



## Geological report at the seismic station IV.MILN – Milano

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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.)
IV.MILN	Milano	45,480128	9,231745	125
ADDRESS	Via A. Corti 12, 20133 Milano, Italy			

## 2. TOPOGRAPHIC AND GEOLOGICAL INFORMATION

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

Table 2

Topography	Description	Class
	Flat surfaces, isolated slope and reliefs with slope $i \leq 15^\circ$	T1
Morphology	Description	Code
	Plain	P

Table 3

Geological map	Source	Scale
IV.MILN	Geological map of Italy sheet 118 (Milano)	1:50.000



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 (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 (50k Geological map of Milano) <i>original</i>		LITHOLOGICAL UNITS (Amanti et al., 2008) <i>deduced</i>		LITHOTECHNICAL UNIT (MZS) <i>deduced</i>	
code	description	code	description	code	description
BEZ	Gravel alluvial deposits	B3	Gravel deposits	GW	Gravel deposits



### 3. GEOLOGICAL MAP

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

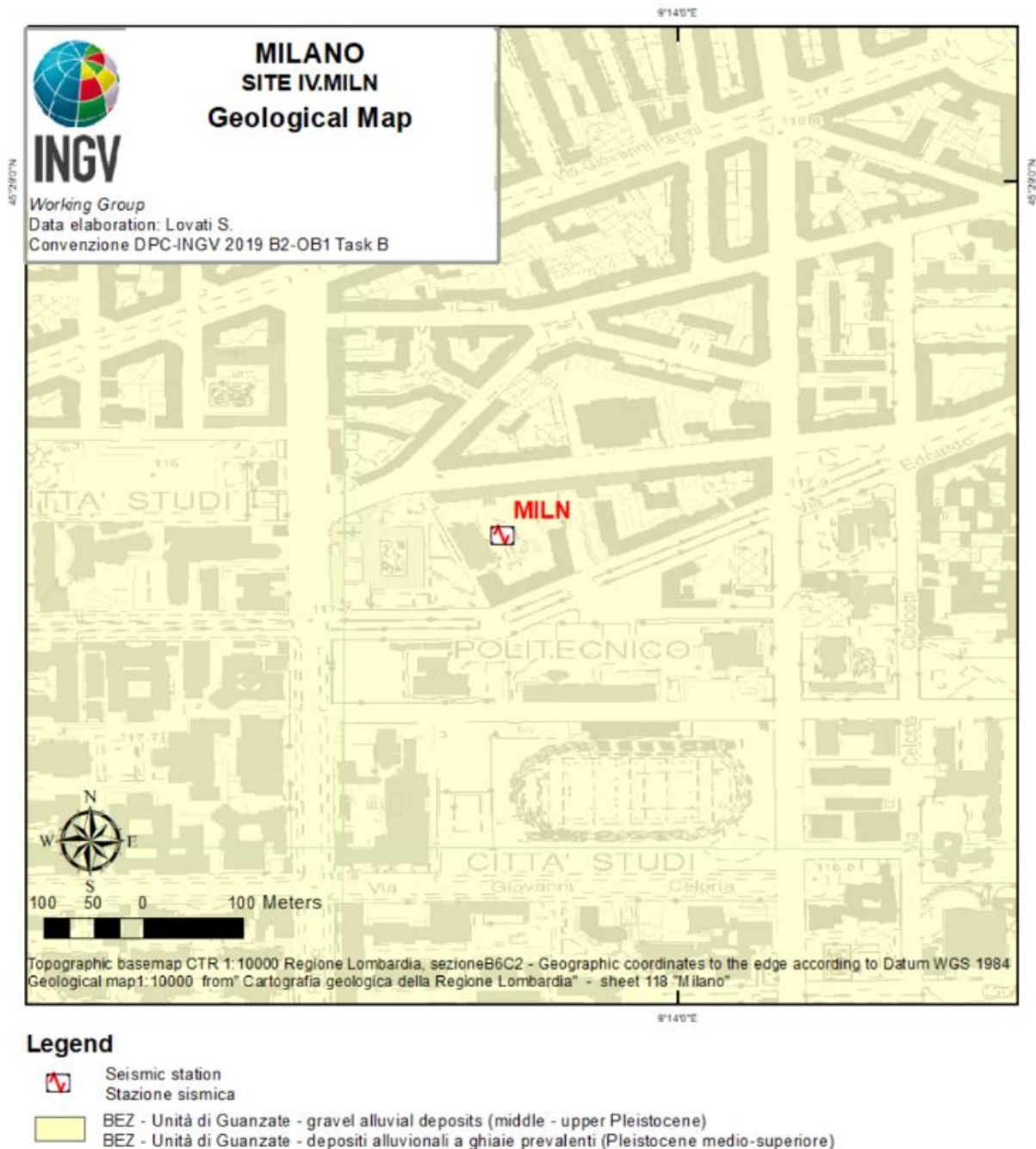


Figure 1. Geological map of seismic station IV.MILN. Scale 1:5.000. Geological units are established according to the nomenclature of geological map of Italy 1:50000 (Carg project -sheet 118 Milano).



