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## Micro-Tunneling Challenges in Rocky Lands Contains Huge Boulders

**Babak Mohammadi<sup>1</sup>, Ali Kavyani<sup>2</sup>, Sadegh Dashtara<sup>3</sup>, Payam Soltan Sanjari<sup>4</sup>**

1.Head of Technical section at Tehran Micro Tunneling Project, KAYSON Inc., Water & Wastewater Division, Iran; e-mail: [B.Mohammadi@kayson-ir.com](mailto:B.Mohammadi@kayson-ir.com)

2.Executive Deputy of water & wastewater Division, KAYSON Inc.; e-mail: [Akavyani@kayson-ir.com](mailto:Akavyani@kayson-ir.com)

3.Project Manager of Micro Tunneling projects at KAYSON Inc., Water & Wastewater Division, Iran; e-mail: [Sadeghd@kayson-ir.com](mailto:Sadeghd@kayson-ir.com)

4.Executive Deputy Site manager of Micro tunneling Project, KAYSON Inc., water & wastewater Division, water & wastewater Division, Iran; e-mail: [Payams@kayson-ir.com](mailto:Payams@kayson-ir.com)

### ABSTRACT

Wastewater collection network is one of the most important urban infrastructures, which its development is very critical due to its location in the urban area and in the vicinity of municipal utilities and traffic constraints. Trenchless mechanized Excavation methods are one of the most effective methods to implement the wastewater collection network of Tehran, which has been rapidly developed due to its low cost, high quality and also its low impact on municipal furniture and utilities and traffic issues.

The micro-tunneling project in east of Tehran is one of the samples for implementing Tehran's wastewater collection network. This project with the 1400, 1600 and 1800 mm polymer concrete pipes has been completed on Mirdamad, Shariati, Mojtabaie and Khajeh Abdullah Ansari Streets with the length of 3900 m using micro-tunneling machine manufactured by German Herrenknecht Company and is currently in operation.

Since the project route is adjacent to the foothills and northern rivers of Tehran, it has special characteristics in the term of geographical location. The geological situation of project site is also so that the density and size of boulders are increased with increase in depth of earth. Therefore, it was very difficult to design and implement the micro-tunneling operations of this project in the vicinity of numerous stones and boulders and interaction between pipes and boulders caused many challenges such as cracking and failure of polymer concrete pipes as well as deviations in the project route in addition to many problems encountered during Excavating operations due to the proximity of micro-tunneling path to many boulders around the project route.

The purpose of present article was to investigate the interaction between micro-tunneling path and boulders around the pipeline path as well as the raised challenges and obstacles through experiences obtained from micro-tunneling project of east of Tehran as well as the conducted as well as numerical studies and to provide solutions for each of the above mentioned problems.