Geoconservation: principles and practice

Part 2 of 3

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NATURAL ENGLAND

Sections through gastropods preserved in the Late Jurassic Malton Oolite at Nunnington Cuttings and Quarries SSSI, North Yorkshire. ©Natural England/ Dave Evans

Geoconservation: Principles and Practice

By: Dave Evans, Eleanor Brown, Jonathan Larwood, Colin Prosser, Barbara Silva, Hannah Townley and Anna Wetherell

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Front cover images

Clockwise from top right:

Rescue excavation of a large Lower Jurassic Ichthyosaur on the foreshore in Bridgwater Bay National Nature Reserve, Somerset. ©Geckoella Ltd reproduced with permission

Clearance works to re-expose the Middle Jurassic Cornbrash Formation at Thrapston Station Quarry SSSI, Lincolnshire. ©Natural England/Dave Evans

Demonstrating geoconservation at Wren's Nest National Nature Reserve, Dudley, West Midlands. ©Natural England/Colin Prosser

Site investigation to determine the location and distribution of the geological interest at Teffont Evias Quarry / Lane Cutting Site of Special Scientific Interest, Wiltshire. ©Natural England/Dave Evans

Section of the dry valley at Lathkill Dale National Nature Reserve, Derbyshire.
©Natural England/Dave Evans

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Chapter 3: Management guidance by site type

3.1: EA: Active Quarries

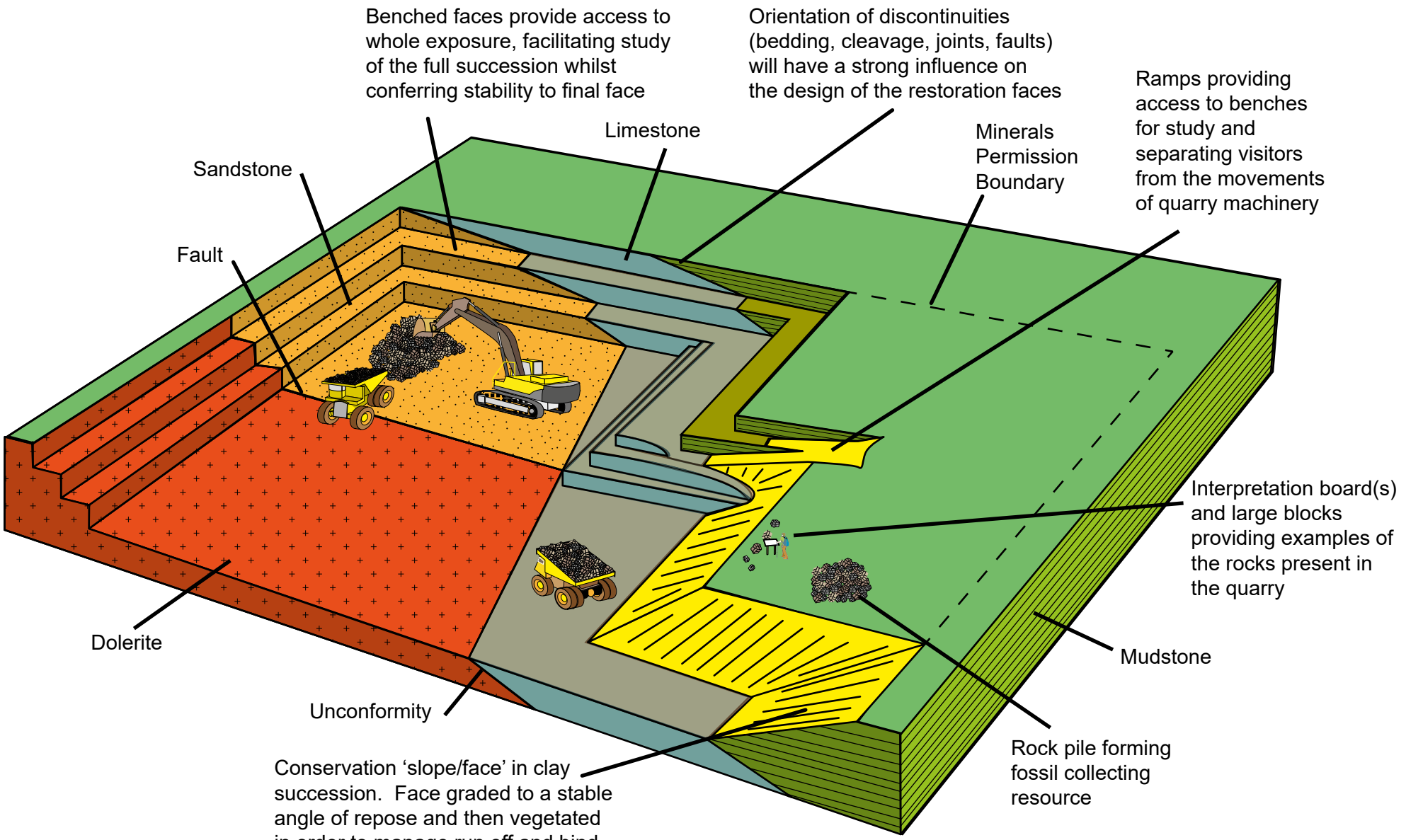
Potential threats and management issues

- **Scientific access to geological features**
- **Storage of quarry waste**
- **Development on the quarry floor and adjacent to the quarry**
- **Restoration**
- **Landfill**

Active quarries can provide unique opportunities to study otherwise unexposed geological features. As such, they can be of great scientific and educational importance, as they provide a continuously replenished resource of geological material. Safe access to newly exposed geological features for research purposes is generally desirable, as this provides the greatest opportunity for scientific study. Some quarry operators provide off-site rock and fossil stores where geological study can be safely undertaken. Storage of quarry waste against important geological features should be avoided. Quarry floor developments such as buildings should not obstruct access to geological features. Developments beyond the quarry but close to the crest of the quarry face should be avoided as they can impact on restoration options and create a need for face stabilisation, potentially leading to the loss of interest features. Restoration which takes account of important geological features should be considered early in the planning process.

Wellacre Quarry SSSI, Gloucestershire. The regular winning of clay for brick making maintains fresh exposures of a succession through a part of the Lower Jurassic, Charmouth Mudstone Formation that forms a condensed sequence elsewhere in England. ©Natural England/Dave Evans

Access and management of geological features in a working quarry (EA)



