Appendix 2H – Life Cycle Management Plan – Geotechnical Assets

Introduction

The Geotechnical asset can be defined as the foundation of every road and highway structure, and the land on and through which the road network is formed. In Gloucestershire we are monitoring, designing or constructing over 50 Geotechnical sites.

Geotechnical assets typically have a long service life. They generally deteriorate slowly over time and require little routine maintenance, as long as associated assets such as drainage and structures are well maintained, and the asset is not disturbed by removal of supporting material (for example excavation at the toe of a slope) or opening of potential zones of weakness (for example excavation at the crest of a slope).

The drivers for decision making in the management of the geotechnical asset are generally a balance of:

- The risk posed to the road network from ground related, or external hazards (e.g. climate change).
- The performance required from the geotechnical assets contributing to overall service levels for the highway network (e.g. to minimise disruption caused by roadworks or provide soft estate habitats).
- The cost of geotechnical asset management activities (and available budgets).

Further details can be found in the Design Manual for Roads and Bridges (DMRB).

Condition

When defects have been identified, they are inspected, and a monitoring regime is established. This may range from a visual inspection on a regular basis by the Area Highway officer to installation and monthly monitoring of inclinometers/groundwater monitoring equipment. In 2007 the Coopers Hill landslip site on the A46 was considered to be a very high-risk location but also a key part of the highway network. At this site we installed telemetry which allowed continuous monitoring, and which would send a text message to an engineer if trigger rates of movement were exceeded.

The Life Cycle

Creation/Acquisition: New geotechnical assets are most likely to be created as part of developments; this might comprise cuttings or embankments to form public authority road schemes or private developments. To maximise use of available land for development, there are often stabilisation works or retaining works which would become part of the highway. The requirements for developers are set down in the Manual for Gloucestershire's Streets, and all new geotechnical assets have to go through the technical approval process laid down in DMRB.
Operations/Maintenance: Operate and maintain the asset on a routine basis.
Upgrade or Renew: Replace and renew based on condition, safety or capacity reasons.
Disposal/Decommission: There are no plans for disposal of any geotechnical asset, however in some circumstances it may be considered possible to permanently close or restrict a highway, rather than invest disproportionally large amounts of capital money on repairs, where the restriction to the road is seen as acceptable.

Deterioration
Deterioration is the change in the physical condition of the asset resulting from use or ageing. Geotechnical defects can occur where the land itself is inherently unstable, or where engineered works (cuttings, embankments) have failed through the action of weather, accidental over-loading or under-design.

Recent severe weather events have resulted in an increase in the incidence of failures and the awareness of the vulnerability of the road network to these failures. The County has experienced several high-profile landslips in 2024 and therefore the development of schemes and early intervention reduces the safety risk of further slippages and the Council having to fund far higher costs in future. Capital investment has increased in 2025/26.

It is noted that at many of the sites where there are geotechnical issues, the condition of highway drainage is often found to be a contributory factor or exacerbates the failure mechanism.

Standstill and Backlog Costs
Various models exist to determine the Standstill and Backlog costs. The Standstill cost is how much needs to be spent every year in order to maintain the asset in the condition it's in today (plus inflation). The Backlog cost is how much you would need to spend to return the whole asset to very good condition. The following figures represent the latest data for carriageways:

- Standstill - £3M Capital
- Backlog - >£10M Capital

Funding from the revenue budget for Reactive/Cyclical repairs to the asset is included in the annual amount provided for Bridges/Structures/Geotechnical (see Appendix 2C).

Approach
Our approach to Geotechnical asset planning involves several key steps to ensure the stability and longevity of infrastructure projects:

- Assessment and Data Collection – ongoing site investigations/monitoring/testing to gather data.
- Risk Analysis – identify (wherever possible) potential geotechnical hazards and assess the likelihood and impact of these hazards.
- Design and Planning – develop designs that address identified risks and plan for appropriate and relevant construction methods and materials
- Implementation – execute the construction lan and monitor conditions during construction
- Maintenance and Monitoring – establish a maintenance plan/inspection regime and use sensors and other technologies to detect changes in conditions
- Documentation and Reporting – update relevant asset records.