#### 4. LITHOLOGICAL MAP

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

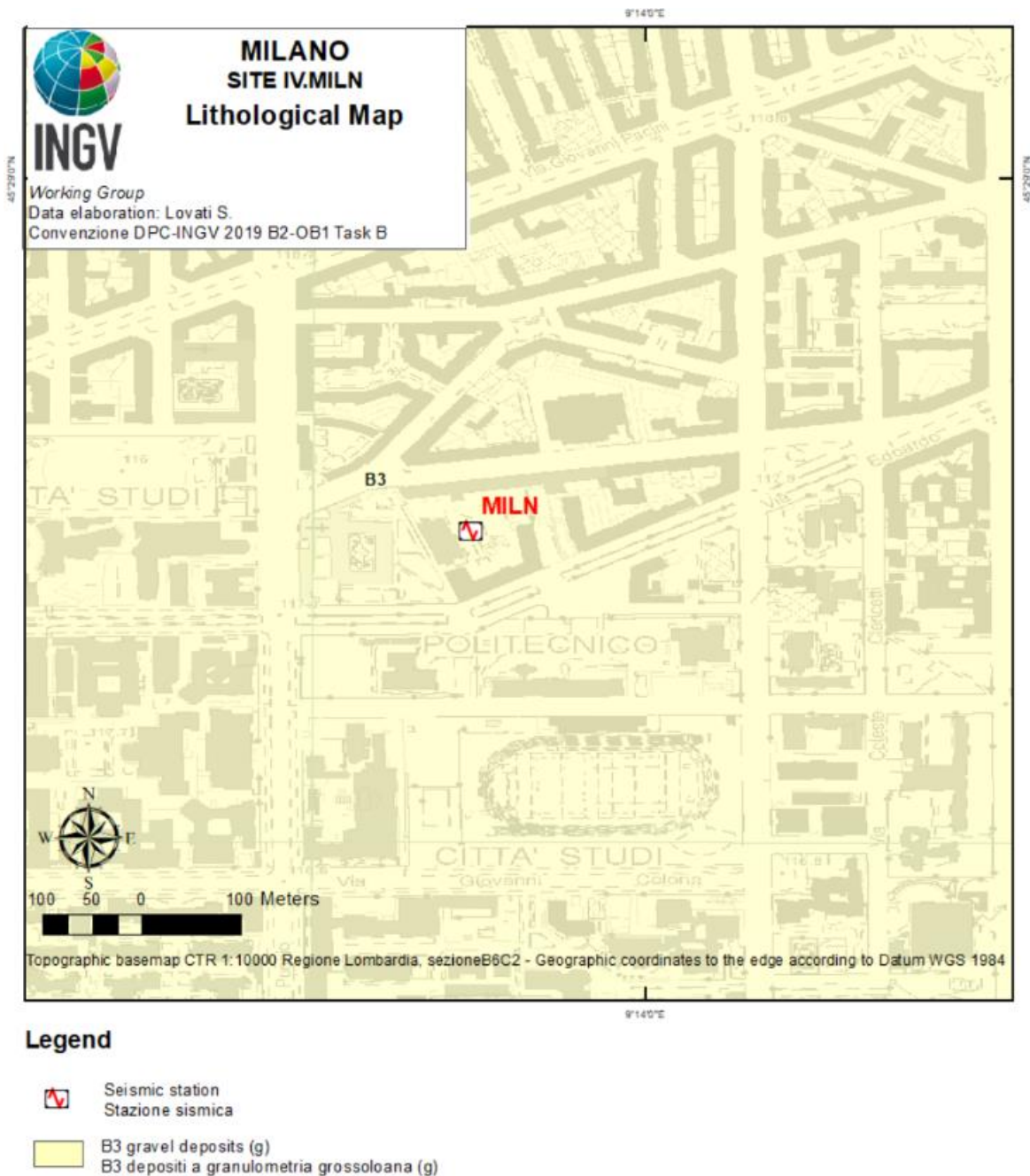


Figure 2: Lithological map of station IV.MILN. Scale 1:5.000. The codes of the lithological units are assigned according to the nomenclature of the Lithological map ISPRA 1: 100.000 (Amanti et al. 2008).