3.2a: ED: Disused quarries and pits - Instability

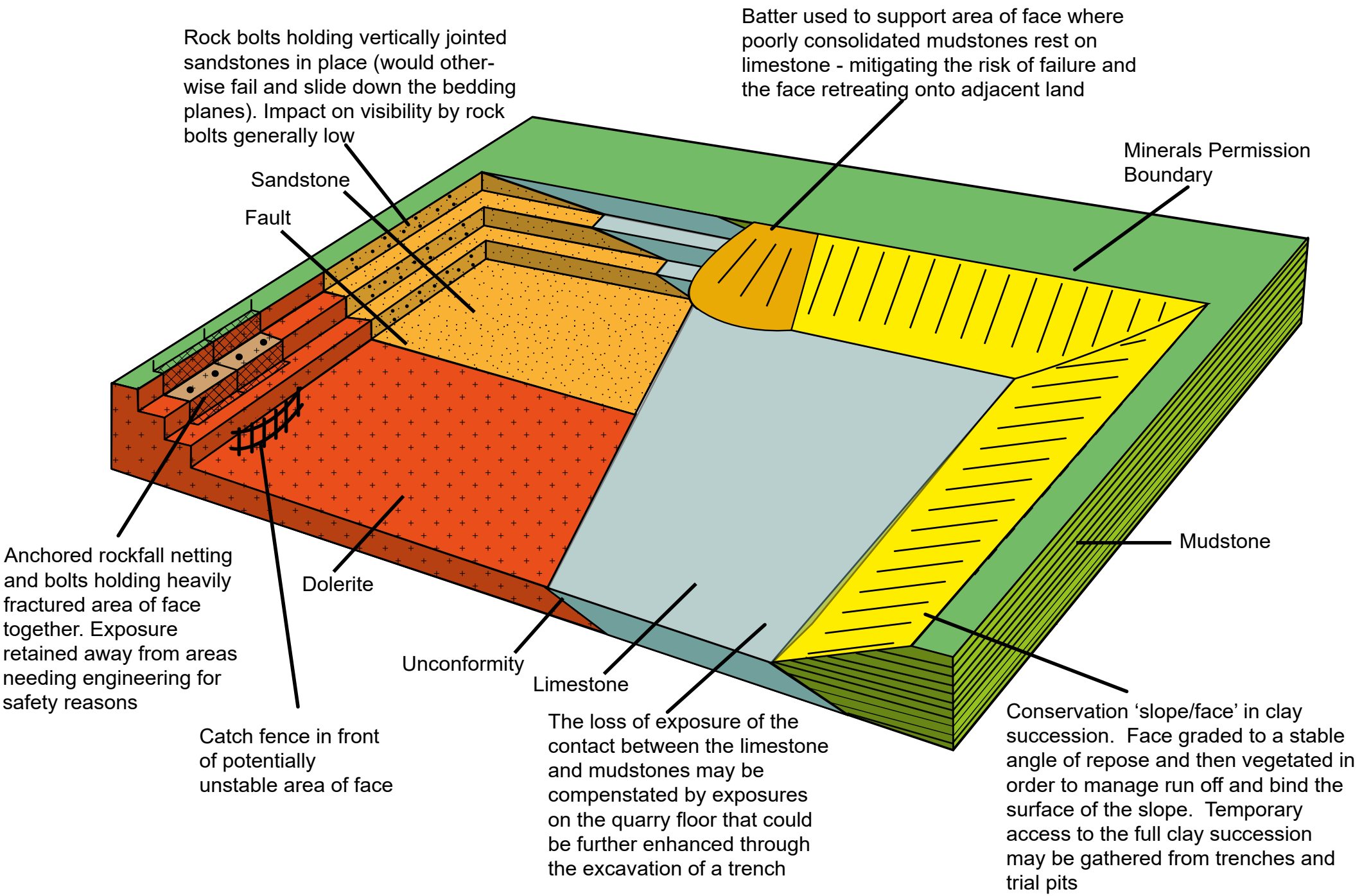
Potential threats and management issues

- **Instability and slumping of faces**

Disused quarry faces are often unstable and prone to slumping or collapse. In general, hard engineering solutions such as concreting and meshing are incompatible with conservation of the geological features. Scaling of faces and removal of fallen rock debris may be necessary to maintain the geological exposures in good condition. The re-excavation of a number of small sections can be a useful technique when the conservation interest is located within soft sediments, where retaining a high section may lead to slope instability. Ongoing management, including re-excavation and vegetation clearance, is generally required to maintain these sections.

Ditchley Road Quarry SSSI, Oxfordshire exposes a succession of Middle Jurassic clays and limestones. The faces have been restored as a series of low benches dictated by the stratigraphy in order to try to maximise future stability and access to the whole of the succession. ©Natural England/Dave Evans

Techniques for countering problems with instability and maintain exposure (ED)



3.2b: ED: Disused quarries and pits - Development

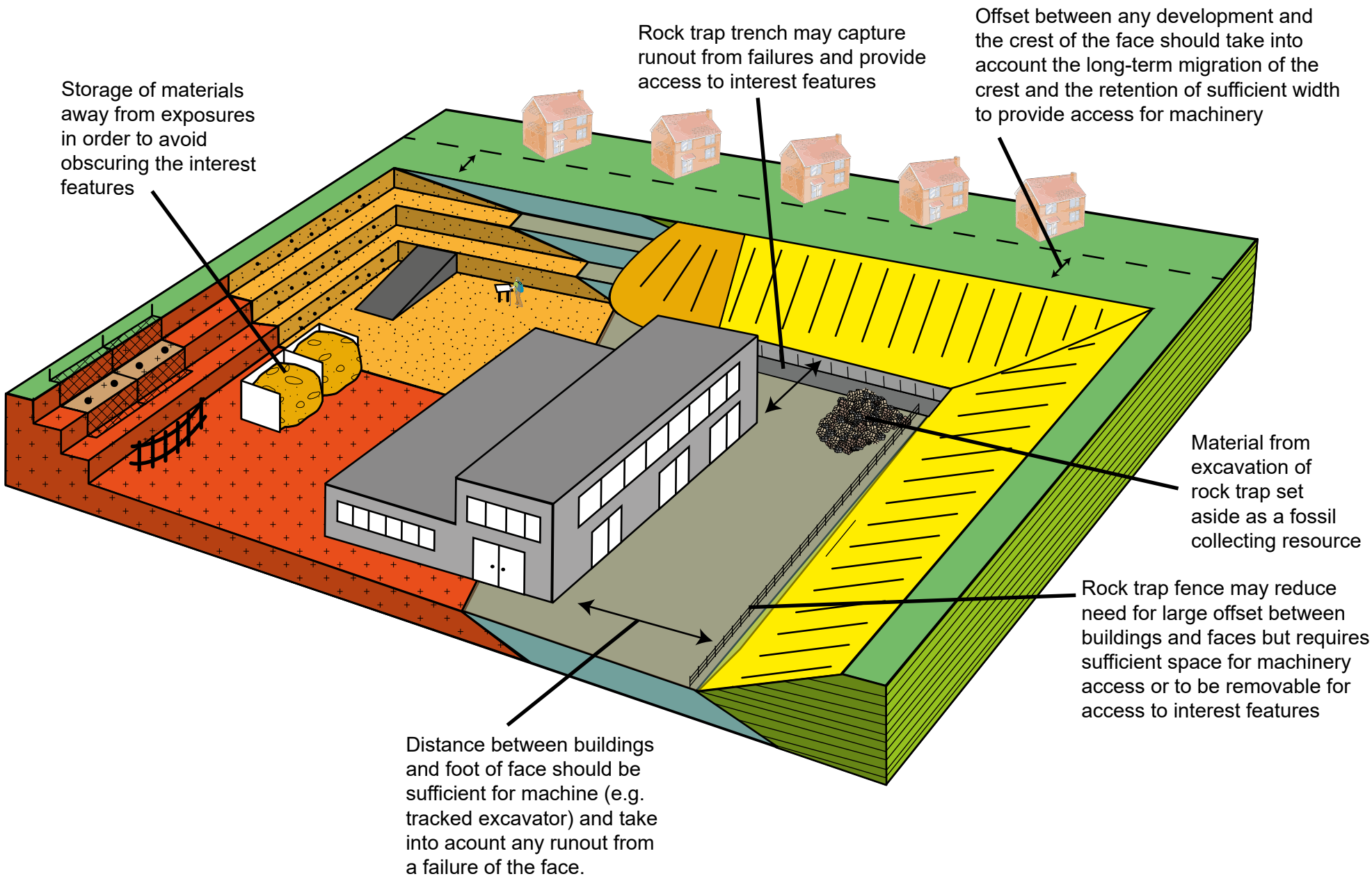
Potential threats and management issues

- **Development**

Development in the base of a disused quarry may be compatible with geological conservation, providing that exposure of the geological features of interest in the quarry walls, and access to the features, are retained. Buildings and infrastructure should be at a sufficient distance from faces and exposure, that any failure that occurs does not effect these structures. Restricting development above the quarry faces avoids a potential conflict of interest between the need to protect the development against potential instability and the need to maintain clean quarry faces for geological conservation. Early and ongoing consultation in the planning process assists in these principles being incorporated into the development plan design.

Purfleet Chalk Pit SSSI, Essex. In redeveloping disused quarries for warehousing, insufficient account was taken of the stability of the faces, with structures and access too close to the faces. Subsequent failures prompted stabilisation efforts, impairing access to, and visibility of the interest features. Face stability needs to be considered early in the design process. ©Natural England/ Mick Murphy

Development within and beyond a disused quarry (ED)



