

SERENGEO Tunnelling



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SERENGEO participate to engineering works providing innovative solutions coming from the results of academic researches and the skills acquired in the areas of Mining, Tunnelling and Excavation Engineering, with a specific focus on environmental aspects and workers safety.

The solutions provided to our customers are mainly based upon innovative approaches, tools and technologies for underground space design and construction. Our activities are focused on workers safety and on technical, financial, environmental and social sustainability of construction works.

SERENGEO addresses to design firms, construction companies and Public Administrations, providing problem-solving support in design and construction works through the following services:

- **tunnelling engineering;**
- **excavation safety engineering.**

Why choose SERENGEO

- Owns a robust know-how in the area of underground engineering, coming from a cumulated experience of more than 40 years developed in collaborations with important national and international research centers, construction companies, Engineering firms, Health and Safety Departments and Public Administrations.
- Provides smart solutions to the challenges faced with its clients, applying innovative approaches and tools transferred from the results of applied research projects.
- Provides a highly specialized service, to effectively meet customers' needs.



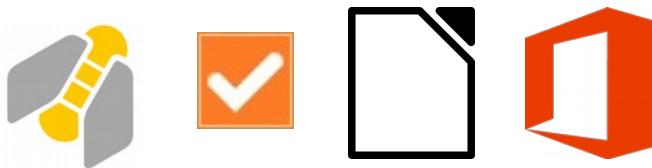
Work tools

Experimental tests

- In situ and laboratory rocks and rock masses characterization
- Design and execution of unconventional tests for specific applications

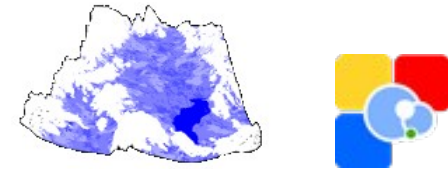
Planning and organization

- Gantt
- PERT
- In-house developed codes



Geostatistical codes

- SGems
- Geo-MS



Geographical Information Systems and Scientific Visualization software

- GRASS GIS
- QGIS
- Paraview



Numerical modeling

- Numerical codes for the simulation of phenomena deriving from excavation works

Tunnelling engineering

Underground excavation interacts with the surrounding environment (rock mass stress state, hydrogeological setting, slope and structures stability, etc.). In order to minimize excavation-induced effects and increase productivity, **it is mandatory to choose the optimal excavation method, technique and technologies**, as per tunnel reinforcement and lining works.

SERENGEO provides its clients the skills and the know-how acquired through applied research projects and technical – scientific consultancy activities.

Our know-how concerns the following thematic areas:

- Choice and optimization of the more suitable excavation technique and technology
- Analysis of the geomechanical interaction between rock mass and excavation works;
- Study of instability phenomena (landslides, subsidence) induced by excavation;
- Study of the interaction between excavation and buildings nearby;
- Verification and control of design solution during construction phase.

Excavation safety engineering

Workers involved in underground excavation are exposed to several hazards, due to the specific activities performed in a confined space and due to the interaction with the excavated rock masses. Works complexity and peculiarity claims for specific and adequate technical, technologic and procedural solutions in order to reach the maximum safety level for workers.

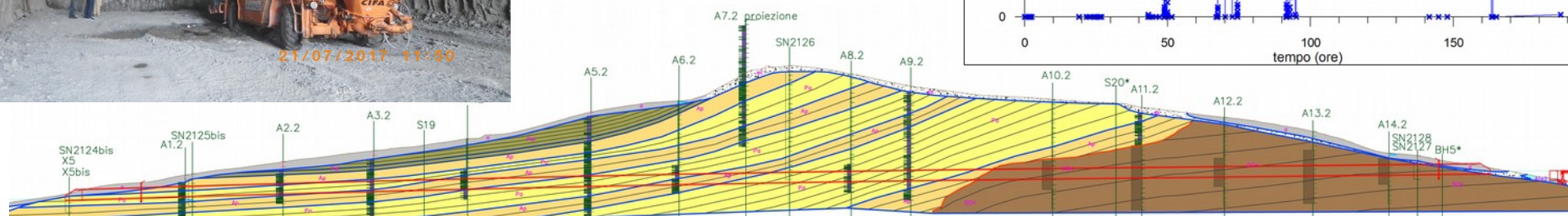
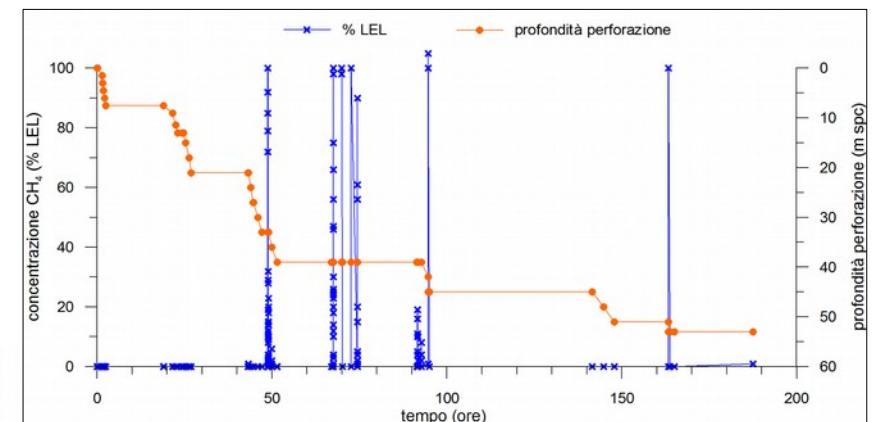
SERENGEO provides support in safety management during design and construction phase of small and wide section tunnels realised with traditional and mechanised tunnelling techniques, even in compressed air and in gassy rock masses and asbestos rocks.

