

FEATURE OF TECHNICAL SERVICE

Subject

Detailed and Executive design of artificial tunnels, roadways, hydraulic works, environmental mitigations and minor works in Ca of Maxilotto 2 - Completion works of the Perugia-Ancona route: SS.318 «Valfabbrica» section of Pianello-Valfabbrica, SS.76 «Val d'Esino» sections of Fossato di Vico-Cancelli and Albacina-Serra San Quirico and «Pedemontana delle Marche» section of Fabriano-Muccia-Sfercia.

Carried out by

SGAI srl di E. Forlani & C.

Client

Dirpa 2 Scarl

Service length

2015 – 2019

Value of works

€ 316'071'173,03

Category values

V.03	€ 21'852'549,29	D.05	€ 21'540'329,00
S.04	€ 19'774'412,48	P.01	€ 19'774'412,48
S.05	€ 25'122'888,20		

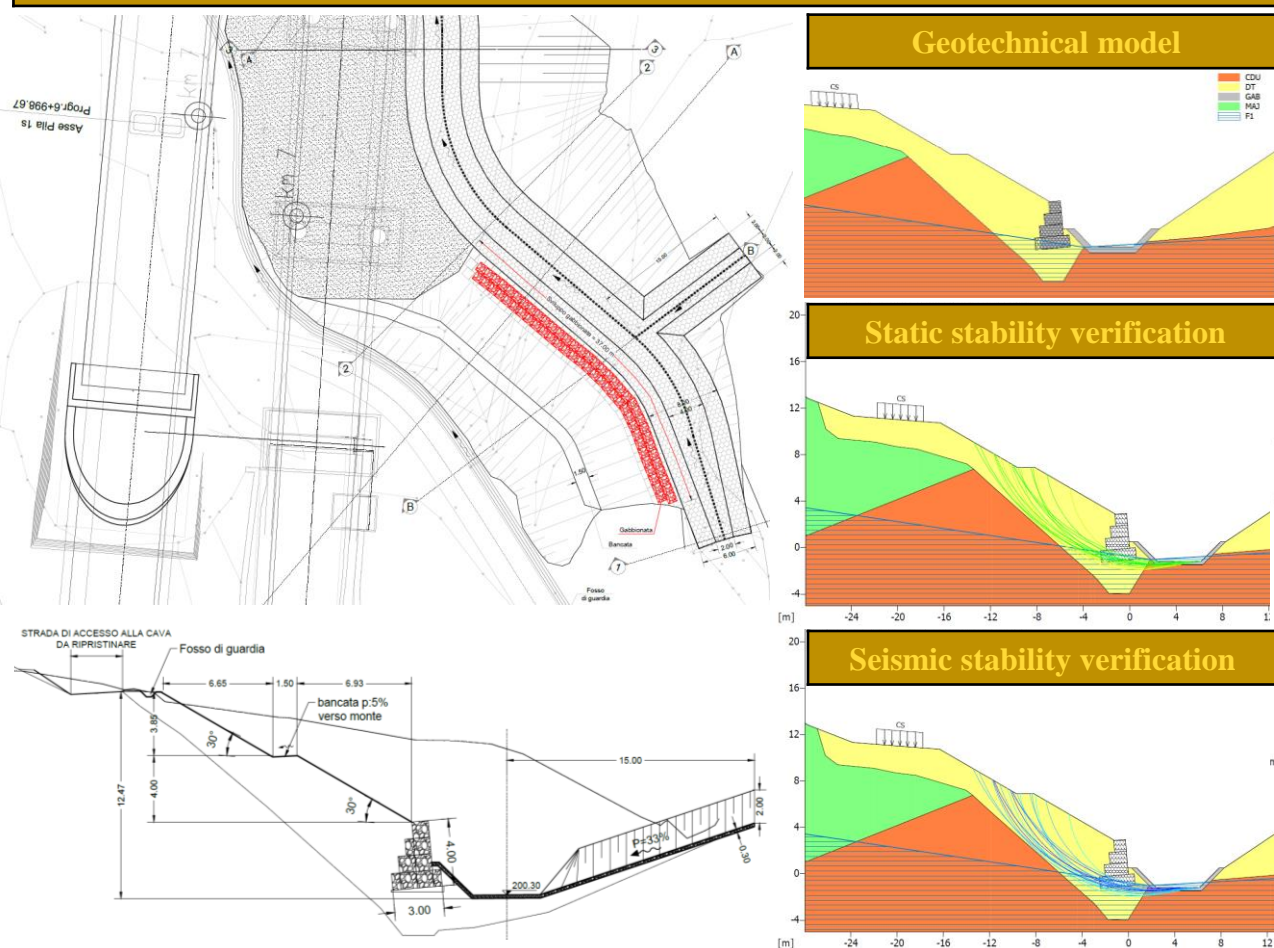
CONSOLIDATION WORKS – Consolidation of excavation fronts, embankments and hydraulic arrangements

