of studied seismic station. The coordinates are reported in Table 1.

Table 1

CODE	NAME	LATITUDE	LONGITUDE	QUOTA (a.s.l.)
IT.PTV	Pontevico	45.274192	10.087920	45
ADDRESS	Via Servolta, 9, 25026 Pontevico (BS), Italy			

2. TOPOGRAPHIC AND GEOLOGICAL INFORMATION

Topographic information related to the site are reported in Table 2. Table 3 summarizes all available geological maps from literature for geological analyses.

Table 2

Topograpy	Description	Class
	Flat surfaces, isolated slope and reliefs with slope i<=15°	T1

Table 3

Geological map	Source	Scale
IT.PTV	Geological map of Italy sheet *061* (Cremona)	1:100.000
IT.PTV	Lithological map of Pontevico	1:10.000

In Table 4 Geological, Lithological and Lithotechnical Units (according to Seismic Microzonation classification; Technical Commission MS, 2015) are described and are concerned to maps of following chapters. The term "original" means the result comes from a preexisting cartography

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(Table 3); the term “deduced” means the result comes from an interpretation of a preexisting cartography according to the nomenclature of corresponding cartography.

Table 4

GEOLOGICAL UNITS (100k Geological map of Pontevico) *original*		LITHOLOGICAL UNITS (Amanti et al., 2008) *deduced*		LITHOTECHNICAL UNIT (MZS) *deduced*	
code	description	code	description	code	description
fw	Sand -clay	B2-B1	Fine-medium granulometry	SC	Clay sands, mixture of sand and clay

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3. GEOLOGICAL MAP

In Figure 1 Geological Map is reported in a 1kmx1Km square around the station.