Prof. Eng. Paolo Berry, retired Full Professor in "Mining Engineering" and "Excavation Safety Engineering" at the University of Bologna, School of Engineering, co-authored the "Safety Standards for the realization of Major Public Works" (Emilia Romagna – Tuscany Inter Regional Notes, 1998-2013) and their revision as "National Guidelines" approved by the Permanent Committee for the relationships among the Italian State, Regions and Autonomous Provinces – Trento and Bozen.

Excavation Safety Engineering

Quadrilatero Marche – Umbria, Pedemontana delle Marche highway, “Fabriano – Muccia / Sfercia” track

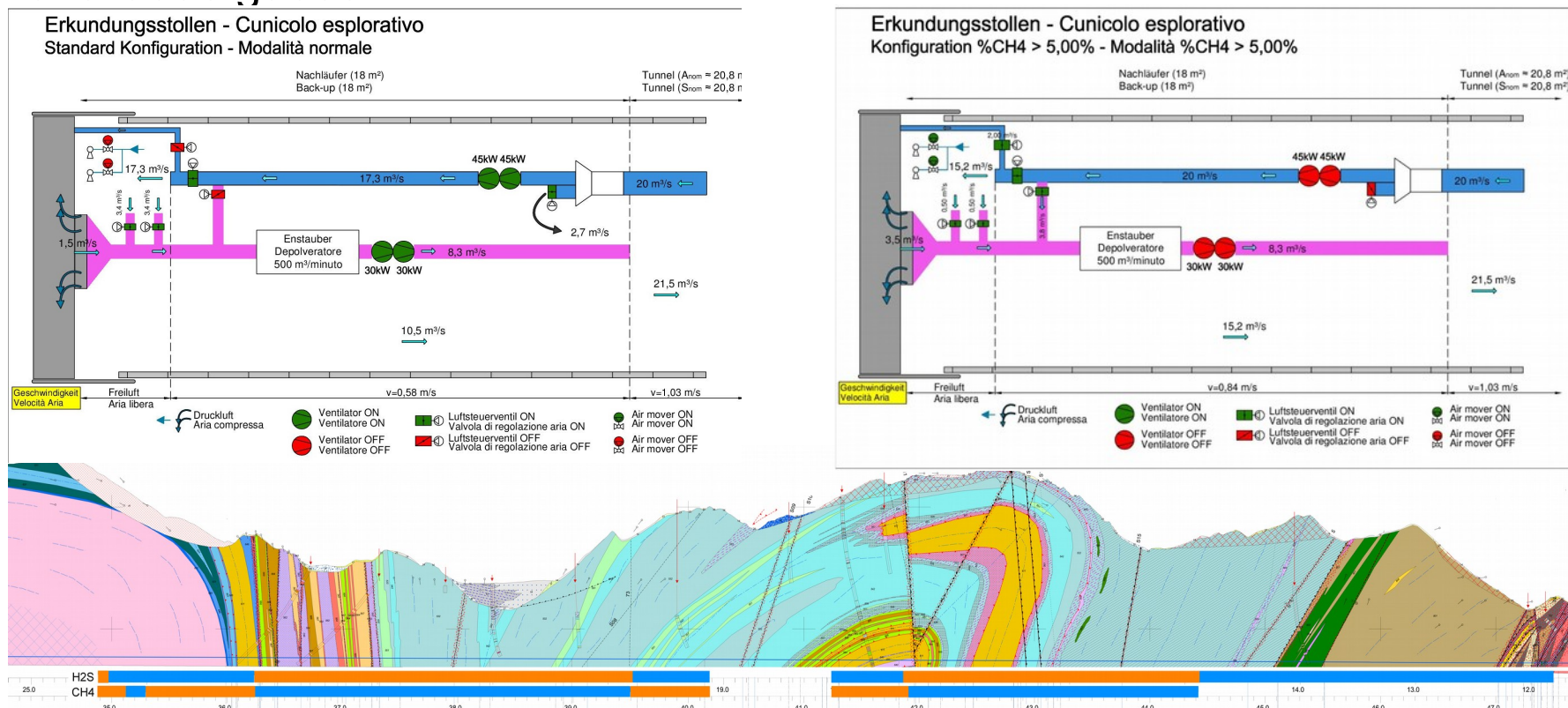
Technical – scientific support, during design and construction works, on safety against detonation or deflagration of air - methane mixtures during the tunnels construction works.