As part of the **completion works of the Perugia Ancona - Maxilotto 2: Marche-Umbria road axis and Quadrilatero of internal penetration** - the detailed and executive design was carried out for the SS.318 section «Pianello-Valfabbrica» (sub-lot 1.2) and for the SS.76 «Val d'Esino» in the sections «Fossato di Vico-Cancelli» (sub-lot 1.1A) and «Albacina-Serra San Quirico» (sub-lot 1.1B).

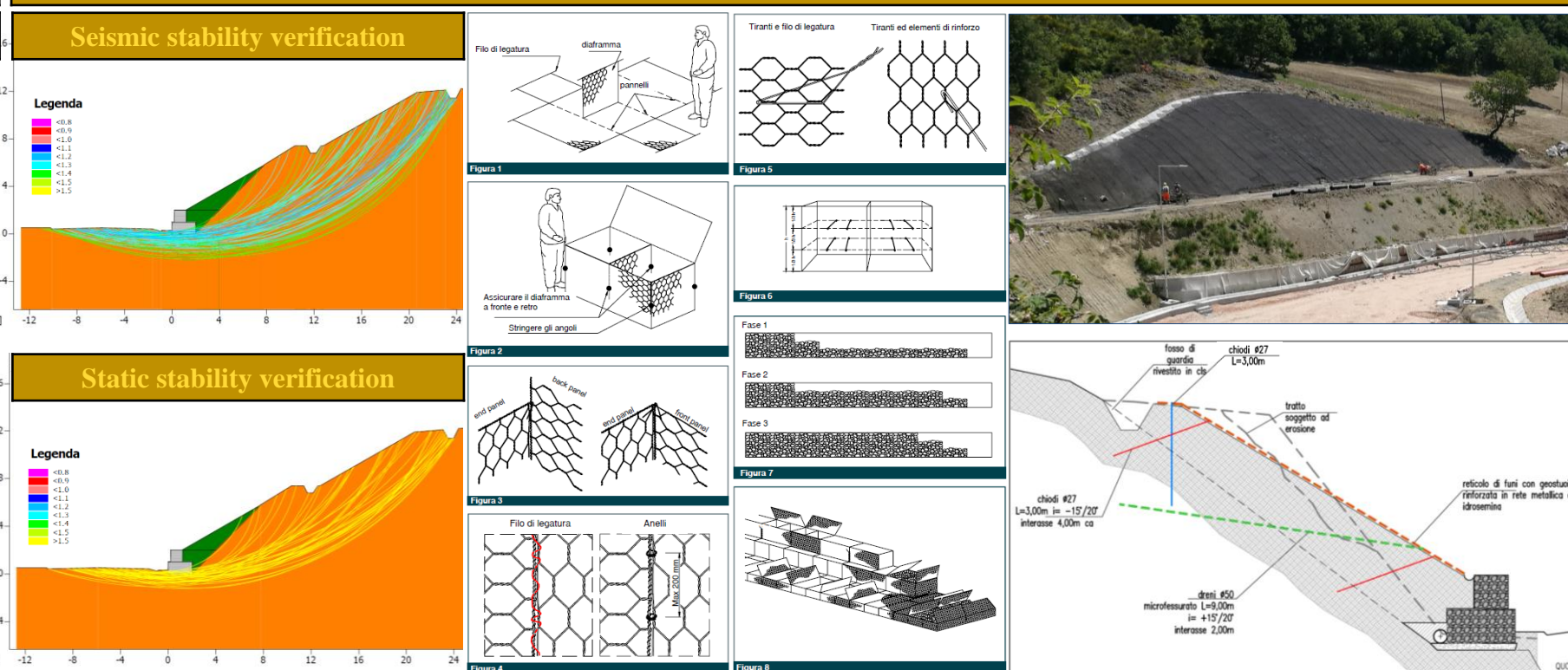
Among the works carried out, numerous sustain structures were carried out, consolidation of the excavation fronts and escarpments, as well as works of arrangement and hydraulic protection. With the aim of optimizing the useful life cycle of the works, the cost of construction, maintenance and management was chosen to use **sustain works consisting of steel box gabions filled with stones**. This construction technology allows to perfectly integrate the work with the escarpment, limiting the problems of environmental mitigation, combining the passive containment function with the active one of restoring the geotechnical stability. In addition, gabions have deformation capacity such as to adapt to the settlements of the soil and to the effect of unexpected loads, ensuring the drainage of water by limiting instability.

