

Updated Evaluation of Sinkhole Potential at Belvedere Spinello Brinefield

by

Massimo Guarascio, University of Trieste

Gabriel Fernandez, University of Illinois

Robert Thoms, AGM

ABSTRACT

This paper presents an update of previous evaluations for sinkhole potential at the Belvedere Spinello brinefield managed by Montecatini S.p.A.. A first evaluation was performed by the main author in 1985 one year after the occurrence of a major sinkhole and concurrent flooding at the site. A description of this event was given by M. Guarascio at the 1986 SMRI Amsterdam meeting.

The initial evaluation was based on interpretation of the local geology, stratigraphic data obtained from well logging, and data on the subsurface conditions obtained from electro-resistivity surveys on the site.

Based on the data above two areas of different sinkhole potential were identified, one at the north and of the field and one at the central-south of the brinefield. A sinkhole, designated as C3, occurred at the northern area of the brinefield identified as a "high risk area" in the initial 1985 evaluation.

A second evaluation was performed by the main author in 1992 incorporating additional data obtained from salt production, subsidence survey measurements, additional sinkholes occurrences, recorded casing collapse and shearing at various wells, loggings from additional wells drilled in the area and results from a second electro-resistivity surveys carried out at the site in 1991. This second evaluation confirmed the potential for sinkhole formation in the northern area of the field and resulted in an extension of the central-south area forwards the centre of the brinefield. This extension of the central-southern area was based on observations of outflow of brine in 2 wells and data on casing collapse.

Shortly after the second evaluation two additional sinkholes developed in the brinefield. One, designated as C4, occurred in early 1993 at the northern zone.

The two evaluations described above were based on comparison of key parameters of different areas of the brinefield without incorporating a sinkhole formation mechanism. The potential for sinkhole formation was determined by normalising the key parameters with respect to the measured in areas of known sinkholes.

This paper presents an updated evaluation for sinkhole potential incorporating a model of ground behaviour which includes a sinkhole formation mechanism. All data on key parameters collected to date was included in the new evaluation presented in this paper.