











**Table 9:** Result of risk level of rock slopes in the study area

Slopes	G-Rating	Instability Potential	Type of Failures	Risk Level	Category
S1	0.44	Yes	Wedge Failure	Low Risk	II
S2	0.38	Yes	Wedge Failure	No Risk	I
S3	0.32	-	-	No Risk	I
S4	0.53	Yes	Wedge Failure	Moderate Risk	III
S5	0.21	Yes	Wedge and Planar Failure	No Risk	I
S6	0.35	Yes	Wedge and Planar Failure	No Risk	I

### 3.7 Mitigation Suggestions

Based on a study, there are suitable mitigation methods to prevent slope failure to occur (Table 3) [5]. Each proposed mitigation methods are depending on the risk level achieved by the slopes.

Slope S4 is classified as moderate risk which requires further inspection of the slope and the stream system of the area. Planting a vegetation on exposed area of the slope is also suggested other than proposed rock anchor and soil nailing method to prevent the slope failure. As for slope S1 which is low risk classification, no immediate action needed and it is suggested to make inspection on the stream system and vegetation on the exposed area to reduce the instability potential. As for other slopes, no suggestion is needed for there is no risk of slope failure to occur (Table 10).

**Table 10:** Mitigation suggestions proposed based on the risk level

Slopes	Risk Level	Category	Mitigation Suggestions
S1	Low Risk	II	<ul style="list-style-type: none"> <li>To inspect the stream system</li> <li>To plant vegetation on the exposed area of the slope</li> <li>No immediate action needed</li> </ul>
S2	No Risk	I	No suggestion
S3	No Risk	I	No suggestion
S4	Moderate Risk	III	<ul style="list-style-type: none"> <li>To inspect the stream system</li> <li>To plant vegetation on the exposed area of the slope</li> <li>Rock anchoring</li> <li>Soil nailing or stone pitching</li> <li>Further action required</li> </ul>
S5	No Risk	I	No suggestion
S6	No Risk	I	No suggestion

### 4. CONCLUSION

Modified D-Slope comprised of G-rating determination and Potential Instability using kinematic analysis. Additional of laboratory analysis (porosity and strength analysis) and microfabric observation (micro-petrographic and micro-fractures index) are conducted to assess the internal properties of the slope, besides the field observations (geological parameters, hydrogeological parameters and slope characterization) for the exterior of slope's potential of failure.

G-rating determination show slope S1 and S4 have value more than 0.4 (0.44 and 0.53 respectively), while other slopes have value less than 0.4 which indicates no risk of failure. Slope S1, S2 and S4 show wedge failure

while slope S5 and S6 show both wedge and planar failures. This indicates the potential instability of all slopes. Based on modified D-Slope analysis, slope S4 is classified as Moderate Risk (III), slope S1 as Low Risk (II) and other slopes as No Risk (I).

Mitigation suggestions are depends on the risk level of the slopes. Slope S4 is suggested to have rock anchor or soil nailing as further actions are required on this level; while slope S4 is suggested to inspect the stream system and plant vegetation on the exposed area of the slope as no immediate actions needed. Other slopes (S2, S3, S5 and S6) have no suggestion for mitigation as been assessed as level I.

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