## 5. LITHOTECHNICAL MAP

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

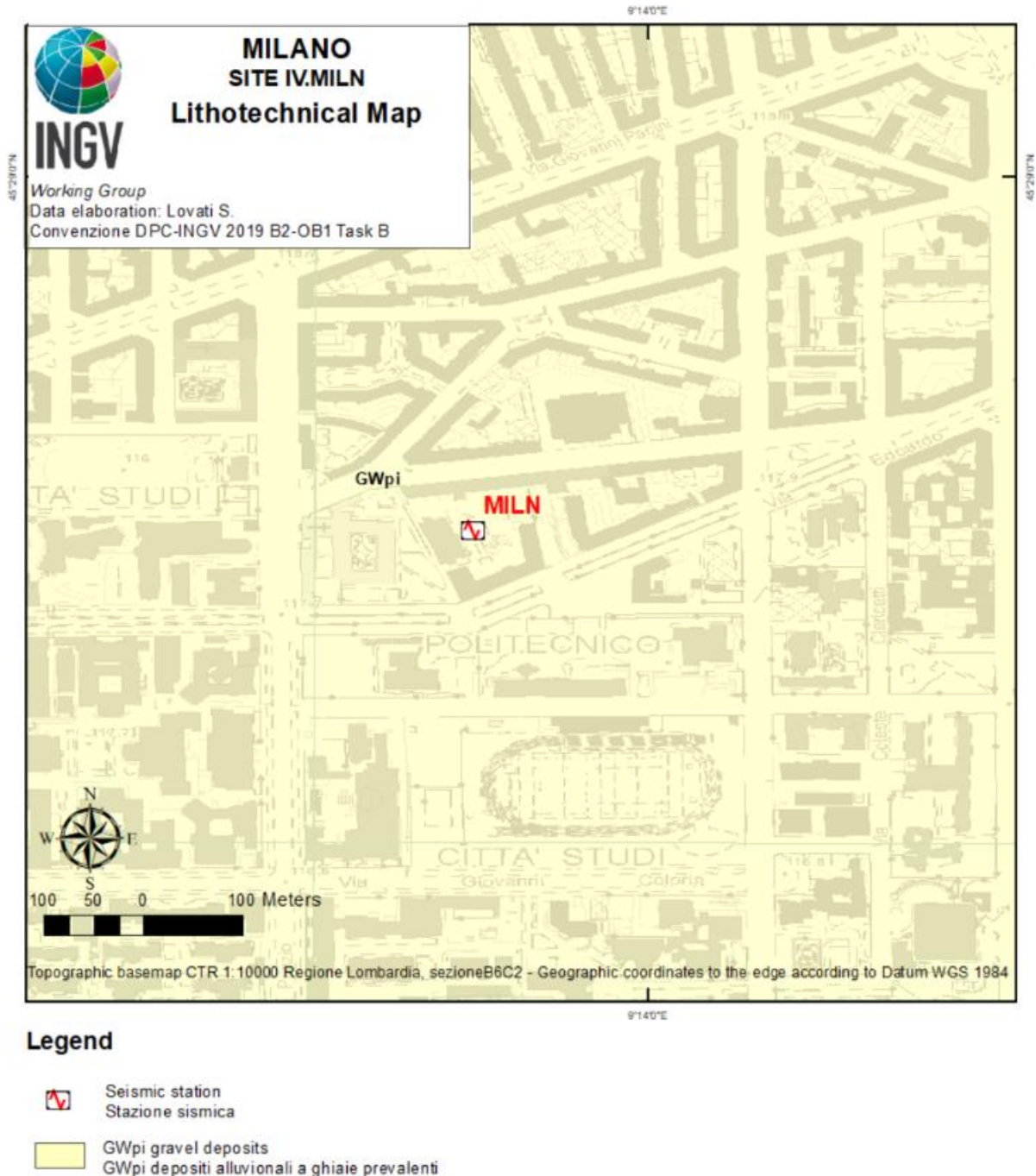


Figure 3: Lithotechnical map of the seismic station IV.MILN Scale 1:5.000. The lithotechnical units are deduced according to the nomenclature of Seismic Microzonation (Technical Commission MS, 2015).