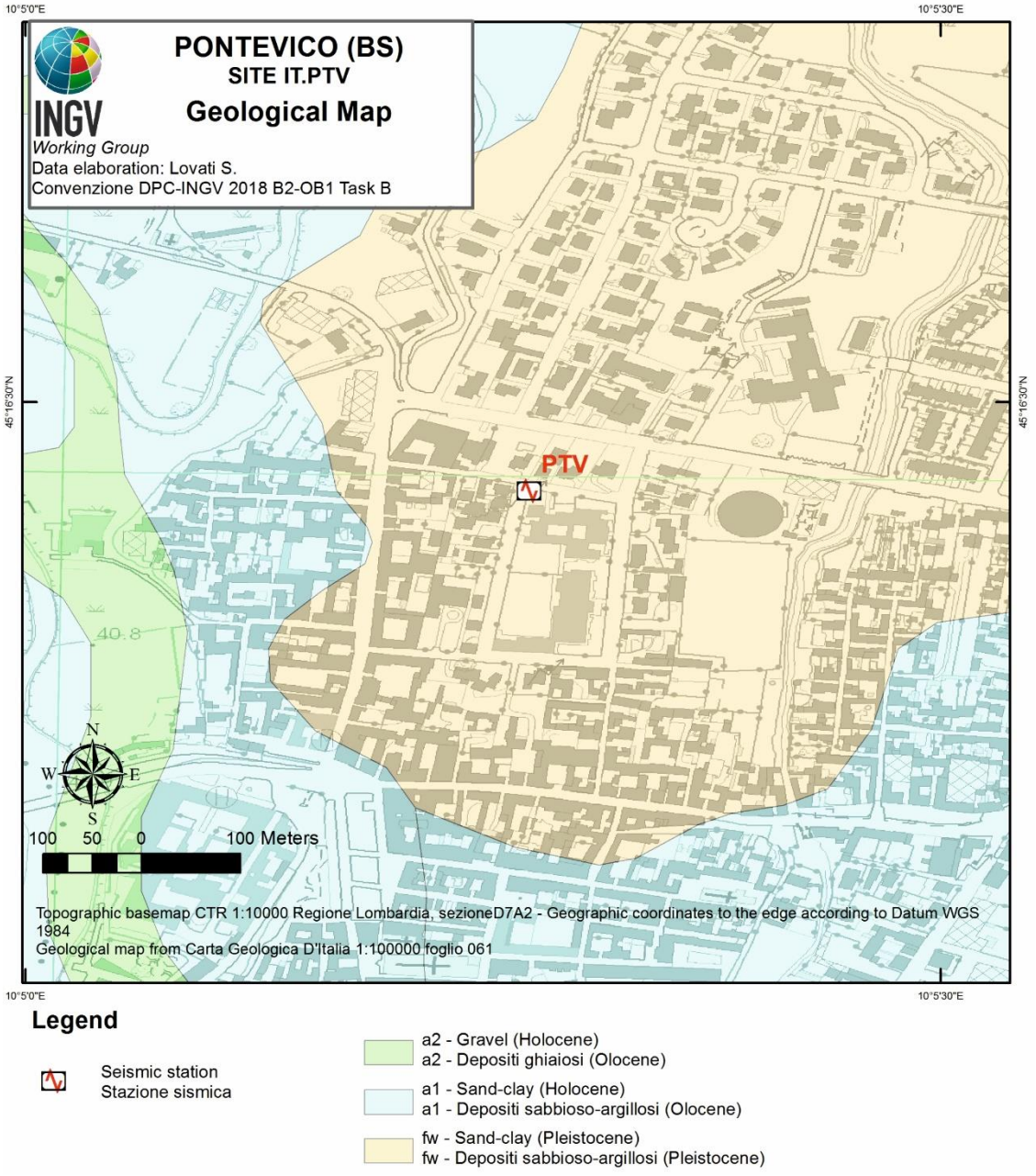

Figure 1. Geological map of seismic station IT.PTV. Scale 1:5.000. Geological units are established according to the nomenclature of of geological map of Italy 1:100.000 (Sheet 061-Cremona).

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4. LITHOLOGICAL MAP

In Figure 2 Lithological Map is reported in a 1kmx1Km square around the station.

