

Roadheaders glean valuable tips for Istanbul Metro

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The population of Istanbul, Turkey's most important commercial city, has increased in the last two decades to more than 7 million, causing severe congestion. Its ancient character and historical monuments restrict the construction of wider roads. The only solution to the traffic problem in the centre of the city, as planned by the municipal authorities is a 16km metro between Aksaray or Topkapi and Levent. The possible line of the proposed metro and generalised geological features of the area are shown in Fig 1. The metro is

Data collected on roadheader performance during construction of tunnels for Istanbul's sewerage system have proved invaluable as a preliminary guide for predicting machine cutting performance when it comes to building the city's metro.

expected to go to tender at the end of 1990. It is reported that many national and international contractors are showing interest in this project.

Site investigations for the project

showed that ground conditions vary extensively, from made ground to the very strong and partly fractured Trakya Formations, i.e. greywacke, alternating sandstone, siltstone and mudstone. Some diabase dykes are also expected while driving the metro tunnels.

Previous articles in *Tunnels & Tunneling*^{1,2} have given details of some of the sections of the sewer system, including the Eyüp Tunnel and the Haliç Tunnel. A comparison is made between the two tunnels and it is concluded that the rock mass cuttability index defined for the Eyüp Tunnel may well be valid for the geological formations encountered around Istanbul. This index may be used as a preliminary guide in predicting machine cutting performance for the Istanbul Metro tunnels.

Performance in sewer tunnels

All six tunnels are part of a new combined interceptor sewer system; overall performance in these tunnels is given in Table 1. The project is being carried out by the Istanbul Water and Sewerage Authority (ISKI) to renew Istanbul's inadequate sewerage network and to clean the very polluted Golden Horn. The first section of the project, which is for the South Haliç, comprises 13km of gravity-fed sewer including the Eyüp, Haliç and Fatih tunnels and a new 750 000m³/day capacity sewerage treatment plant. The North Haliç project has been planned in two sections. The Donanma, Findikli and Kasimpasa tunnels, with a total length of 5km, are completed and they form the first part of the North Haliç project. When the 8km-long Baltalimani Tunnel is completed, 1.1x10⁶m³ of polluted water will be fed to a new treatment plant.

The design of the system was completed by Turkish Consultant UBM and UK consultant Binnie and Partners. The plan was supported by the World Bank which has agreed to finance 75% of the project. The Turkish civil engineering company STFA was awarded the tunnelling work with technical assistance from Edmund Nuttall.

Four shield mounted Herrenknecht roadheaders were used in the tunnels. These machines are designed with the roadheader built as an integral part of the shield body and the hydraulically

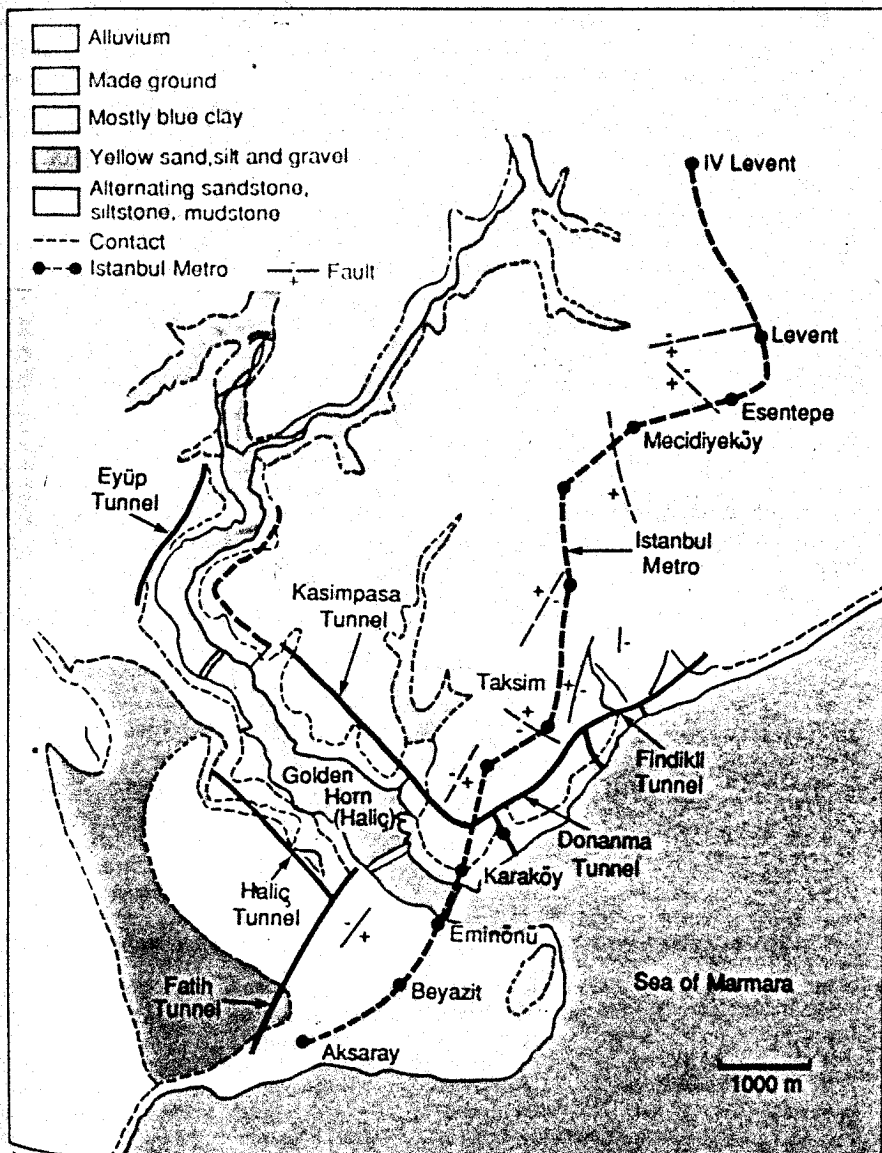


Fig 1. Plan of Golden Horn sewerage tunnels and possible line of the Istanbul Metro.