3.2c: ED: Disused quarries and pits - Landfill

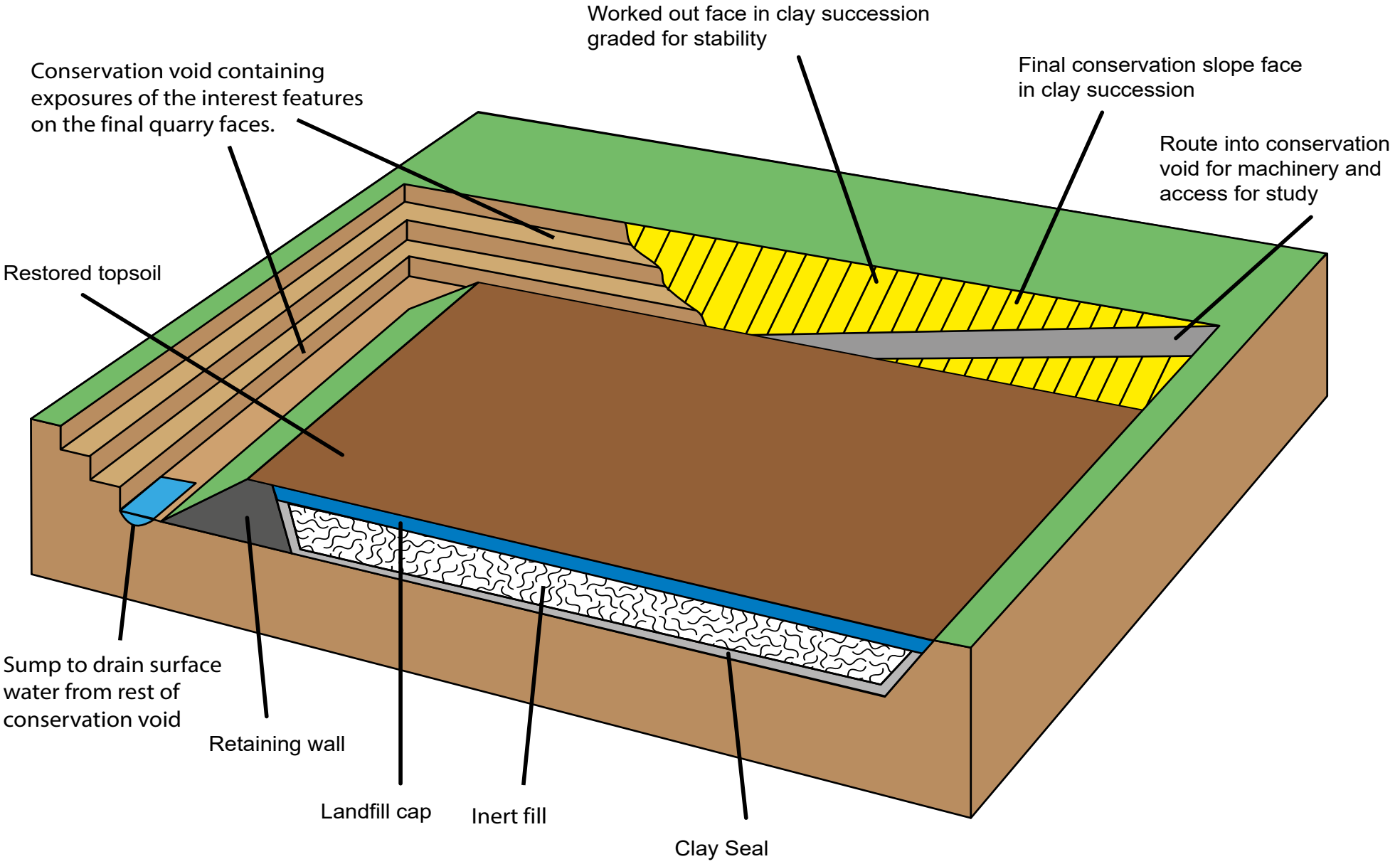
Potential threats and management issues

- **Landfill**

Disused quarries often provide unique opportunities to study geological features which are otherwise unexposed. They are, therefore, of great scientific and educational importance in many areas. However, disused quarries also present opportunities for waste disposal. Infilling typically results in the effective destruction of the geological interest but there are compromise solutions which may be acceptable in some cases. These include conservation voids and conservation sections above or adjacent to the landfill. If the geology is laterally variable, several conservation sections or voids may be required.

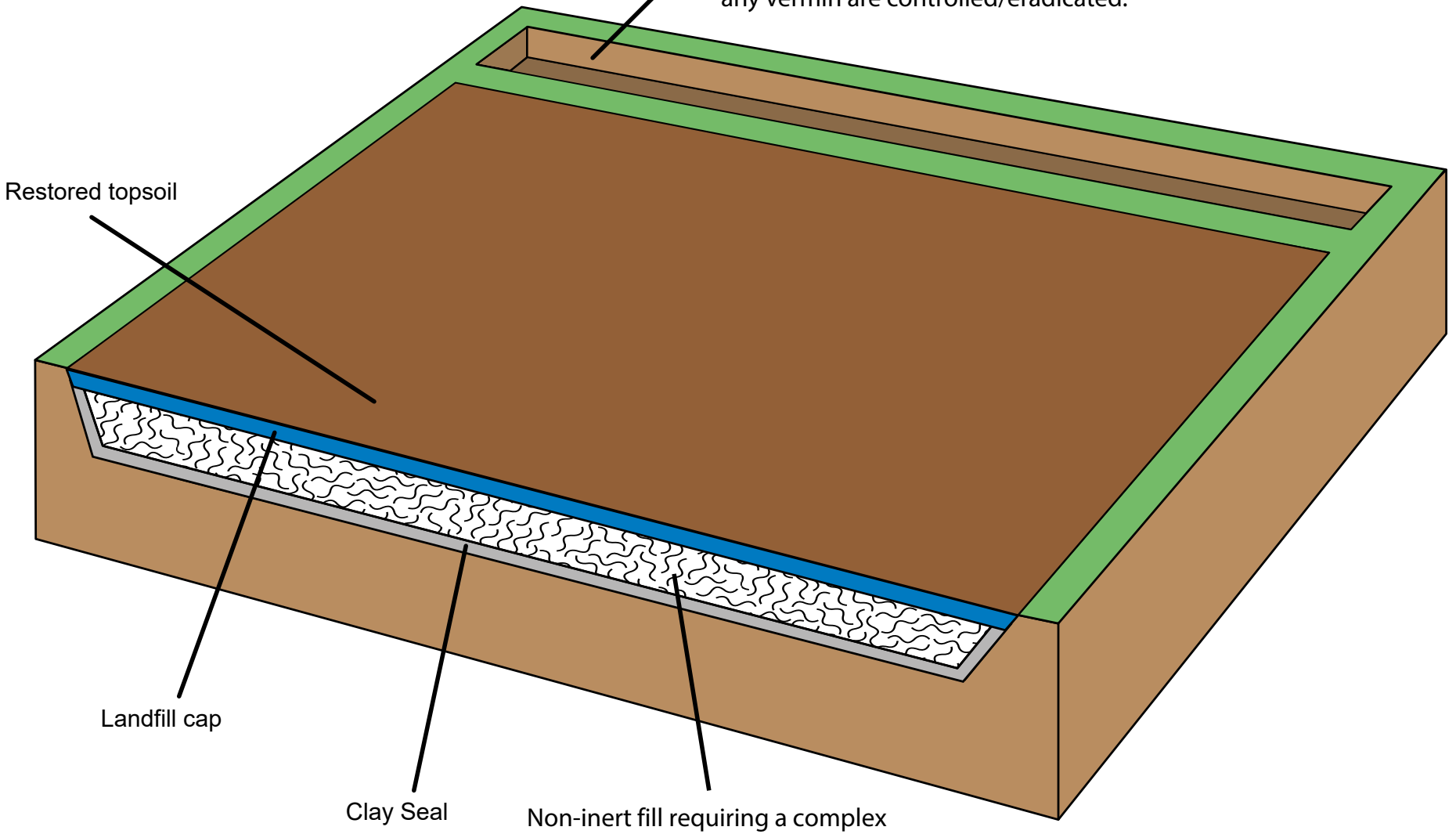
Investigation of Late Pleistocene sediments at Four Ashes Pit SSSI (Staffordshire). The original gravel workings were landfilled, but a conservation void was retained at the edge of the workings. This now provides access to some of the interest features. ©Natural England/Eleanor Brown

Landfill - Conservation void (ED)



Landfill - alternative exposure away from landfill (ED)

Replacement exposure created on land adjacent to landfill. Detailed consideration of design and long-term management of such structures is essential in order to ensure that the exposures remain stable and accessible while vegetation encroachment is kept to a minimum and any vermin are controlled/eradicated.



Non-inert fill requiring a complex infrastucture for the management of leachates and gas. The retention of voids at the margin of the fill tends to be incompatible with managing the landfill