## 6. SURVEY MAP

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

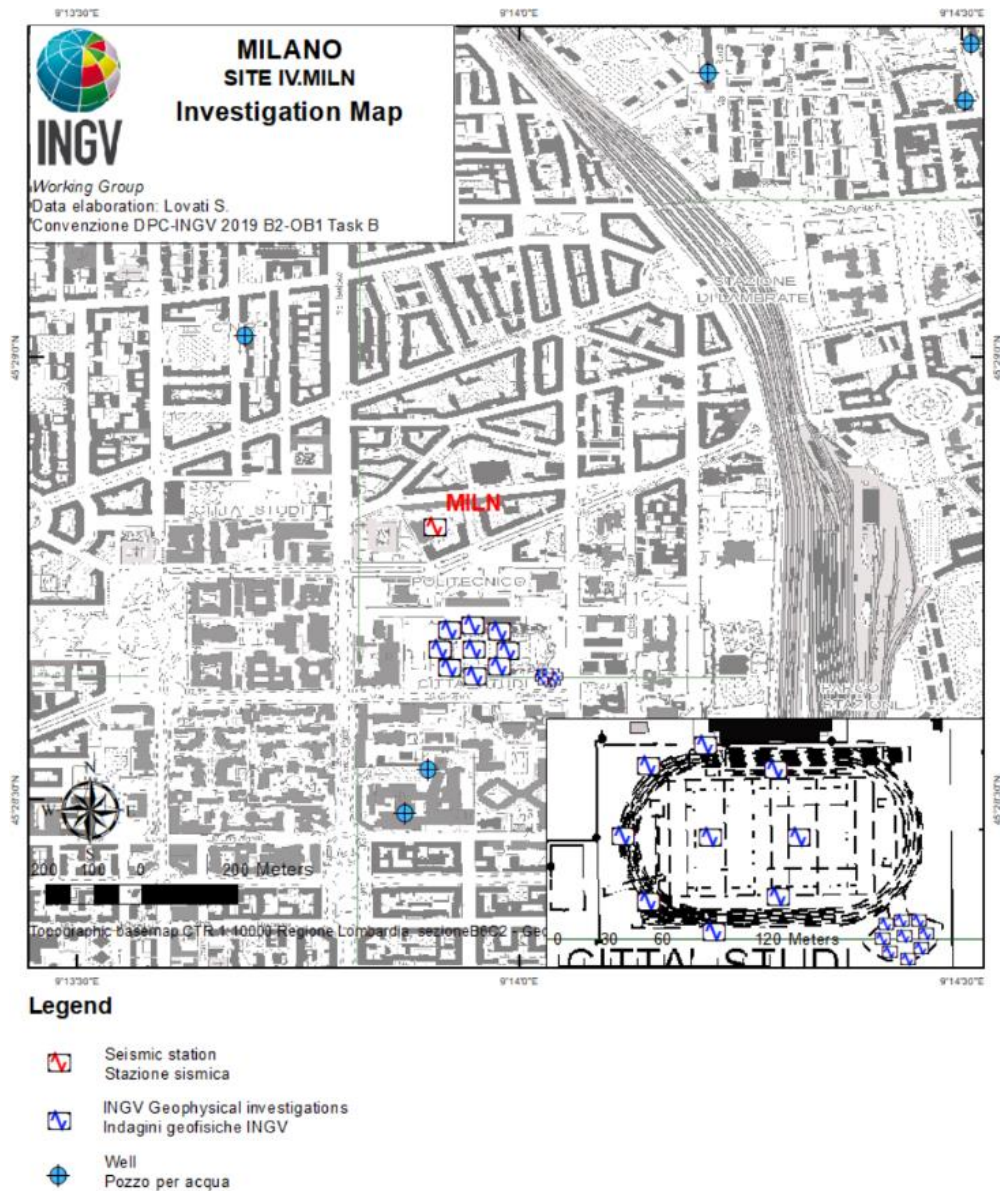


Figure 4: Map of the surveys in the surroundings of the station IV.MILN Scala 1: 10.000. The box at the bottom right contains a zoom of the area with the detail of 2 geophysical 9-stations array conducted by INGV Working Group for the seismic characterization of the site (Agreement DPC-INGV 2019, Allegato B2: Obiettivo 1 - TASK B, Velocity profile report IV.MILN)





## 7. GEOLOGICAL MODEL

### 7.1 General description

The municipality of Milan is located in the western Lombardia region, 25 km east of the Ticino river, 25 km west of the river Adda, 35 km north of the river Po and 50 km south of Como lake, along "resurgence belt", where there is an encounter, in the subsoil, between geological layers of different permeability that allow the deep waters to come to the surface.

The study area is characterized by a succession of Quaternary deposits belonging to depositional fluvial and fluvio-glacial systems.

The sediments have an alluvial origin and the term "fluvio-glacial" refer to Pleistocenic alluvial deposits contemporary to the different advance and retreat phases of the glacier. In particular the study area (south east of Milan) is characterized by gravel and sandy gravel deposits belonging to the *recent Diluvium* (Wurm) due to fluvial and fluvio-glacial sedimentations of last glacial phases (Cavallin et al., 1983). These Units constitute the "*fundamental level of plain*" that it is interrupted in correspondence of Lambro valley Pleistocenic terrace. It is possible to define three layers, the first one made of prevalent gravel, the second one (the study area) mainly of gravel and sand and the third one made of prevalent sand with a progressive increase of fine sediments from the north to the south.