Excavation Safety Engineering

Brenner Base Tunnel – Mules 2-3 Lot

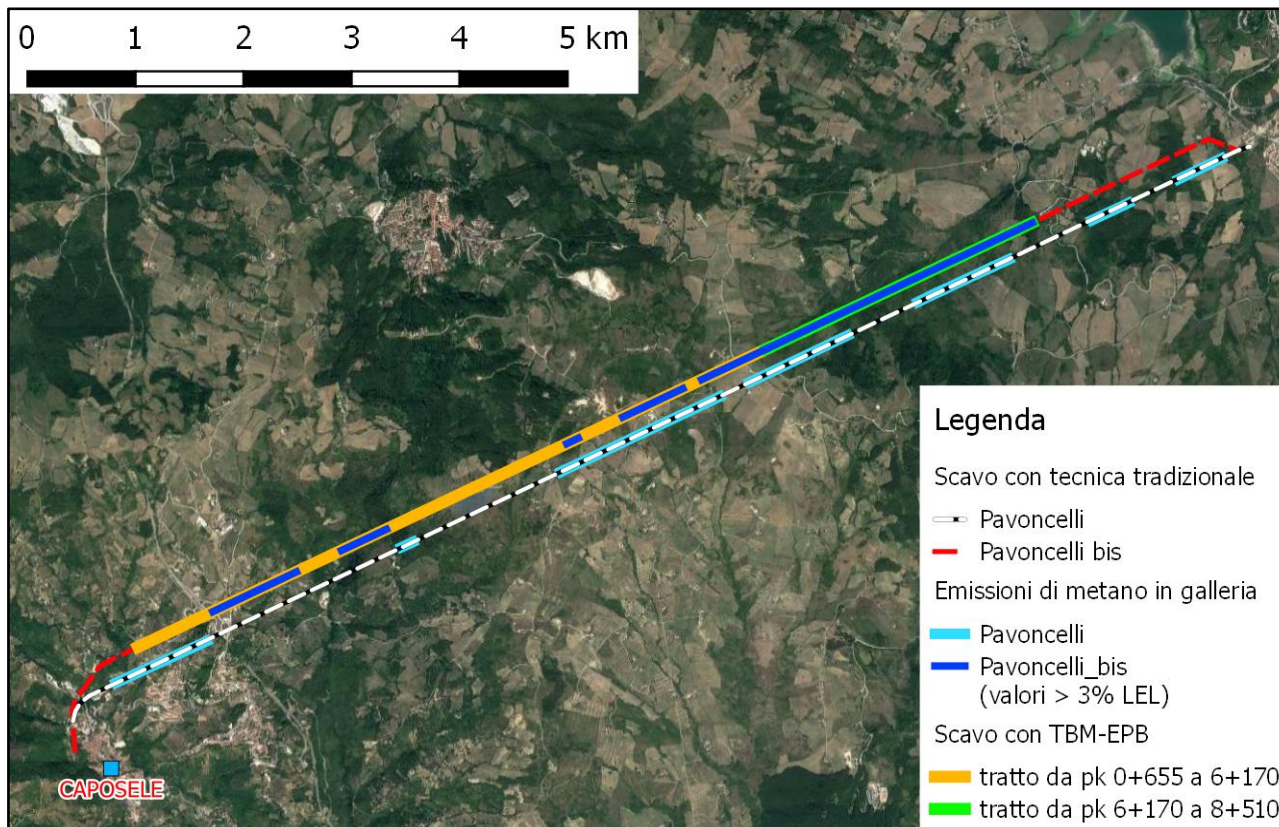
Technical and technological solutions to guarantee the maximum safety in tunnelling with double shield TBM through rock masses containing methane, hydrogen sulfide and other hazardous gases