3.2d: ED: Disused quarries and pits - New and temporary exposures

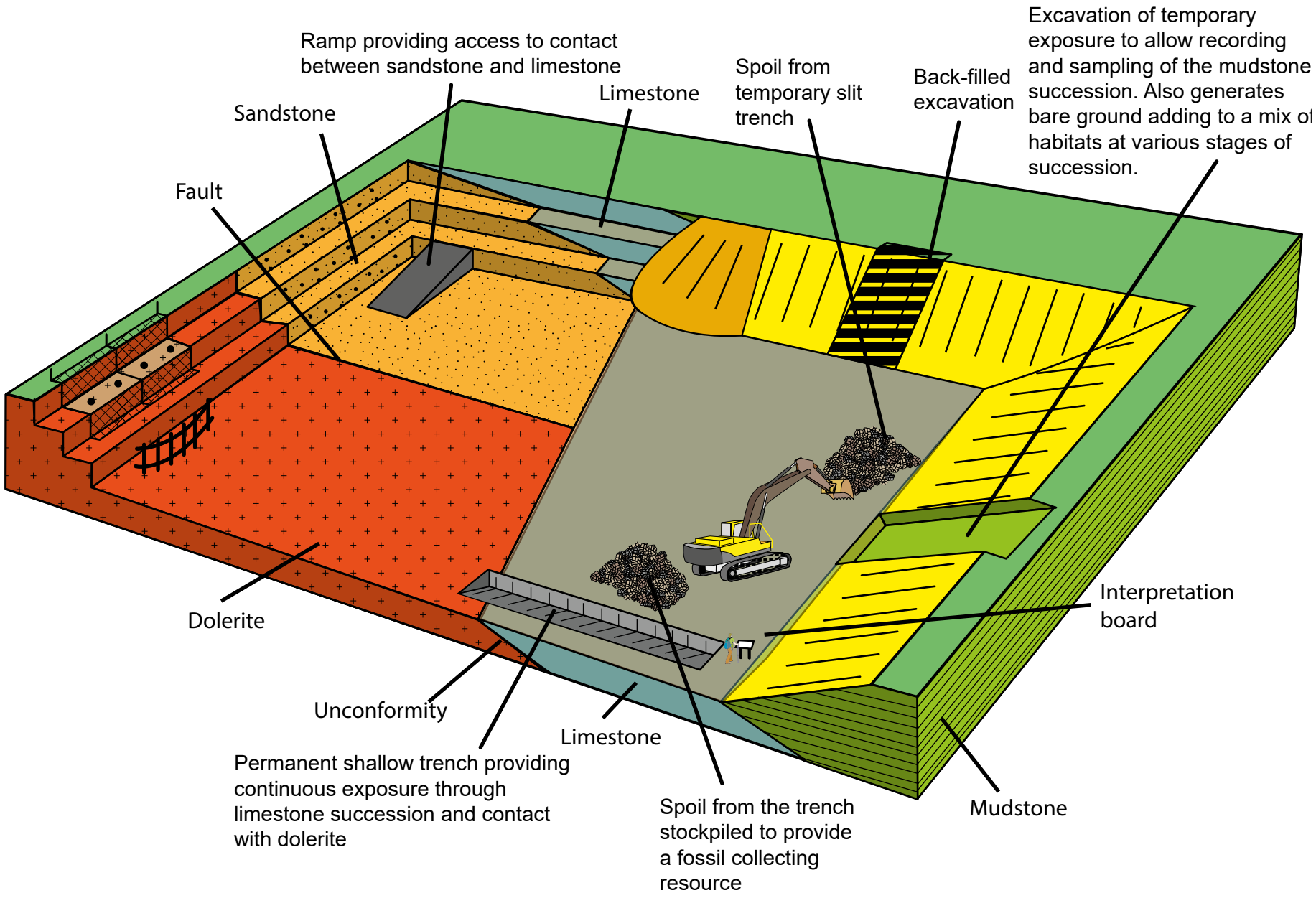
Potential threats and management issues

- **Generation of instability**
- **Flooding**
- **Creation of hazards**

Degradation of exposure in disused quarries may require the large-scale clearance of talus, the opening of new exposures, or re-profiling in order ease maintenance and access to interest features. Such works need to be considered in terms of their effects on face stability, and in particular, on impacts to the surrounding land and services. The hydrology of a site also needs consideration, as the excavation of a trench in a quarry floor is of little use if it promptly floods. Designs should avoid the creation of hazards such as hidden drops and over-steepened slopes. Large operations must be planned with care, and where there are inherent issues with stability, should always involve the consultation and advice of professional engineering geologists'.

Southerham Grey Pit SSSI, Sussex exposes a unique Chalk succession that was progressively obscured by talus build-up. In order to improve the condition of the site it was proposed that both of the faces visible in the image be cleared of talus. However, the distant face is adjacent to the A27 trunk road. Prior to carrying out any works. The potential effects of talus removal on the position of the crest of the face was carried out in order to demonstrate that the works would not affect the road. ©Natural England/Dave Evans

3.2d: Creation of new or temporary exposures (ED)



3.2e: ED: Disused quarries and pits - vegetation and tree planting

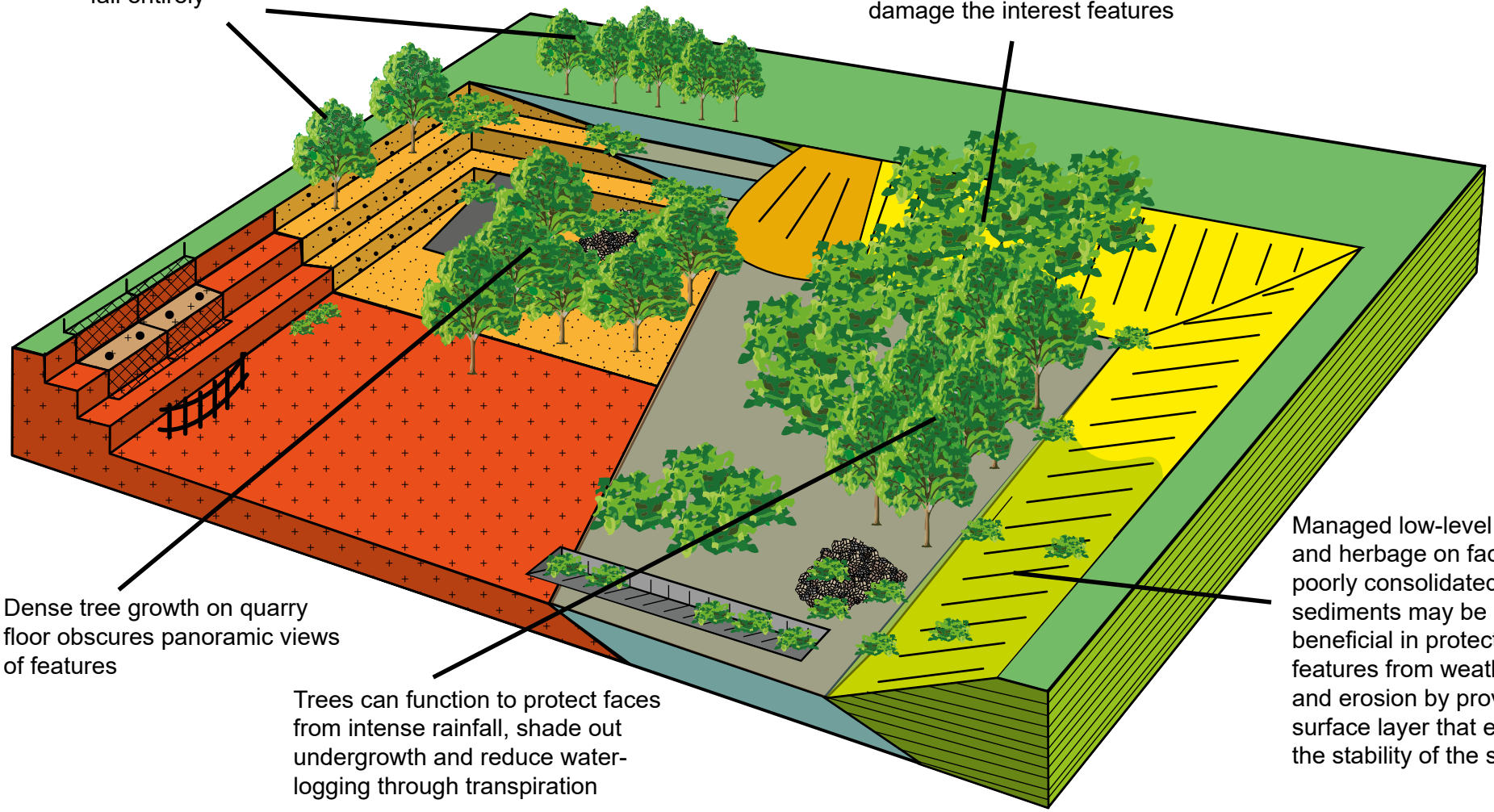
Potential threats and management issues

- **Vegetation encroachment**
- **Tree planting**

Natural vegetation can grow rapidly on and in front of disused quarry faces, concealing the interest features. Ongoing vegetation management is necessary in many disused quarries to maintain clean faces. Tree planting should be avoided close to geological features. In particular, some geological features need to be viewed from a distance and trees can obscure such views.

Rockhall Wood Pit SSSI, Suffolk. Section in the Pliocene, Coralline Crag Formation maintained through vegetation clearance along a limited length of the quarry face. ©Natural England/Mick Murphy

Vegetation management in disused quarries (ED)



3.2f: ED: Disused quarries and pits - Geodiversity and biodiversity enhancement in small quarries and pits