### 7.2 Geological Section

Closing at IV.MILN station, stratigraphic data were obtained from two drilling of wells for water purpose, the first one, to the north-west, 100 m deep and the second one, to the south-east, 110 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 IV.MILN (Figure 5 bottom).



### 7.3 Subsoil model

A subsoil model is built up to a depth of 100 m for the area around the IV.MILN station on the basis of geological and stratigraphic information (Figure 5 right).

Until 40 m in depth an alternation of gravel, sandy gravel and coarse sand is present. This unit is called BEZ (Guanzate Unit, upper Pleistocene, according to Geological map of Italy 1:50000 *sheet 118 Milano*). 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/>). From 40 m in depth, an alternation of gravel, sand and clay is present, with a prevailing of sand until about 90 m in depth where another gravel layer seems to occur. Considering other stratigraphic data coming from wells for oil purpose and aquifer exploration (Regione Lombardia, Eni Divisione Agip, 2002), the transition between Quaternary continental to marine sediments (i.e., R-Surface) is about 175 m in depth at the IV.MILN site. Moreover, data coming from wells for oil purpose (i.e., Lambrate 1-4), at a distance of 2 Km from the study area, indicate at 900-1100 m in depth the base of the Quaternary marine sedimentation (Progetto Videpi, 2009-2019).