The main design problems were encountered in carrying out the **re-profiling and consolidation work on the slope** upstream of the Cancelli interchange. The conditions of the excavation walls showed very fractured and broken material often subject to local cortical detachments. In this regard, a gabion wall of 78m in length was built at the foot of the escarpment. The work is to be considered as a gravity wall made up of box-shaped **elements made of double-twist metal mesh** with hexagonal mesh type 8x10. In order to strengthen the structure, all the edges are reinforced with a wire having a diameter greater than that used for the mesh. The excavation slope on the back of the gabions have an inclination of 45°, and at their foot there is a drainage consisting of a Ø400mm concrete pipe covered with draining material protected by a geotextile. The slope upstream of the support work has been re-profiled with a 30° slope. In order to **avoid cortical detachments and the possible consequent fall of material on the roadway**, the slope has been protected by means of a hexagonal mesh geo-composite and wire rope. At the top of the gabion there is a prefabricated channel for the interception and removal of surface water.

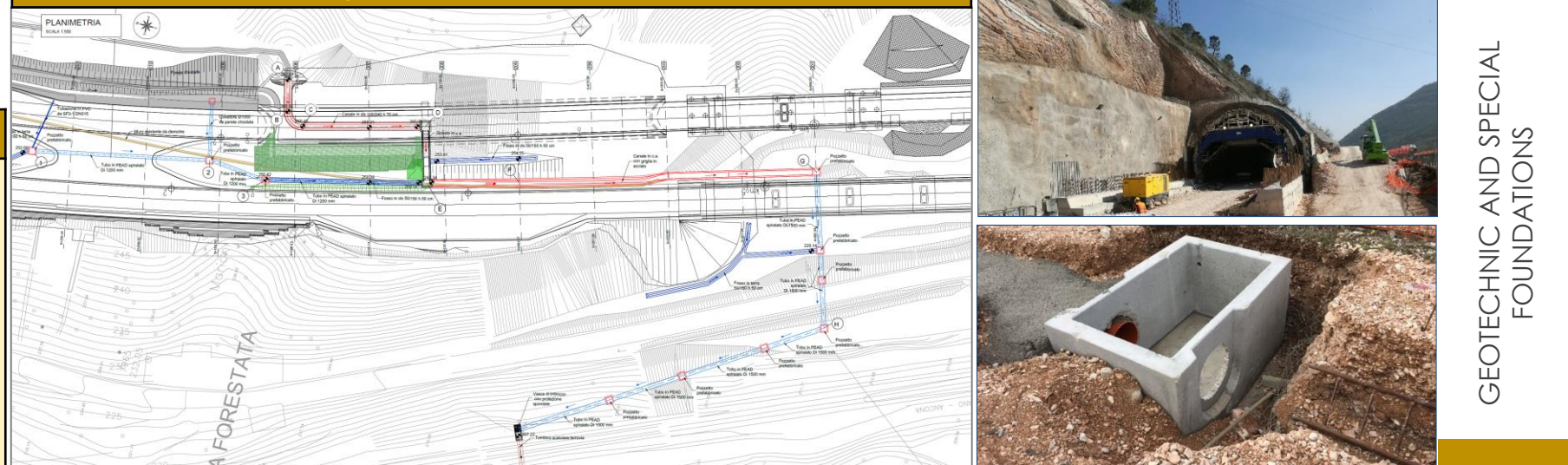
GATTUCCIO GABION WALL – Modeling, stability checks and construction details



CANCELLI GABION WALL – Modeling, stability checks and construction details



Plan of the hydraulic intervention in Mariani area



HYDRAULIC INTERVENTIONS – Arrangement and collection of slope waters

The intervention of hydraulic arrangement in the area of the Mariani tunnel and viaducts, located between progressive 5+000 and 5+250 of sub-lot 1.1B, SS76 Albacina-Serra San Quirico section, was necessary to guarantee the conditions of site safety, studying a substantial variant of the work with respect to the approved PE. The work allows to **collect the surface waters of the natural slope**, which are conveyed near the entrance of the Mariani tunnel, North carriageway, due to the presence of a natural impluvium. In order to **guarantee the stability of the slope and the artificial tunnel**, the regulation of the surface rainwater conveyed through reinforced concrete structures has been provided open air and collection through a head well and a PEAD Ø1500 pipe buried up to the final drain with appropriate inspection shafts. Given the significant difference in height, special measures have been taken to **dissipate the energy by jumping and sliding**, especially in the stretch at the top of the artificial tunnel.