

## Utilization and accuracy of helicopter-borne electromagnetic method for tunnel ground on the accretionary complex in Hokkaido

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### 1. Introduction

Improvement in accuracy of geological information on deep under ground over an extensive area is vital for process control and avoidance of risk during construction of tunnels. The authors carried out helicopter-borne electromagnetic method survey for a planned road tunnel, 0.9km-long and maximum overburden is 150m, in a mountainous area in eastern Hokkaido where an accretionary complex is distributed.

### 2. Overview of the survey site

The study area is a mountainous region in the northwestern part of Kitami city, Hokkaido. In the area surrounding the survey site, the Nikoro Group of the Tokoro belt is distributed and inconsistently overlain by the Saroma Group. The Nikoro Group mainly consists of greenstone, pyroclastic sedimentary rock and hyaloclastite, and is mixed with pillow lava, chert and limestone. The Saroma Group is marine sediment of the Cretaceous system consisting mainly of conglomerate and sandstone. Many faults are formed in the area around the survey site due to tectonic movements at the time of formation of the accretionary complex and after that.

### 3. Survey method

The apparent resistivity of the tunnel ground was found using each frequency, which is equipped with five pairs of transmitter and receiver coils by helicopter-borne electromagnetic method survey. Flights were made on the three lines measurement at intervals of 100m including a planned route, at 30m above the ground surface. The results of these surveys were compared with geological information obtained by geological reconnaissance, horizontal boring and other surveys to clarify the effectiveness and scope of application of the electromagnetic method survey for geological survey of tunnel ground.

### 4. Results of survey

Electromagnetic method survey was conducted along the planned route of road tunnel ground located in accretionary complexes. In comparison with the results of other geological surveys, the following findings were obtained:

1) The detection accuracy of anomalies by the measurement of electric sounding corresponding to geological features on the near surface is higher than helicopter-borne electromagnetic method survey. On the other hand, accuracy to geological features at the deeper part showed the same tendency.

2) The distribution of apparent resistivity the tunnel ground found by electromagnetic method survey tended to indicate sections where RQD and elastic velocity waves of tunnel ground are low. These indicate the possibility of broad-based interpretation of rough geological structure in the shallow layer from the difference in apparent resistivity.