Excavation Safety Engineering

"Pavoncelli bis" hydraulic tunnel works (Caposele, AV)

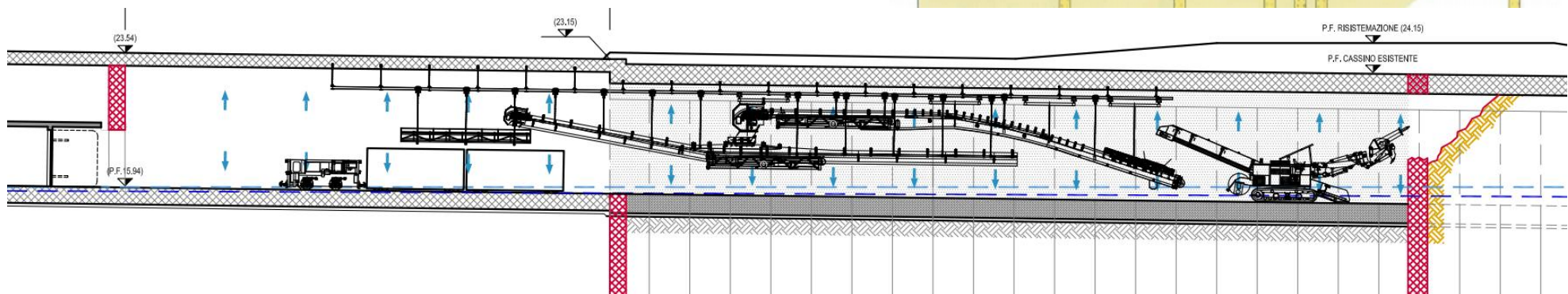
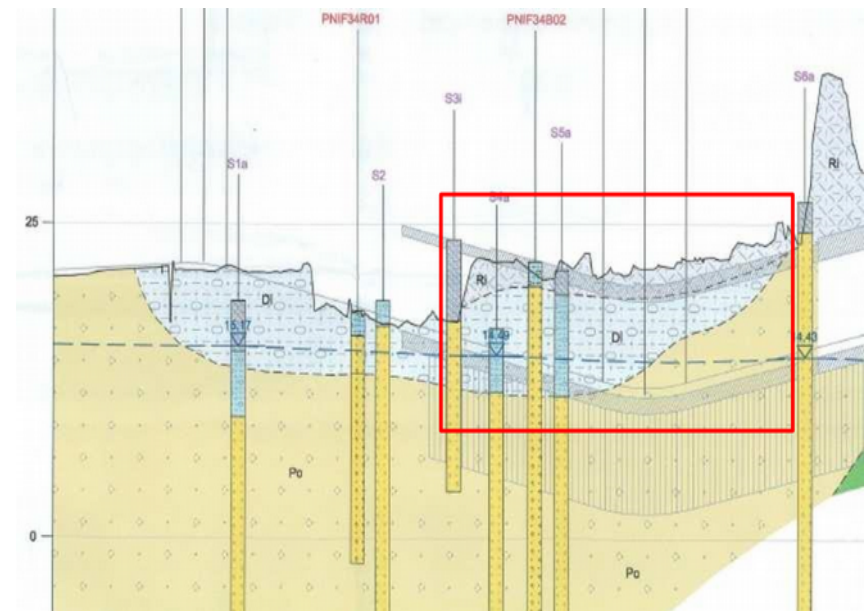
Technical – scientific consultancy on topics related to small section (diameter < 10 m) tunnelling with EPB-TBM in gassy rock masses



Excavation Safety Engineering

Casalnuovo tunnel (Napoli – Bari high speed railway line, Napoli – Cancello track)