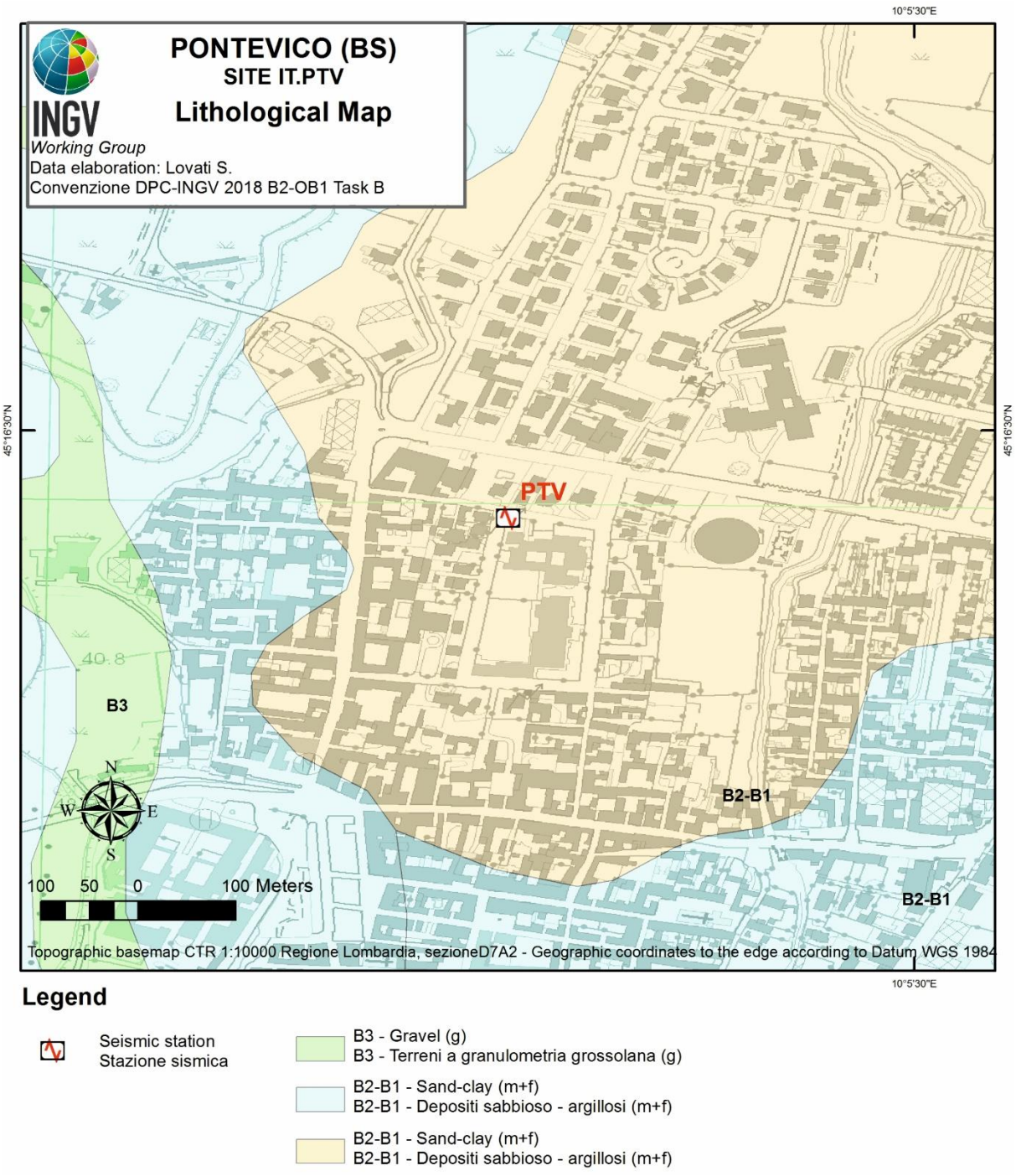

Figure 2: Lithological map of station IT.PTV Scale 1:5.000. The codes of the lithological units are assigned according to the nomenclature of the Lithological map ISPRA 1: 100.000 (Amanti et al. 2008).

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5. LITHOTECHNICAL MAP

In Figure 3 Lithotechnical Map is reported in a 1kmx1Km square around the station.