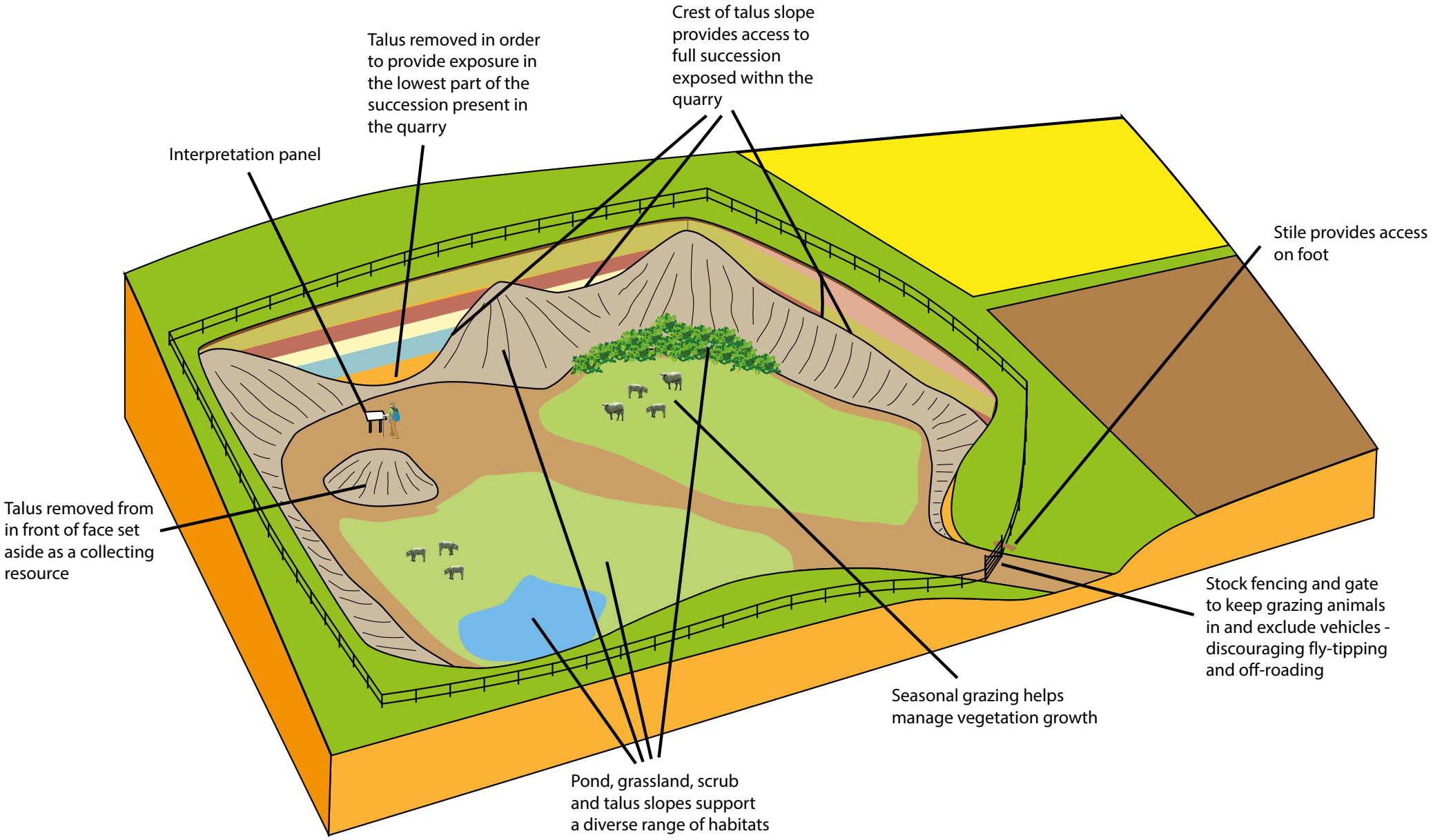
Potential threats and management issues

- **Appropriate vegetation management**
- **Inappropriate use of the site**

Disused quarries may provide some of the few remaining areas where biodiversity can survive/thrive amongst the built environment or intensive agriculture. Disused quarries can support a mosaic of habitats and may provide connectivity with other sites. Quarry floors may support permanent or ephemeral ponds, and bog. Aspect may be diverse, generating many microclimates variable aspects in relation to sunlight, temperature, wind and rain. Rock and talus be for burrowed, bored and sheltered in. The substrates available may support specialist floras such as calcareous grassland. Vegetation succession may be managed at a variety of different levels, increasing habitat and species diversity, while the geological interest may be integrated into the overall management of the site without impacting on the ability to retain and maintain the geological features. Some sites, particularly, but not exclusively in urban situations, may be subject to uses that do not benefit the interest features and these may require innovative measures in order to deflect, divert or end such activities.

Common lizard basking on boardwalk at Swaddywell Pit Nature Reserve, near Peterborough, Cambridgeshire. The boardwalk provides access to the face and the geological trail at times when water-levels are high and the floor of the pit is partially flooded. ©Natural England/Dave Evans

3.2e: Small urban and rural quarries managed to enhance geodiversity and biodiversity features (ED)



3.3: EC: Coastal (Cliffs and Foreshore)

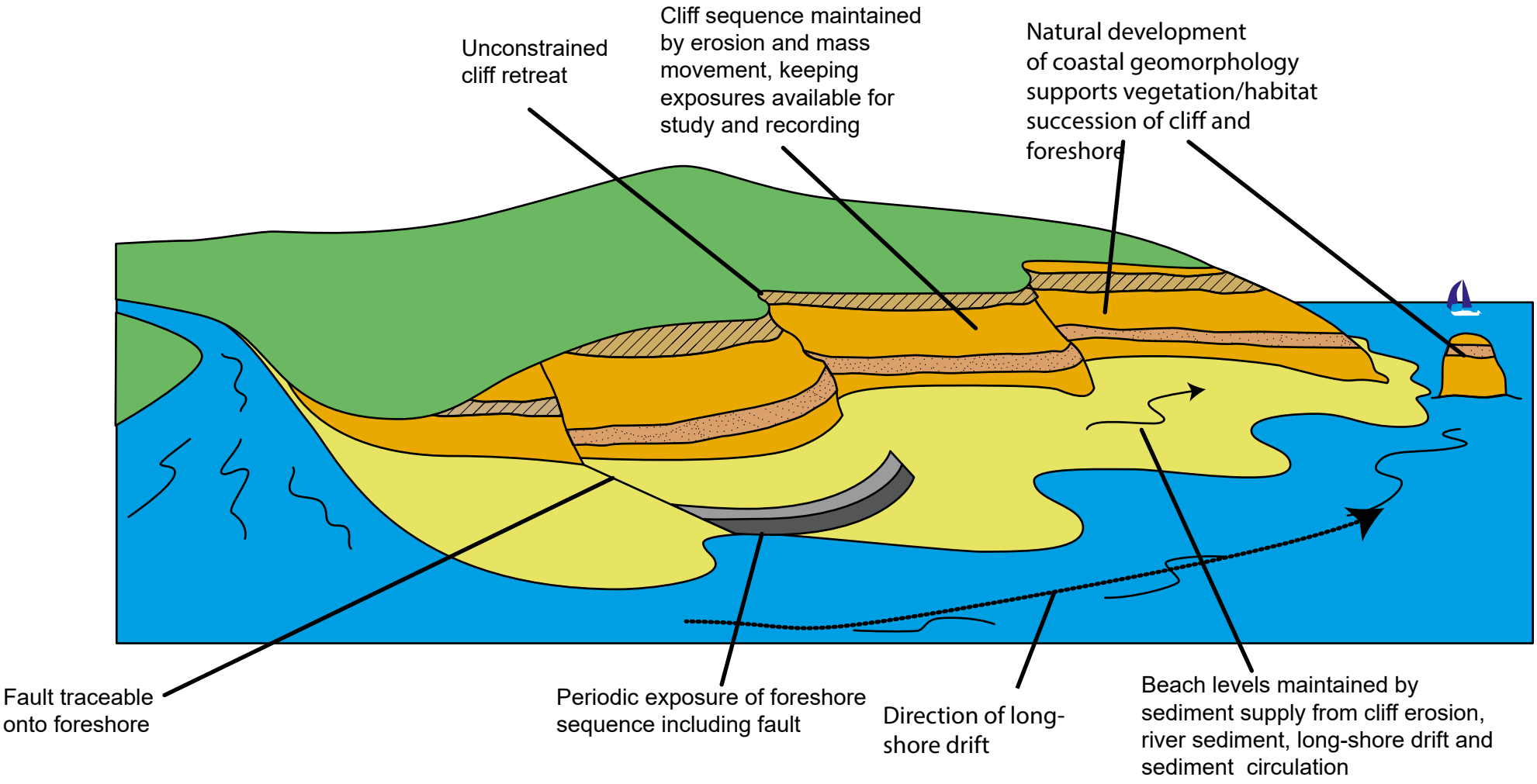
Potential threats and management issues

- **Coastal protection**
- **Cliff stabilisation and re-profiling**
- **Development**
- **Vegetation encroachment**
- **Dredging**
- **Offshore renewable energy schemes**
- **Irresponsible specimen collecting**

