

## INTISARI

Sebelum dilakukan pembangunan tubuh bendungan utama Bendungan Cipanas perlu dilakukan pengalihan air Sungai Cipanas, Cibuluh, Sumedang, Jawa Barat menggunakan terowongan pengelak. Pada bulan Oktober 2018 telah dilaksanakan penggalian awal terowongan tersebut namun terjadi keruntuhan baik pada terowongan maupun lereng portal dan *spillway*. Maka dari itu diperlukan penyelidikan geologi teknik permukaan dan bawah permukaan yang selanjutnya dapat digunakan sebagai material konstruksi, rekomendasi sistem penyangga terowongan dan analisis kestabilan lereng. Aspek yang digunakan sebagai data meliputi aspek batuan dan tanah, aspek geomorfologi, aspek struktur geologi, dan aspek air tanah. Metode penelitian dilakukan dengan pemetaan geologi teknik, deskripsi kualitas massa batuan pada batuan inti, dan analisis kestabilan lereng dengan metode kesetimbangan batas.

Daerah penelitian terdiri atas empat satuan batuan yaitu satuan batupasir kerikilan, satuan konglomerat, satuan batupasir, dan satuan endapan pasir kerakalan. Secara geomorfologi terdiri atas tiga satuan yaitu satuan punggung zona sesar, satuan lembah zona sesar, dan dataran kolumial. Struktur geologi yang berkembang yaitu sesar geser dekstral dan sesar naik. Kedalaman air tanah 5-30 m dari permukaan. Karakteristik geologi teknik berdasarkan tingkat pelapukan daerah penelitian terdiri atas enam satuan yaitu satuan batupasir lapuk rendah, satuan batupasir lapuk sedang, satuan konglomerat lapuk rendah, satuan konglomerat lapuk sedang, satuan batupasir kerikilan lapuk rendah, dan satuan batupasir kerikilan lapuk sedang. Pelapukan dijumpai semakin rendah pada daerah sungai. Daerah penelitian didominasi oleh satuan batupasir lapuk sedang yang menjadi letak konstruksi terowongan pengelak. Berdasarkan kualitas massa batuan *Geological Strength Index* (GSI) permukaan, daerah penelitian memiliki batuan dengan kualitas sangat buruk hingga baik dengan kecenderungan semakin buruk mendekati zona sesar naik. Terowongan pengelak sendiri memiliki kondisi batuan bawah permukaan yang didominasi oleh batupasir dengan sisipan batulempung, konglomerat, dan breksi. Kualitas massa batuan bawah permukaan *Geological Strength Index* (GSI) terdiri dari batuan berkualitas buruk, sedang, dan baik, sedangkan kualitas massa batuan *Rock Mass Rating* (RMR) terdiri dari buruk (IV) dan sedang (III). Batuan dengan kualitas tersebut memerlukan sistem penyangga berupa *shotcrete*, *rockbolts*, *wire mesh*, *steel sets*, dan perlu dijauhkan dari air terutama pada batulempung yang mengandung smektit. Analisis kestabilan lereng menunjukkan portal *inlet* cenderung stabil, sedangkan portal *outlet* dan *spillway* belum stabil meskipun sudah diberi perkuatan berupa *shotcrete*.

**Kata kunci:** Terowongan pengelak, karakteristik geologi teknik, sistem penyangga terowongan, kesetimbangan batas, *Geological Strength Index*.

## ABSTRACT

*Before starting the construction of the main dam, it is necessary to divert the flow of Cipanas River, Cibuluh, Sumedang, West Java using a diversion tunnel. In October 2018, the initial excavation of the tunnel was carried out but there was a collapse in the tunnel, portal and spillway slopes. Therefore, it is necessary to investigate surface and subsurface engineering geology characteristics which can then be used as construction materials, recommendations for tunnel support systems, and slope stability analysis. The aspects used as data include rock and soil aspects, geomorphological aspects, geological structure aspects, and hydrological aspects. The research method is carried out by scale 1: 10,000 geological engineering mapping, rock mass quality description from core, and analysis of slope stability using limit equilibrium method.*

*Study area consists of four lithological units, that is gravelly sandstone unit, conglomerate unit, sandstone unit, and pebbly sand sediment. Based on geomorphological aspect, study area consists of fault zone ridge unit, fault zone valley unit, and colluvium plain unit. The geological structure that developed in this area are dextral fault and reverse fault. The groundwater depth around the study area is quite shallow. Based on weathering degree, engineering geology characteristics of the study area consists of seven units, namely pebbly sand sediment, low weathered sandstone units, medium weathered sandstone units, low weathered conglomerate units, medium weathered conglomerate units, low weathered gravelly sandstone units, and medium weathered gravelly sandstones. The weathering degree is decrease approaching the river. The research area is dominated by a medium weathered sandstone unit which is the location of the diversion tunnel construction. Based on surface Geological Strength Index (GSI), research area consist of very poor-good rock with the tendency of quality to get worse approaching the fault zone. The subsurface rock condition of diversion tunnel is dominated by sandstones intercalation with claystone, conglomerate, and breccia. Subsurface rock mass quality based on Geological Strength Index (GSI) consists of poor, fair, and good rocks while rock mass quality based on Rock Mass Rating (RMR) consists of poor (IV) and fair rocks (III). These quality rocks require a support system such as shotcrete, rockbolts, wire mesh, steel sets, and need to be kept away from water, especially in claystones containing smectite. Slope stability analysis shows inlet portal tend to be stable, while outlet portal and spillway have not been stable even though shotcrete reinforcement has been given.*

**Keywords:** *diversion tunnel, engineering geology characteristics, tunnel support, limit equilibrium, Geological Strength Index.*