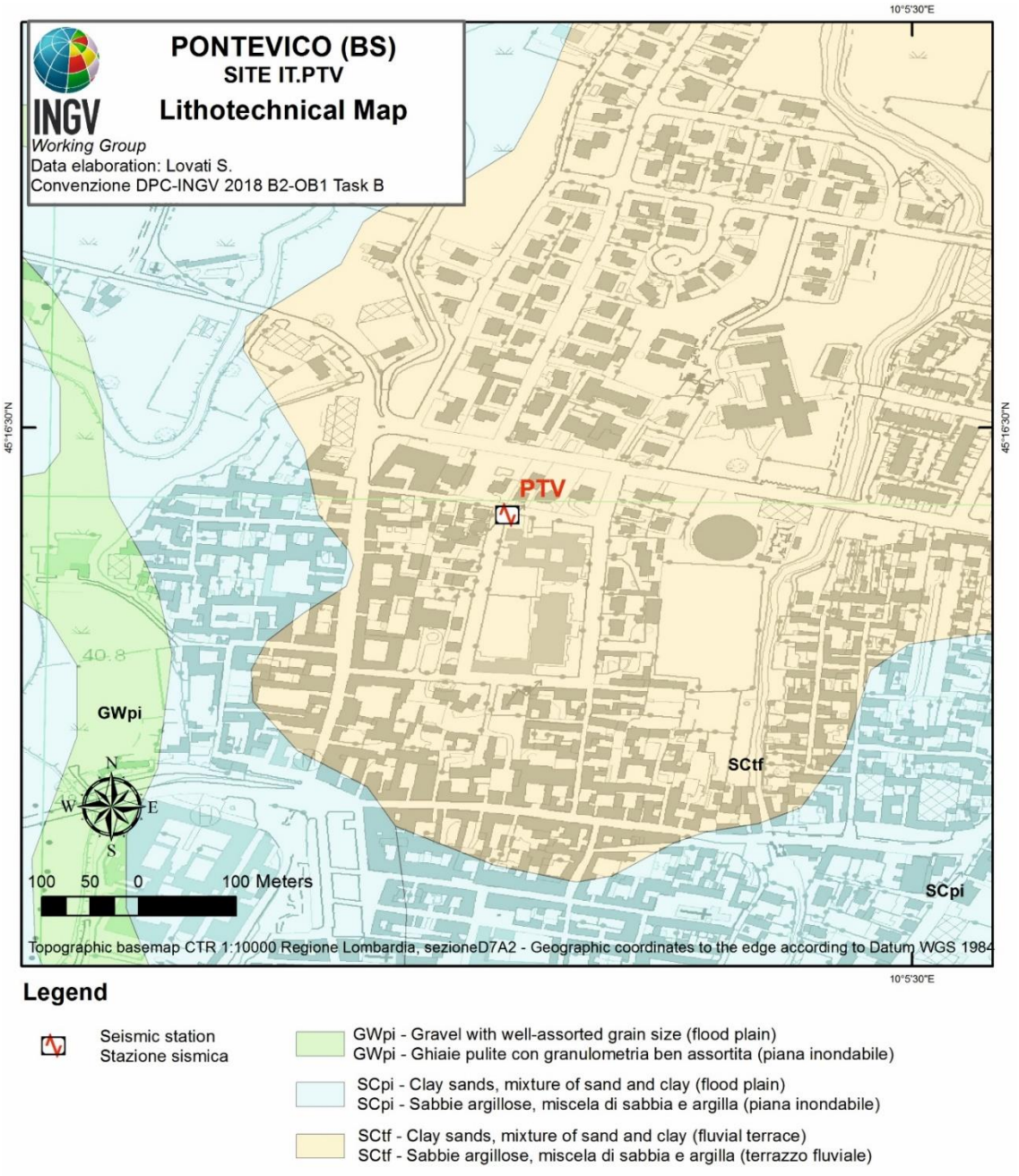

Figure 3: Lithotechnical map of the seismic station IT.PTV. Scale 1:5.000. The lithotechnical units are deduced according to the nomenclature of Seismic Microzonation (Technical Commission MS, 2015).

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6. SURVEY MAP

Figure 4 shows the survey Map reported both previous investigations and geophysics surveys conducted by INGV Working Group.