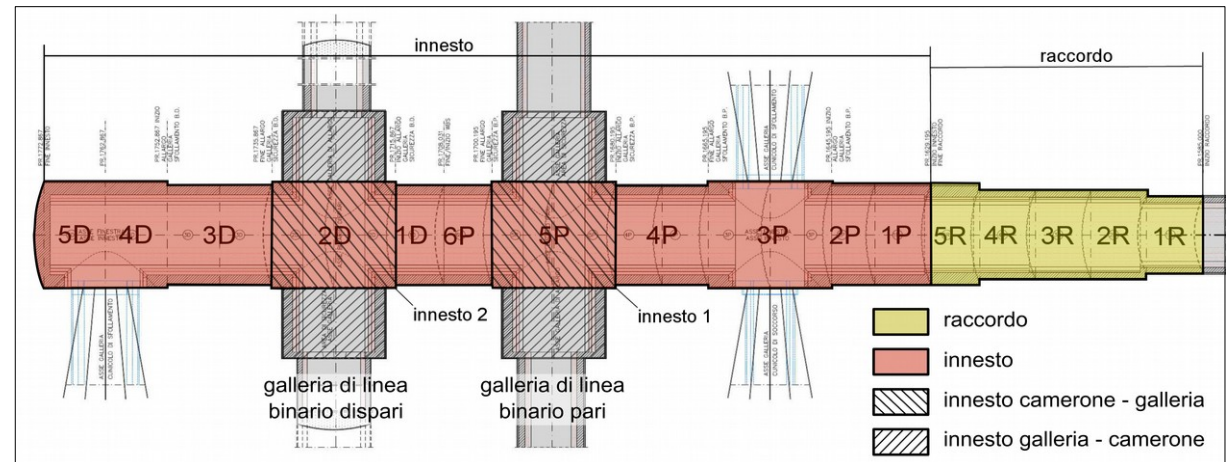
Technical and technological solutions to ensure the highest safety level to workers involved in tunnelling under hyperbaric conditions.



Excavation Safety Engineering

“Terzo Valico dei Giovi” high speed railway line tunnels, Vallemme Lot

Technical - scientific consultancy on topics related to tunnel excavation with traditional technique in gassy rock masses



Research projects

SERENGEO works, in collaboration with relevant national and international Research and Academic Institutes, Construction Companies and Health & Safety Departments, on Research and Development projects concerning the following topics in the area of underground excavation engineering:

- Tunnelling in gassy rock masses
- Tunnelling in asbestos rocks
- Workers safety in underground excavation works
- Excavation in hyperbaric conditions
- Surface instability phenomena due to tunnelling
- Innovative technologies for traditional and mechanised tunnelling

Portfolio | Publications



Bandini A., Berry P., Colaiori M., Cormio C., Lisardi A. (2017). Safe excavation of large section tunnels with Earth Pressure Balance Tunnel Boring Machine in gassy rock masses: the Sparvo tunnel case study. *Tunnelling and Underground Space Technology* 67 (2017) p. 85-97, DOI: 10.1016/j.tust.2017.05.001.

Bandini A., Berry P., Boldini D. (2015) Tunnelling-induced landslides: the Val di Sambro tunnel case study. *Engineering Geology* 196, pp. 71 – 87, DOI:10.1016/j.enggeo.2015.07.001.

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Bandini A., Berry P., Cormio C. (2014) Soluzioni ingegneristiche introdotte dalla NIR 41. *Atti Workshop Nazionale “NIR 2013 – Note Interregionali di Ingegneria della Sicurezza nello scavo di gallerie”*. Bologna 4-5 Luglio 2014, Alma Mater Studiorum Università di Bologna, AMS Acta, p. 113-124, ISBN: 9788898010202.

Bandini A., Berry P., Colaiori M., Cormio C., Lisardi A. (2014) Il franco di sicurezza nello scavo di gallerie grisutose. *Atti Workshop Nazionale “NIR 2013 – Note Interregionali di Ingegneria della Sicurezza nello scavo di gallerie”*. Bologna 4-5 Luglio 2014, Alma Mater Studiorum Università di Bologna, AMS Acta, p. 63-77, ISBN: 9788898010202.

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Bandini A., Berry P., Bertolin S., Boldini D. (2014) Analisi critica del monitoraggio nello studio dell'interazione tra una galleria autostradale e movimenti franosi. *INGENIO* 26: 40-41; ISSN: 2307-8928.

Portfolio | Publications



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Bandini A., Berry P., Boldini D. (2013) Analisi dei movimenti franosi indotti dallo scavo di una galleria autostradale in una formazione strutturalmente complessa. Congresso Internazionale della Società Italiana Gallerie, Bologna 17-19 Ottobre 2013. Volume "Gallerie e Spazio Sotterraneo nello Sviluppo dell'Europa", Patron ed., Granarolo dell'Emilia (BO), p. 1079-1090, ISBN: 978-88-555-3253-2.

Berry P., Calzolari F., Martelli F., Obici C., Paggi P., Pavone V. (2001) Studio e ricerca interregionale di soluzioni tecniche atte a rendere sicure macchine operatrici ed impianti utilizzati nella costruzione delle gallerie grisutose della Linea Ferroviaria "Alta Velocità" nel tratto appenninico Firenze. Monografia stampata in proprio dalla ASL Bologna Sud, Regione Emilia Romagna, Bologna.

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