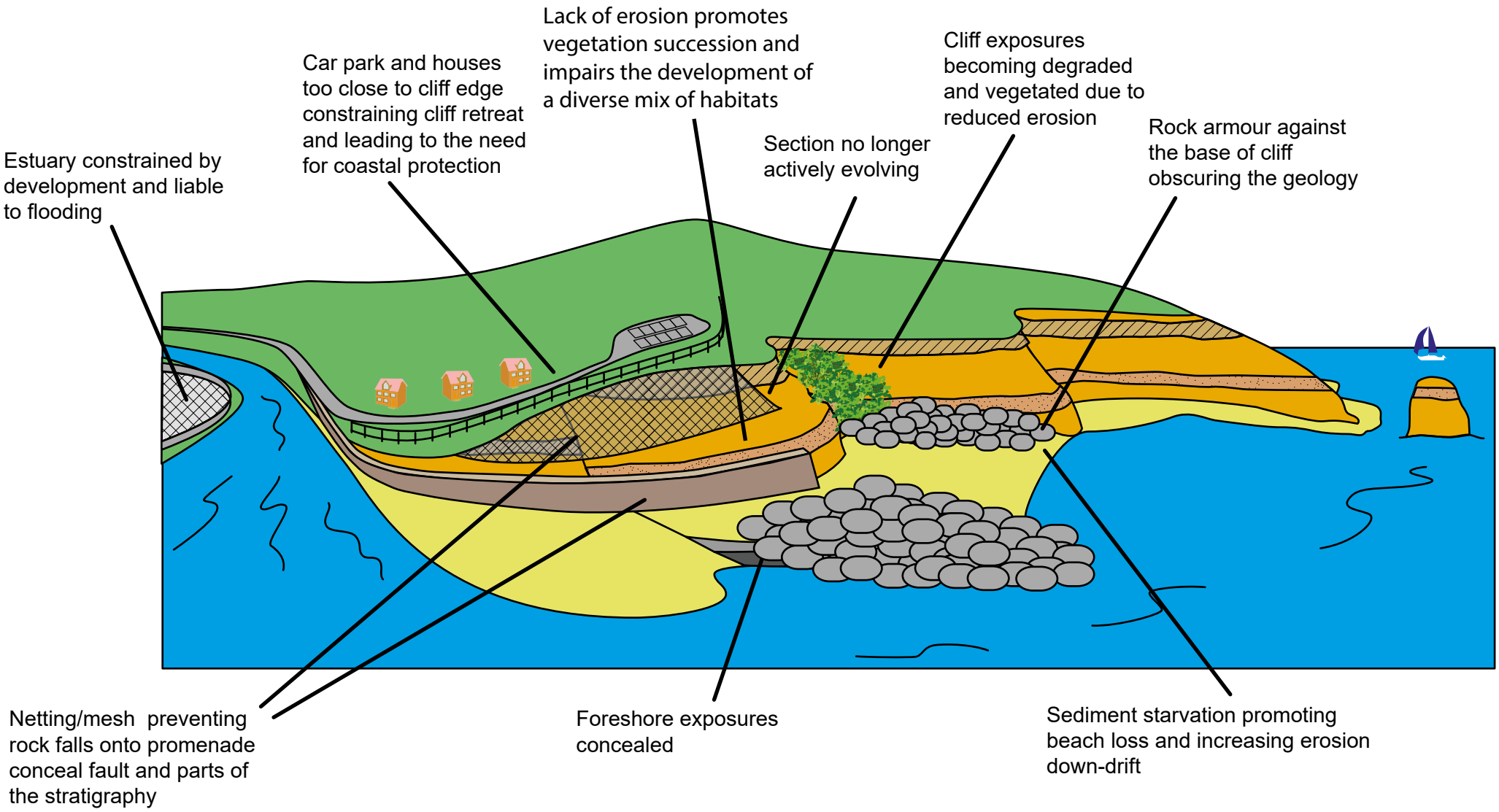
Coastal processes should be allowed to proceed without interference. Eroding coastal cliffs provide fresh geological exposures. If erosion is prevented by coastal protection, cliff stabilisation or re-profiling, exposures become concealed both directly and by vegetation encroachment and build-up of rock debris. Hard engineering structures in front of cliffs and foreshore directly conceal the exposures and should be avoided. Other schemes, such as offshore berms, may be less directly damaging but can result in concealment of features by inhibiting natural processes. Developments on or in front of cliffs or foreshore exposures conceal the features and should also be avoided. Development immediately inland, where there is a future risk from erosion, should be avoided. Vegetation is usually only a problem where coastal protection or developments are preventing natural erosion. Dredging can impact on natural coastal processes which in turn, can affect cliff and foreshore exposures.

Engineering (doubling as a promenade) to curtail erosion at the base of the cliff on the Brighton to Newhaven SSSI in Sussex obscures parts of the Chalk succession and promotes talus accumulation and vegetation growth on the cliff. Groynes in front of Rottingdean (left) trap mobile sediment on the foreshore and obscure what would otherwise be extensive exposures of bedding planes in the Chalk. ©Google Earth 2020. Data SIO, NOAA, US Navy, NGA, GEBCO. Image Landsat/Copernicus.

Cliff and foreshore exposures (no intervention) (EC)



Cliff and foreshore exposures - effects of intervention (EC)



3.4: EW: Rivers and Streams

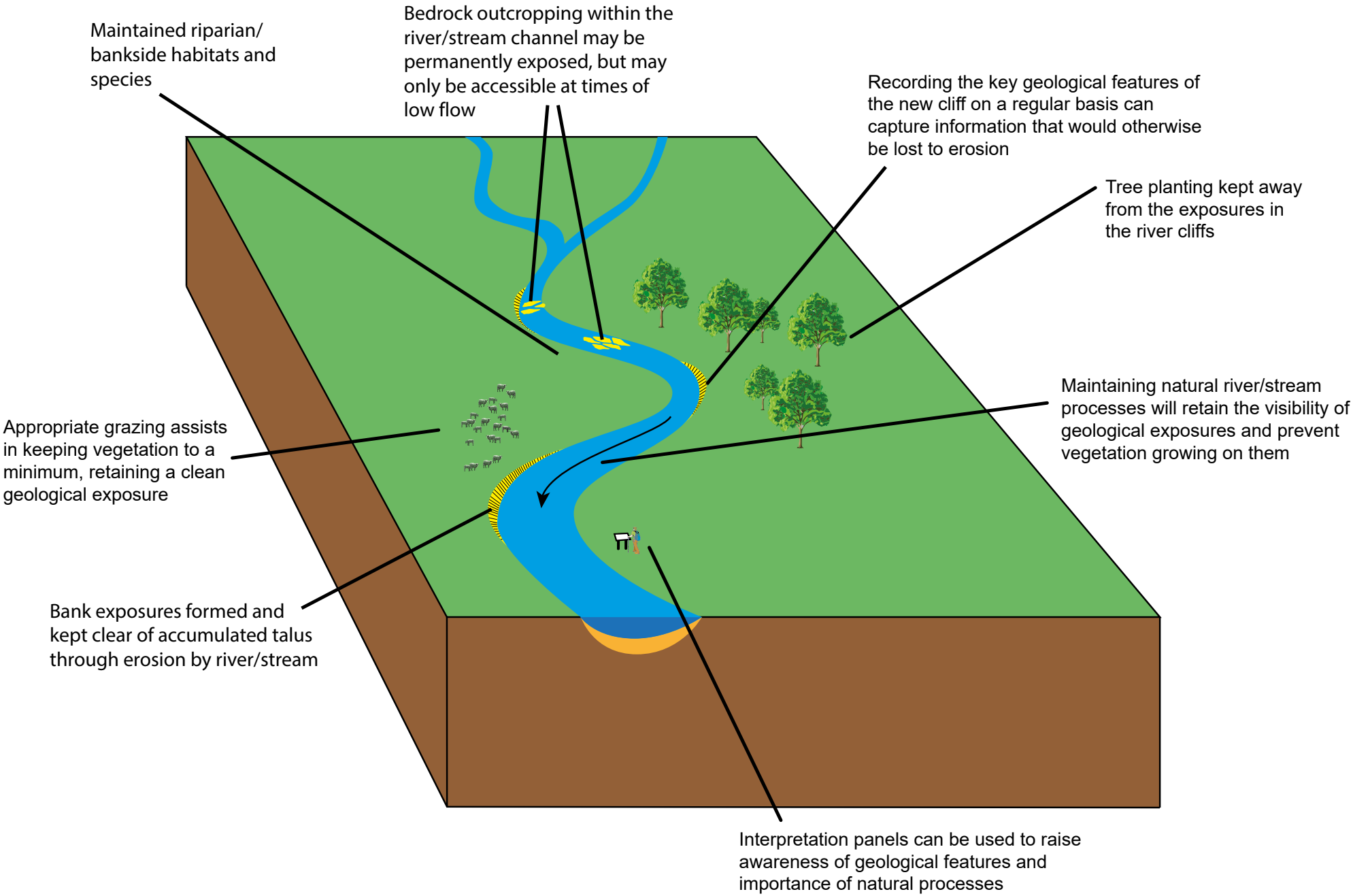
Potential threats and management issues

- **River management**
- **Bank stabilisation**
- **Engineering and construction**
- **Vegetation encroachment**
- **Development**
- **Tree planting and afforestation**

