INTISARI

PT Arutmin Indonesia tambang Batulicin terletak di Kecamatan Simpang Empat, Kabupaten Tanah Bumbu, Provinsi Kalimantan Selatan merupakan tambang terbuka dalam industri tambang batubara. Pada tambang terbuka memerlukan penelitian mengenai karakterisasi geologi teknik dan analisis kestabilan lereng pada area timbunan untuk menghindari permasalahan geologi yang dapat mempengaruhi operasional pertambangan. Penelitian ini bertujuan untuk mengetahui karakteristik geologi teknik (geomorfologi, batuan dan tanah, struktur geologi dan kondisi air tanah), mengetahui tingkat kestabilan lereng pada area timbunan, serta mengetahui perbandingan nilai properti material (kohesi dan sudut geser dalam) dari hasil analisis balik dan hasil uji laboratorium. Pada penelitian ini dilakukan metode pengumpulan data sekunder berupa data DEMNAS, data geoteknik, data piezometer, topografi penambangan, dan data profil borehole sedangkan untuk data primer berupa data batuan dan data timbunan. Penelitian ini menggunakan pemetaan geologi teknik skala 1:25.000, analisis kestabilan lereng timbunan dengan kesetimbangan batas (*Limit Equilibrium Method*) metode Morgenstern-Price dan deterministik dengan bantuan perangkat lunak Geostudio Slope/W 2023.1 untuk memperoleh nilai faktor keamanan lereng timbunan, analisis balik untuk menentukan nilai material properties saat timbunan longsor, dan analisis laboratorium meliputi petrografi dan uji kuat geser tanah menggunakan *direct shear test*. Hasil penelitian menunjukkan bahwa daerah penelitian dibagi menjadi 2 satuan geomorfologi sebelum penambangan, yaitu satuan dataran bergelombang kemiringan datar – landai dan satuan dataran bergelombang kemiringan miring – agak curam, kemudian akibat proses penambangan morfologinya berubah menjadi 4 satuan morfologi yaitu satuan bukaan tambang kemiringan miring – curam, satuan bukaan tambang kemiringan landai, satuan bukaan tambang kemiringan curam- sangat curam dan satuan bukaan tambang kemiringan landai – miring. Aspek batuan dan tanah lokasi penelitian tersusun atas litologi berupa satuan batulempung, satuan batubara, dan satuan batupasir dengan tingkat pelapukan yang bervariasi. Kualitas massa batuan permukaan berdasarkan klasifikasi GSI menunjukkan kualitas baik hingga buruk. Struktur geologi pada lokasi penelitian yaitu pola kelurusan pada citra DEMNAS berarah NE-SW dan NW-SE, kekar gerus dengan dominasi arah NW-SE, dan sesar normal diperkirakan dengan orientasi NW-SE. Peningkatan elevasi muka air tanah dapat menyebabkan potensi longsoran di area timbunan. Kondisi kestabilan lereng pada area timbunan (*section* B13-19) memiliki nilai FK 0.983, dalam kondisi tidak stabil dikarenakan FK<1.3. Perbandingan nilai properti material (kohesi dan sudut geser dalam) dari hasil analisis balik dan hasil uji laboratorium yaitu nilai kohesi yang dihasilkan dari uji *direct shear* (18.84 kPa) lebih tinggi daripada nilai kohesi dari analisis balik (15.8 kPa), sementara sudut geser dalam dari uji geser langsung menunjukkan nilai yang lebih rendah (5.25 º) dibandingkan dengan analisis balik (18.1º).

Kata kunci: Karakteristik geologi teknik, *Limit Equilibrium Method*, analisis balik, metode deterministik, IUPK Batulicin PT Arutmin Indonesia.

ABSTRACT

PT Arutmin Indonesia's Batulicin Mine, located in Simpang Empat District, Tanah Bumbu Regency, South Kalimantan Province, operates as an open-pit coal mine. Open-pit mining activities necessitate comprehensive studies on engineering geological characterization and slope stability analysis, particularly within disposal areas, to mitigate geological risks that may impact mining operations. This research aims to characterize the engineering geological conditions—including geomorphology, rock and soil types, geological structures, and groundwater conditions; evaluate the slope stability within the disposal area; and compare material property values (cohesion and internal friction angle) obtained through back analysis and laboratory testing. The study utilizes both secondary and primary data. Secondary data include the National DEM (DEMNAS), geotechnical data, piezometer measurements, mining topographic maps, and borehole profiles. Primary data were obtained through field sampling of rock and disposal materials. Engineering geological mapping was conducted at a scale of 1:25,000. Slope stability was analyzed using the Limit Equilibrium Method (Morgenstern-Price) through a deterministic approach, assisted by Geostudio Slope/W 2023.1 software to determine the Factor of Safety (FoS). Back analysis was carried out to estimate material properties during slope failure events, while laboratory testing comprised petrographic analysis and direct shear testing to assess soil shear strength parameters. The results indicate that, before mining, the study area was divided into two geomorphological units: gently undulating plains with flat to gentle slopes, and moderately undulating plains with moderate to moderately steep slopes. Following mining activities, the morphology evolved into four geomorphological units: pit openings with moderate to steep slopes, pit openings with gentle slopes, pit openings with steep to very steep slopes, and pit openings with gentle to moderate slopes. The lithology of the study area comprises claystone, coal, and sandstone units with varying degrees of weathering. Surface rock mass quality, as classified by the Geological Strength Index (GSI), ranges from good to poor. Identified geological structures include lineaments observed on DEMNAS imagery trending NE–SW and NW–SE, shear joints predominantly oriented NW–SE, and a suspected normal fault with an NW–SE orientation. An increase in groundwater table elevation has the potential to trigger slope failure in the disposal area. The slope stability analysis for the disposal area, particularly in sections B13–19, yielded a Factor of Safety of 0.983, indicating an unstable condition as it falls below the acceptable threshold of 1.3. A comparison of material properties reveals that the cohesion value obtained from direct shear testing (18.84 kPa) is higher than that derived from back analysis (15.8 kPa). Conversely, the internal friction angle from laboratory testing (5.25°) is significantly lower than that determined through back analysis (18.1°).

***Keywords**: Geological characteristics, Limit Equilibrium Method, analisis balik (back analysis), deterministic method, IUPK Batulicin PT Arutmin Indonesia.*