Ground Instability at Pantteg; Risk Map Narrative

The aim of the recent work is to update the historical Hazard and Risk Map based on current engineering geological practice, to develop an understanding of where instability is likely to occur in the future and give us a better understanding of likely impact on roads, land and properties in the area; this work is in progress and the risk map represents the latest understanding and assessment. The following comments are intended to support understanding of the risk plan:

Hazard: a condition with the potential for causing an undesirable consequence (e.g. location, volume/area, velocity of the potential landslides and any resultant detached material) and the probability of occurrence within a given period of time.

A number of different hazard types are present at Pantteg and these have been amalgamated onto one plan to communicate the risk:

- Hazard Type 1: Large-scale complex landslide Godrergraig – Upper;
- Hazard Type 1: Large-scale complex landslide Godrergraig – Lower;
- Hazard Type 1: Large-scale complex landslide Pantteg – Lower;
- Hazard Type 2: Shallow geologically controlled translational landslides;
- Hazard Type 3: Shallow translational landslides in Made Ground;
- Hazard Type 4: Debris avalanches;
- Hazard Type 5: Boulder Fall;
- Hazard Type 6: Rock fall.

Risk: a measure of the probability and severity of an adverse effect to health, property or the environment (risk = probability of a given magnitude x consequences). This can be quantitative or qualitative, depending on the availability of data.

A series of risk assessments have been carried out for the study area using the AGS Guidelines for Landslide Susceptibility Hazard and Risk Zoning, 2007[1].

[1] Specifically: The assessment of landslide hazard and risk, Fell et al (2008) reporting on behalf of JTC-1 (Joint Technical Committee on Landslides and Engineered Slopes - IAEG, ISRM ISSMGE collaboration (the international professional geotechnical societies)). JTC-1 is largely based on AGS (2007) with minor modification for international implementation. The Engineering Group of the Geological Society is the UK National Group of the International Association of Engineering Geology (IAEG).

Quantitative Risk Assessment – central study area

A Quantitative Risk Assessment has been undertaken for the central study area for risk to life. This is considered to be the zone with the highest hazard associated with Hazard Type 2 for which there is sufficient data to allow a quantitative assessment. Risk is reported using annual probability of loss of life. Risk to pedestrians, people in vehicles and residents were all evaluated and reflect the annual individual risk for the persons most at risk.

The following risk zonings are being utilised (from Table 6 in the AGS Guidelines for Landslide Susceptibility Hazard and Risk (Section 7.2.4):

Very High Risk	Annual probability of **>1 in 1,000** (>10^{-3}/annum) that the persons at risk will lose their life.
High Risk	Annual probability of **1 in 10,000 to 1 in 1,000** (10^{-4} to 10^{-3}/annum) that the persons at risk will lose their life.
Moderate Risk	Annual probability of **1 in 100,000 to 1 in 10,000** (10^{-5} to 10^{-4}/annum) that the persons at risk will lose their life.
Low Risk	Annual probability of **1 in 1,000,000 to 1 in 100,000** (10^{-6} to 10^{-5}/annum) that the persons at risk will lose their life.
Very Low Risk	Annual probability of **<1 in 1,000,000** (<10^{-6}/annum) that the persons at risk will lose their life.

With respect to UK individual risk to life, AGS 2007 quotes UK HSE (2001) which notes that 10^{-6}/annum is broadly acceptable and 10^{-4}/annum is tolerable.

Quantitative Risk Assessment – remainder of study area

The approach to the remainder of the study area is quantitative using estimates of likelihood and consequence (AGS, 2007) and is based on risk to property rather than risk to life. The terminology is qualitative i.e. it uses words. This is the best approach because 'where the possibility of obtaining numerical data is limited such that a [numerical] quantitative analysis is unlikely to be meaningful or may be misleading' (AGS, Guidelines for Landslide Risk Management 2007, Section 7.2).

Example Risk Level Implications (taken from AGS Practice Note Guidelines for Landslide Risk Management, Appendix C, 2007):

Very High Risk	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than value of the property.
High Risk	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
Moderate Risk	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
Low Risk	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
Very Low Risk	Acceptable. Manage by normal slope maintenance procedures.

Table 7 of the AGS guide (2007), should also be refereed to when interpreting this information. The implications for a particular situation are to be determined by all parties to the risk assessment and may depend on the nature of the property at risk; the above is a general guide.

Notes:

1. The 3 houses and garages south of the Graig-y-Merched junction are linked to the very high risk area/are in the very high risk polygon; the properties are denoted as 'very high risk' to explain the risk to the residential properties. Mitigation from upslope properties will play a role here; we've adopted a conservative position for landslides >500m3 volume that may engulf the upslope properties and continue downslope. Further information is being gathered and assessed.
2. The high risk zone below Cyfyng Road encompasses the whole terrace. The interconnectivity of the terraced structures plays a role here.
3. Further information is being gathered and assessed and the draft risk map updated.