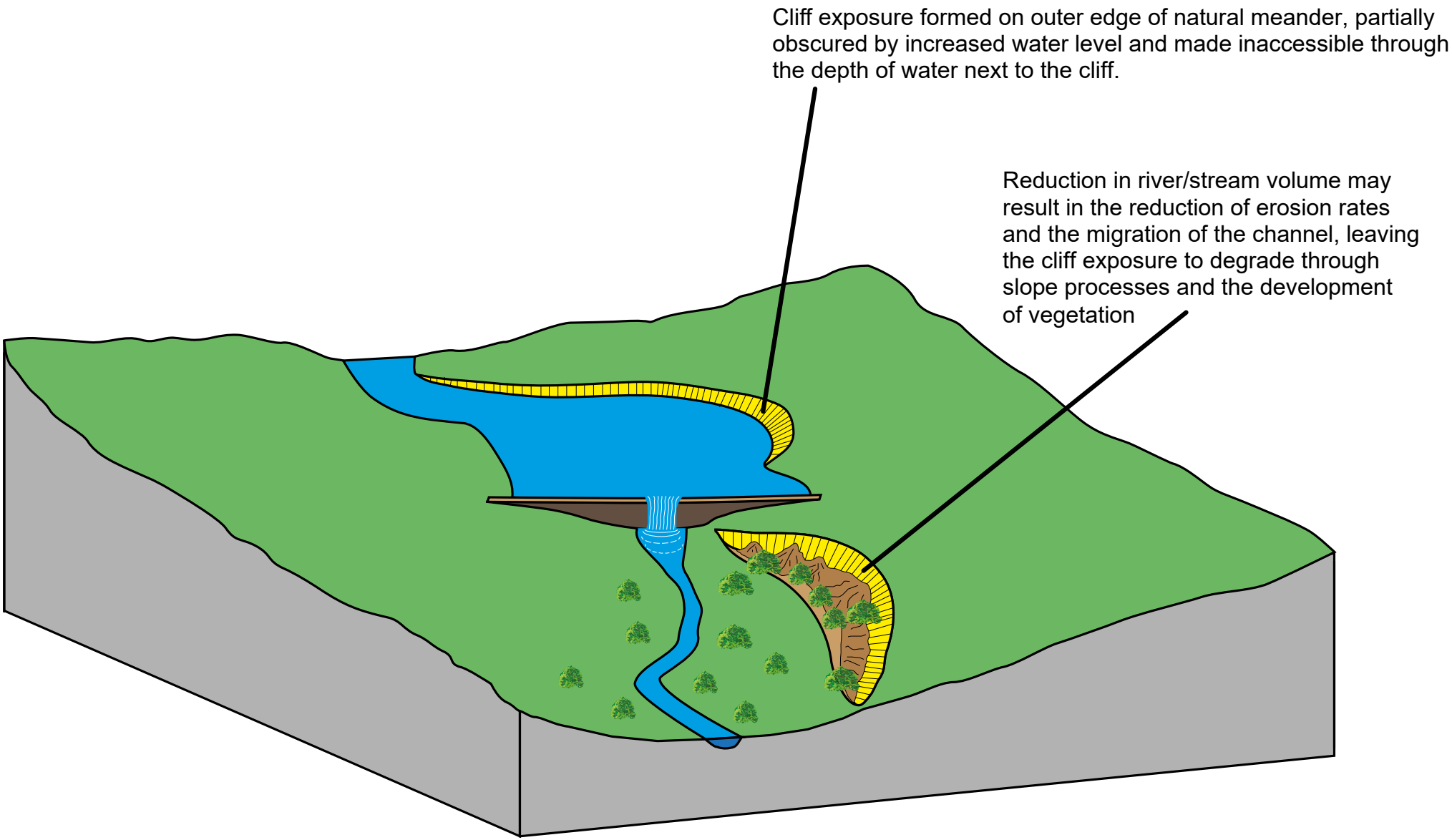
Natural processes should be allowed to proceed without interference to maintain geological exposures in river and stream sections. Activities which interfere with the natural erosion regime are generally inappropriate. The installation of engineering structures to stabilise cliffs can conceal the geological features, as can construction of weirs or hydro-electric schemes. Vegetation management may be required on some sites to maintain exposure, particularly if erosion is inhibited. Developments should be sited away from geological features and should be discouraged on cliff tops to avoid the need for stabilisation works. Tree planting and afforestation should be avoided near geological features.

Part of the late Ordovician succession exposed in Skelghyll Beck SSSI. Here a cephalopod limestone is exposed in the stream bed. Situated in remote upland the site is unlikely to be impacted by engineering, but could be damaged by insensitive afforestation. ©Natural England/Dave Evans

Exposures on a naturally functioning river course (EW)



Natural river course – effects of engineering (EW)



3.5: EO: Inland Outcrops

Potential threats and management issues

- **Vegetation encroachment**
- **Tree planting and afforestation**
- **Development**
- **Inappropriate recreational activities**
- **Vandalism**
- **Irresponsible specimen collecting**

Vegetation management is necessary to maintain many natural inland exposures where erosion rates are low. Without vegetation management, geological features can become obscured. Tree planting and afforestation should be avoided close to geological features. Developments such as roads, paths and buildings should be sited away from geological features. Climbing or cycling is not normally damaging but may be so where rocks are relatively soft and particularly where surface features on the rocks are of scientific importance. Responsible use and collecting should be promoted where there is a sustainable resource.

Well exposed limestones and mudstones of the Late Ordovician Dent Group exposed in crags above Coniston in Ashgill Quarry SSSI, Cumbria, are maintained vegetation-free and available for study through sheep grazing. ©Natural England/Dave Evans

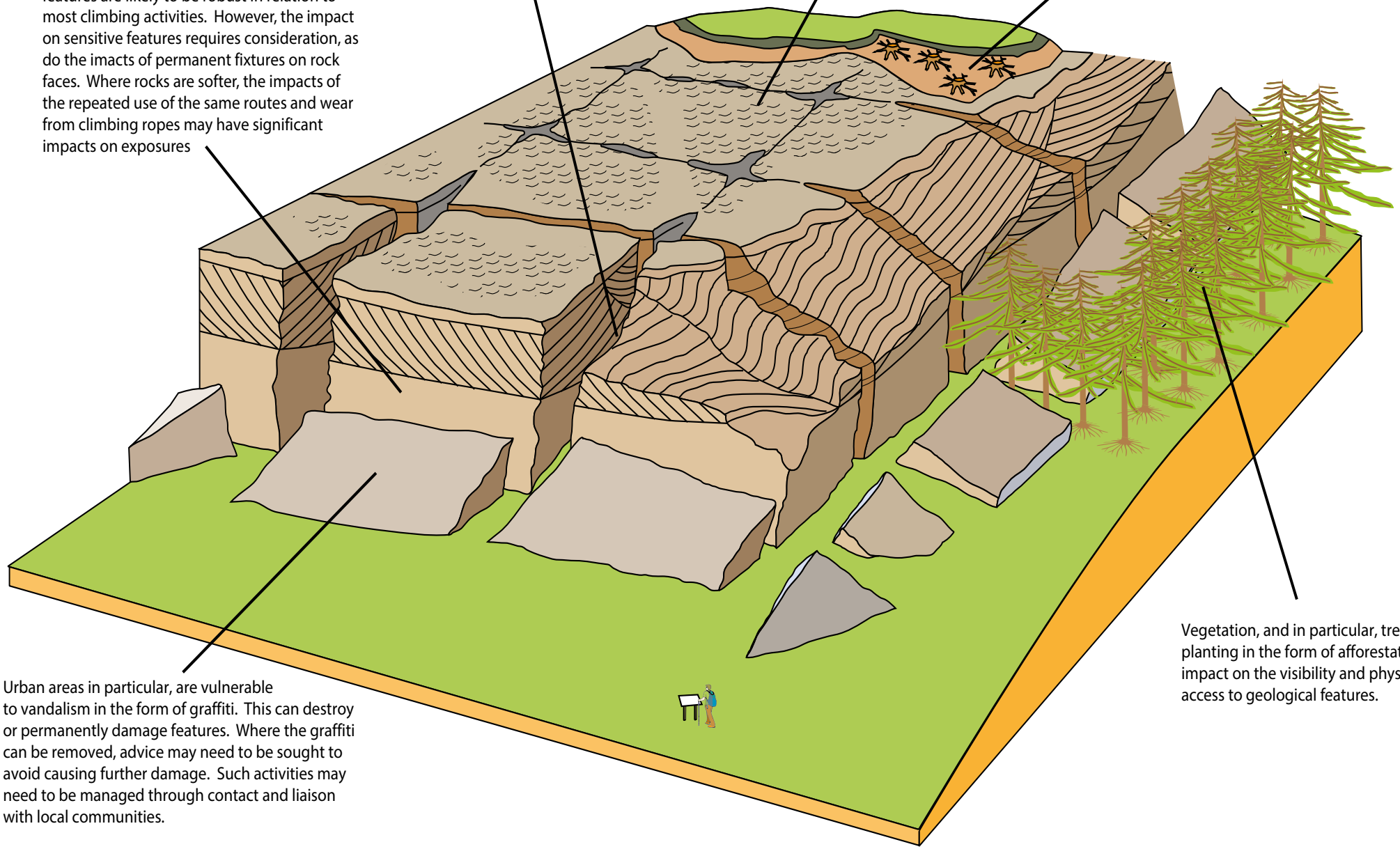
Upland exposure characteristic of parts of the Pennines and northern England (EO)

Where rocks are relatively hard, the geological features are likely to be robust in relation to most climbing activities. However, the impact on sensitive features requires consideration, as do the imacts of permanent fixtures on rock faces. Where rocks are softer, the impacts of the repeated use of the same routes and wear from climbing ropes may have significant impacts on exposures

Rock coring and other forms of invasive sampling should be carried out responsibly, avoiding unique or particularly sensitive features, and should not be easily seen by other site users.

Vehicles driven on bare rock may damage and erase features such as ripple-marked surfaces.

Unique features such as petrified tree stumps in seat-earths are sensitive to vegetation encroachment, irresponsible collecting and damage from vehicles.