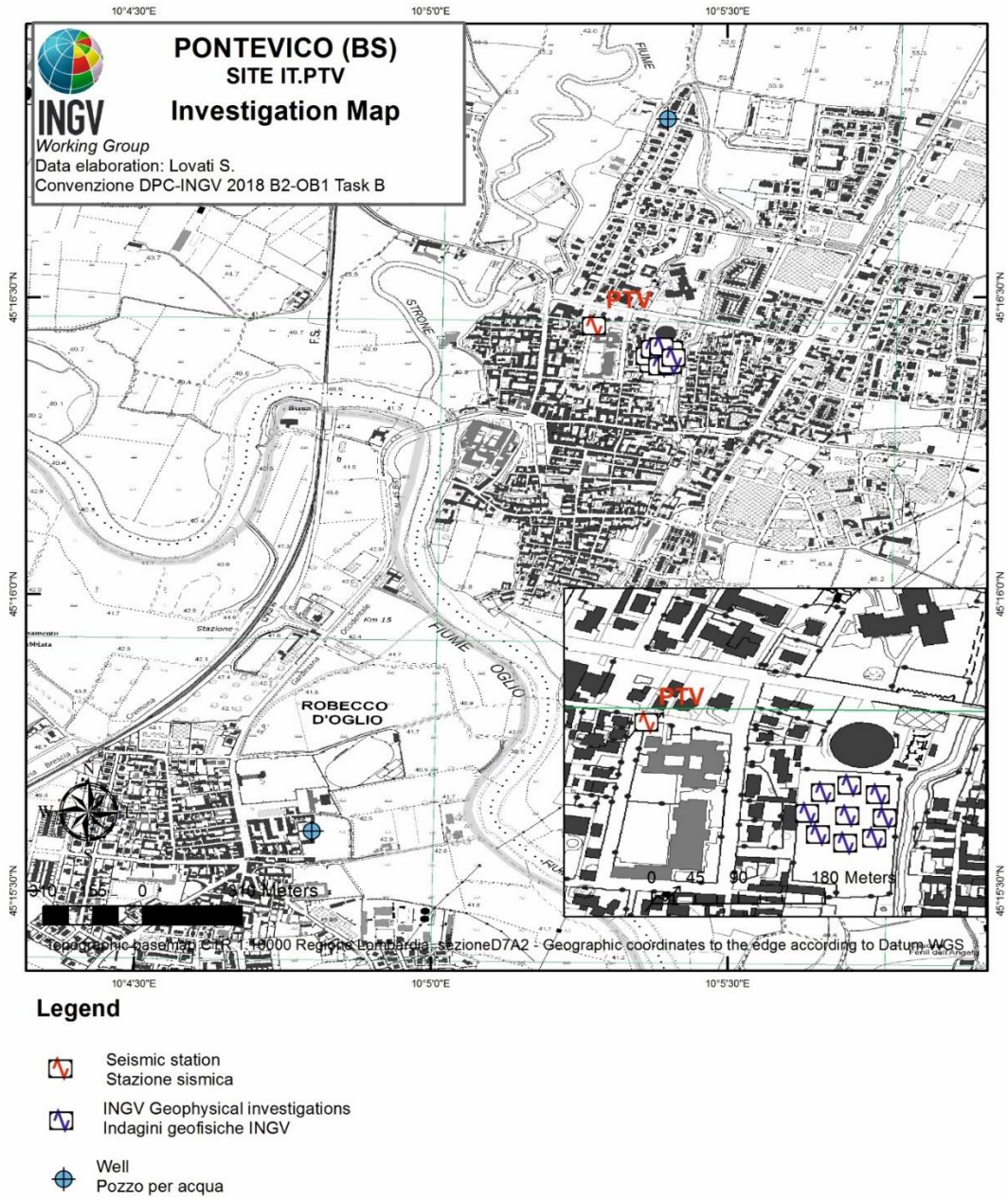

Figure 4: Map of the surveys in the surroundings of the station IT.PTV. Scala 1: 15.000. The box at the bottom right contains a zoom of the area with the detail of the geophysical 9-stations array conducted by INGV Working Group for the seismic characterization of the site (Agreement DPC-INGV 2018, Allegato B2: Obiettivo 1 - TASK B, Velocity profile report IT.PTV)

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7. GEOLOGICAL MODEL

7.1 General description

The studied area is located in the town center of Pontevico Municipality that is in the southern part of the province of Brescia, northern Oglio river. The territory is characterized by a typical flat morphology, with a series of morphological terraces that define the most river's courses shaped by the erosive-depositional action of the water. It is of particular interest to highlight the presence of linear elements such as paleo-riverbed and edges of fluvial terraces.

The territory is closely related to the formation of the Po Valley following the geodynamic evolution between the thrust belts of the Alps and the Apennines (Pieri and Groppi, 1981; Carminati and Doglioni, 2012). The Po Plain sedimentary basin arises, since the Late Cretaceous, as a consequence of the thrusting of Alps and the Apennines chains that loaded and flexed the continental crust originating a foredeep basins with a thick syn-orogenic clastic sequence (Doglioni, 1993) and a complex buried tectonic structure that is characterized by the south verging thrust system of the Alps and the north-verging thrust system of the Apennines.

The evolution of the Po valley is documented by tectonic activity during the middle Pliocene, with phenomena of lifting and compression. With the beginning of the upper Pliocene the sea still covers the area of the current plain and continuous sedimentation, controlled by subsidence, while numerous faults appear to be active. Plio-Pleistocene sea sediments, generally consisting of clays, silts and sands, reached very high thicknesses in some areas, of the order of some kilometers, especially in the synclinal structures. The transition from the marine Quaternary to the continental one is pointed out by salty and continental episodes becoming more frequent towards up, until the only deposition of continental Holocene sediments.