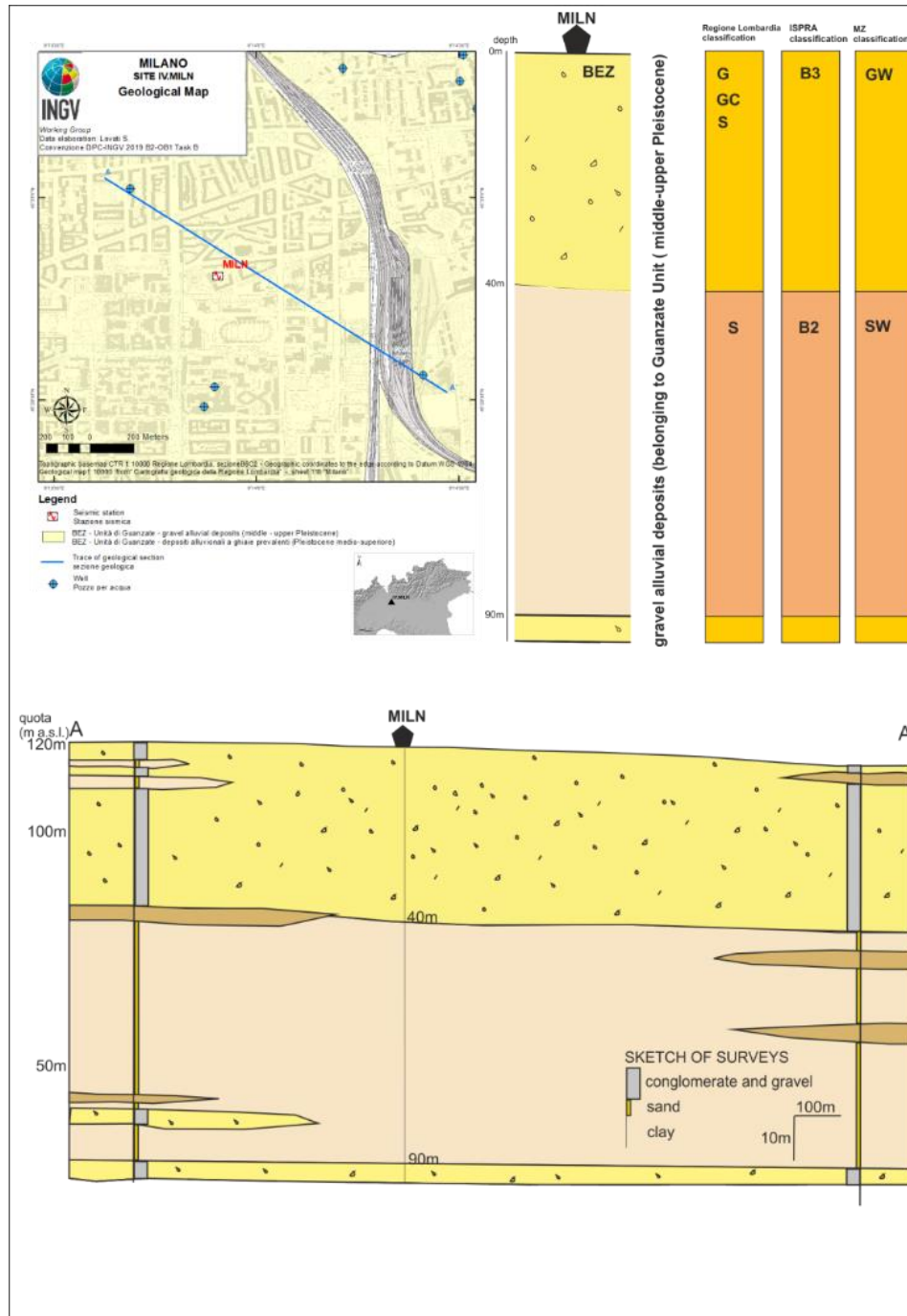


Figure 5: Bottom: Geological section A-A' crossing seismic station IV.MILN. Right: Subsoil model under the IV.MILN seismic station and classification according to Regione Lombardia: G: gravel, GC: gravel with pebbles, S:sand; according to ISPRA: B3: mixed gravel and sand, B2: sand; according to MZ: GW: mixed gravel and sand SW: prevalent sand.



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