During the Quaternary the subsidence persisted and a period of marine regression followed, leading progressively to the filling of the basin from West to East. The deep drilling of *Agip* (Regione Lombardia, Eni Divisione Agip, 2002, Figure 5) of well Alfianello1 (3711 meters deep, 4 Kilometer far from Pontevico Municipality) crossed the Quaternary (up to 1670 m) and Pliocene (up to 2697 m) sediments consisting of sands and clays, and middle Miocene (up to 3711 m) sediments consisting of sandstone, marls and conglomerates (Figure 5).

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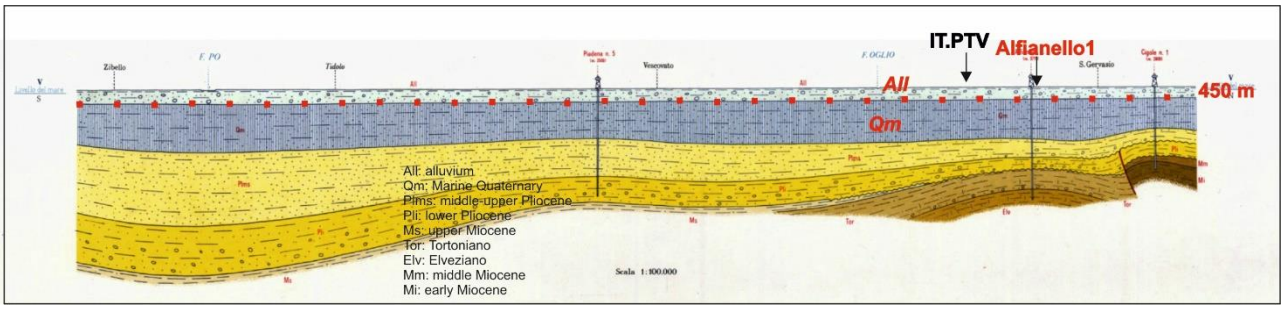

Figure 5: Deep geological section of Po plain crossing IT.PTV station (sheet 061 Cremona).

7.2 Geological Section

Closing at IT.PTV station, stratigraphic data were obtained from the drilling of 2 wells for water purpose, the first one, northern, 200 m deep and the second one, southern, 184 m deep. Collected data presented a good spatial arrangement that allowed to correlate the lateral variability of the lithological units and to draw a schematic geological section crossing the seismic station IT.PTV (Figure 6 bottom left).

For the lithological description of the stratigraphic succession a lithological classification drawn up by the Lombardy Region was used (http://www.geoportale.regione.lombardia.it/). The stratigraphy shows the presence of grey clay yellow sand and some pebbles until a depth of 20 meters. From 20 meters of depth up to about 60 m, yellow sands and clay alternate. Up to 100 m depth dark clay is predominant with lens of yellow and grey sand. From 100 to 200 m depth a continue succession of gravel clay and sand with different thickness are shown.

7.3 Subsoil model

A subsoil model is built up to a depth of 200 m for the area around the IT.PTV station on the basis of geological and stratigraphic information (Figure 6 right). All represented sediments are continental alluvial Pleistocenic and Holocenic deposits called *All* (alluvium, according to Sheet 061 Cremona of Geological map of Italy 1:10000, geological section in Figure 5). Data coming from wells for oil purpose (i.e. Alfianello1) and geologic section indicate the transition from marine (Qm) to continental (All) sediments at about 450 m depth (Figure 5 and Figure 6 right).

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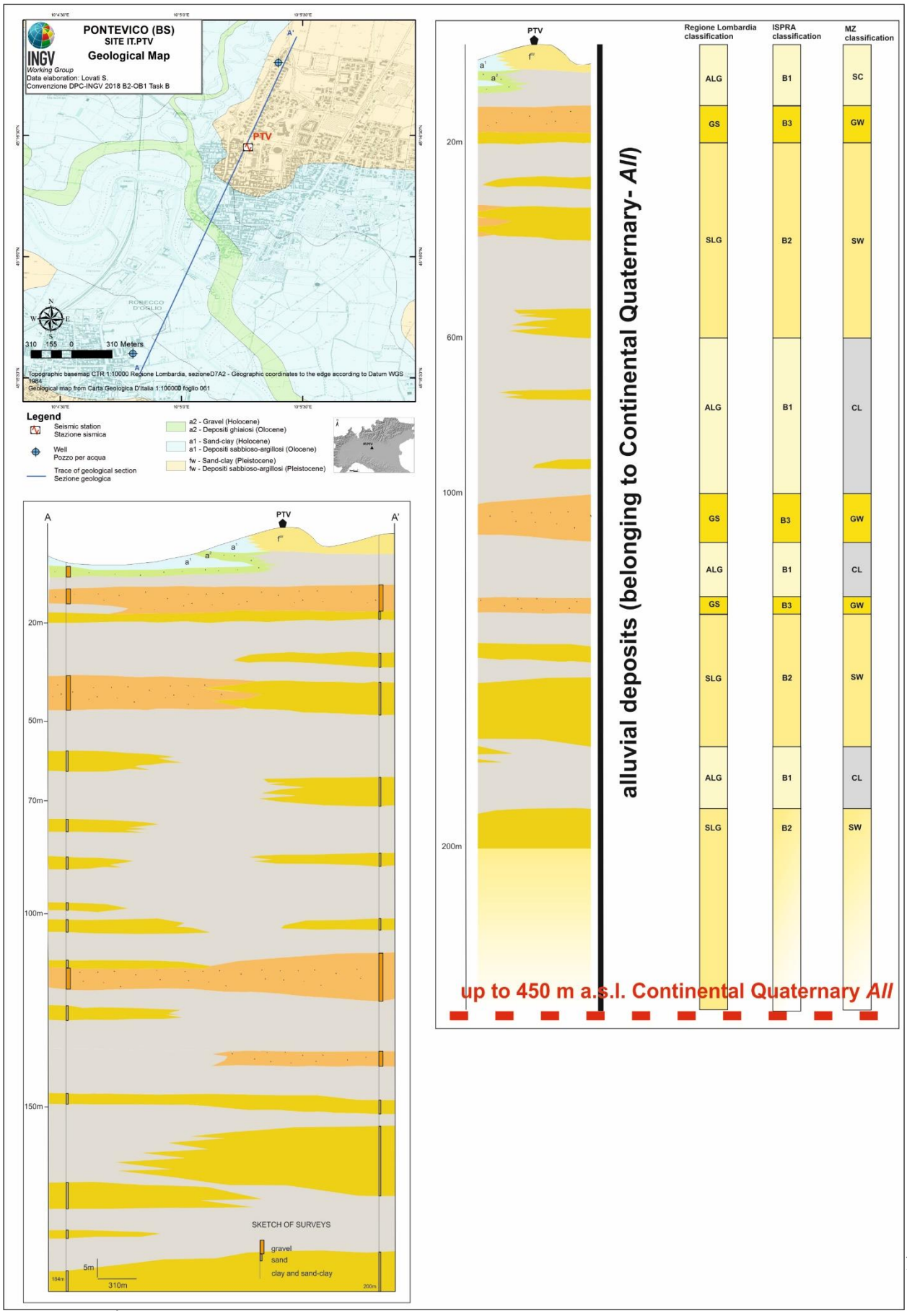

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Figure 6: Bottom left: Geological section A-A' crossing seismic station IT.PTV. Right: Subsoil model under the IT.PTV seismic station and classification according to Regione Lombardia: ALG: silty clays with presence of gravel and sand, GS: sandy gravels, SLG: silty sand with gravel; according to ISPRA: B1: clay, B2: sand, B3: gravel; according to MZ: SC: clay sands, mixture of sand and clay, GW: gravel, mixed gravel-sand, SW: sand and gravel-sand, CL: inorganic clay, silty and sandy clay.

8. REFERENCES

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