Urban areas in particular, are vulnerable to vandalism in the form of graffiti. This can destroy or permanently damage features. Where the graffiti can be removed, advice may need to be sought to avoid causing further damage. Such activities may need to be managed through contact and liaison with local communities.

Vegetation, and in particular, tree-planting in the form of afforestation impact on the visibility and physical access to geological features.

3.6: EU: Underground (Mines and Tunnels)

Potential threats and management issues

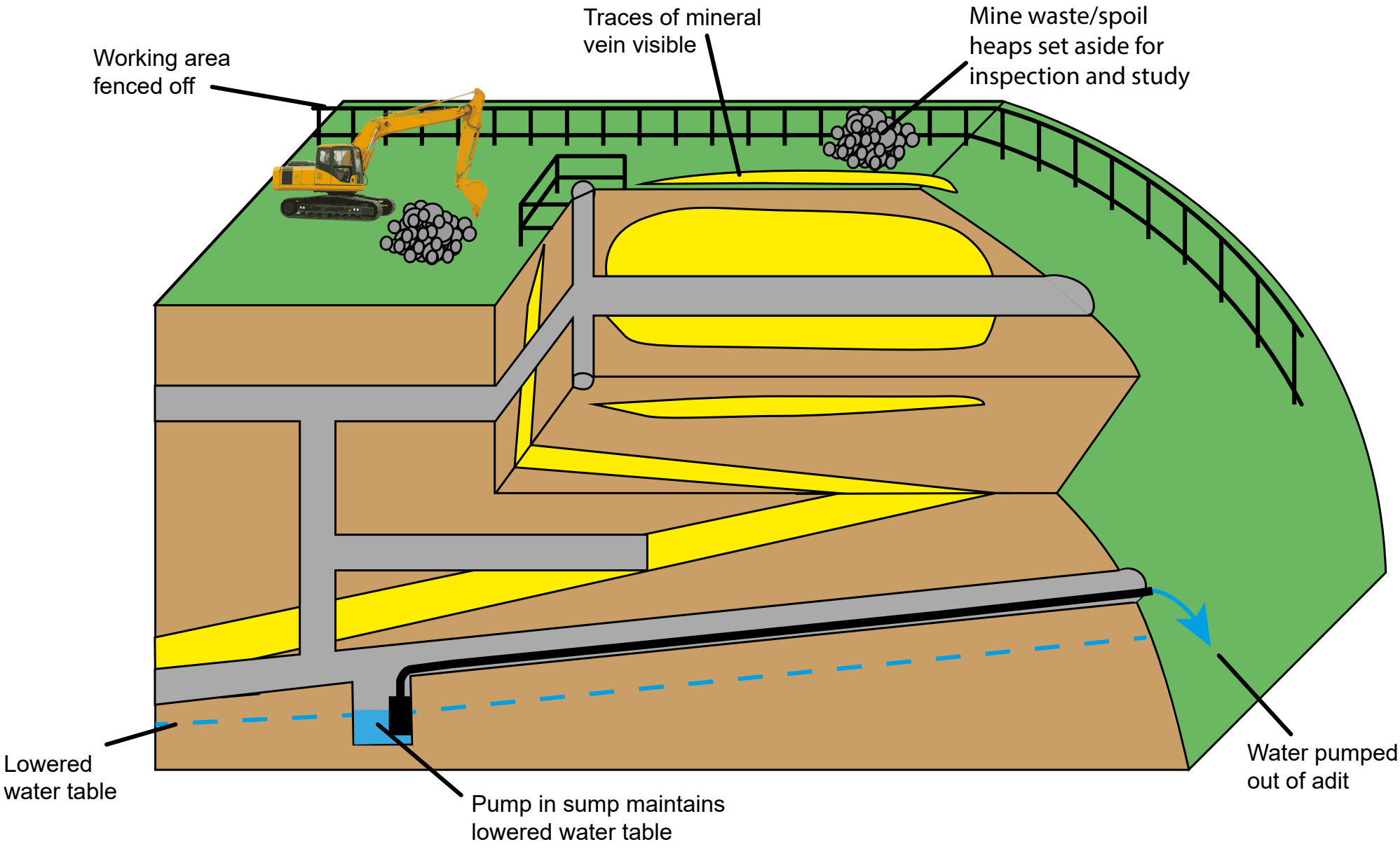
- **Scientific access to geological features**
- **Depletion of resource**
- **Resource becomes finite after mine closure**
- **Flooding after mine closure**
- **Collapse after mine closure**

Operational mines provide a constantly renewed supply of fresh rock exposures, as material is being removed. Providing there are extensive reserves of the material of interest, ongoing mining operations are generally beneficial for conservation. Safe access to newly exposed geological features for research purposes is generally desirable, as this provides the greatest opportunity for scientific study. Some mines may also be suitable for educational use.

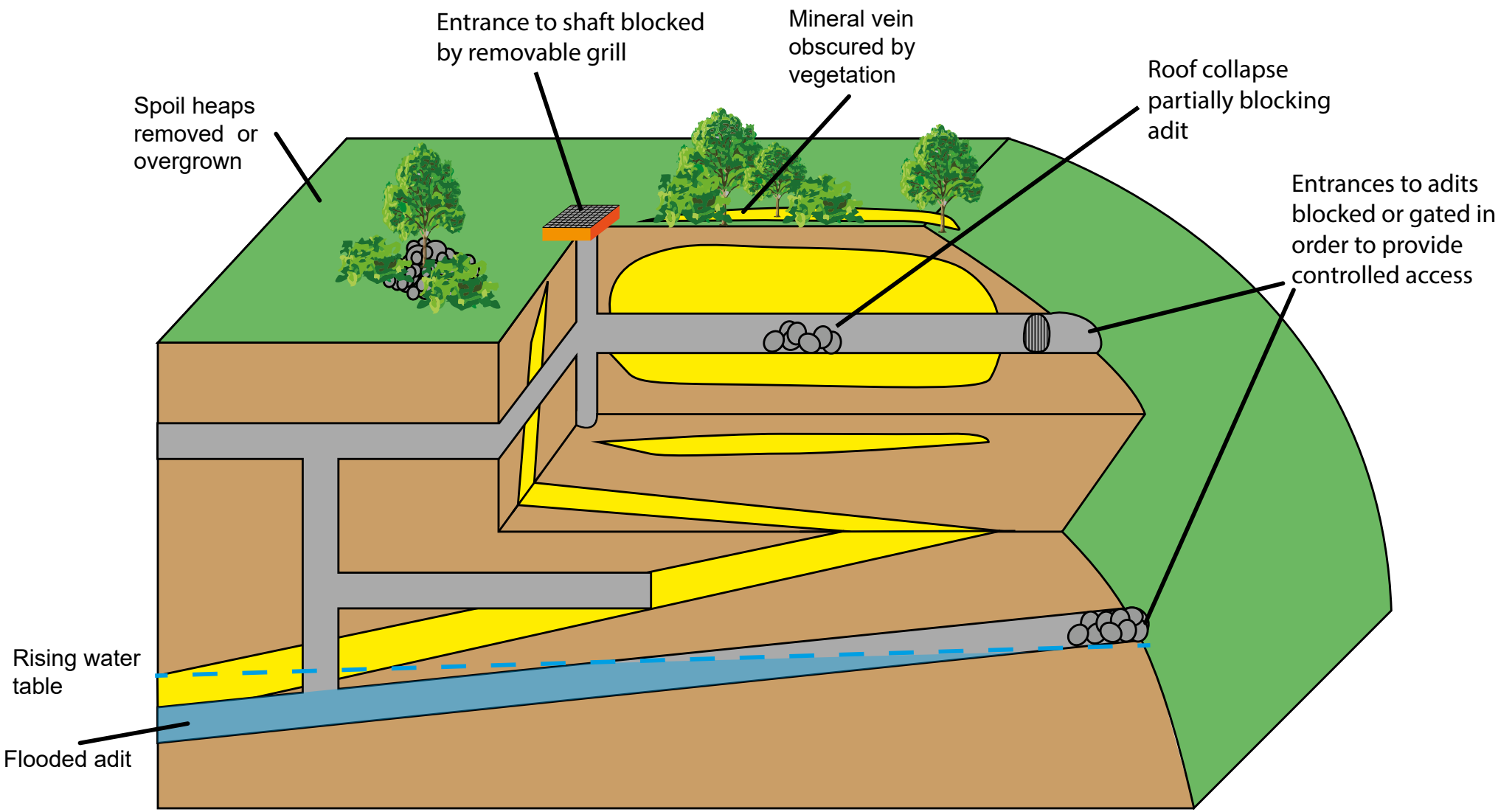
The main problems arise when mines cease to operate. The resource of material of interest becomes effectively finite as fresh exposures are no longer being created. Flooding and collapse are often serious problems after mine closure and the costs of pumping and maintenance of stable passages are typically prohibitive in achieving effective conservation.

Penberthy Croft Mine SSSI, Cornwall. A disused mine now largely consisting of mine dumps, shafts are either capped or fenced off. ©Natural England/Hannah Townley

Operating mine (EU)



Disused and unmanaged mine (EU)



3.7: EB: Extensive Buried Interest

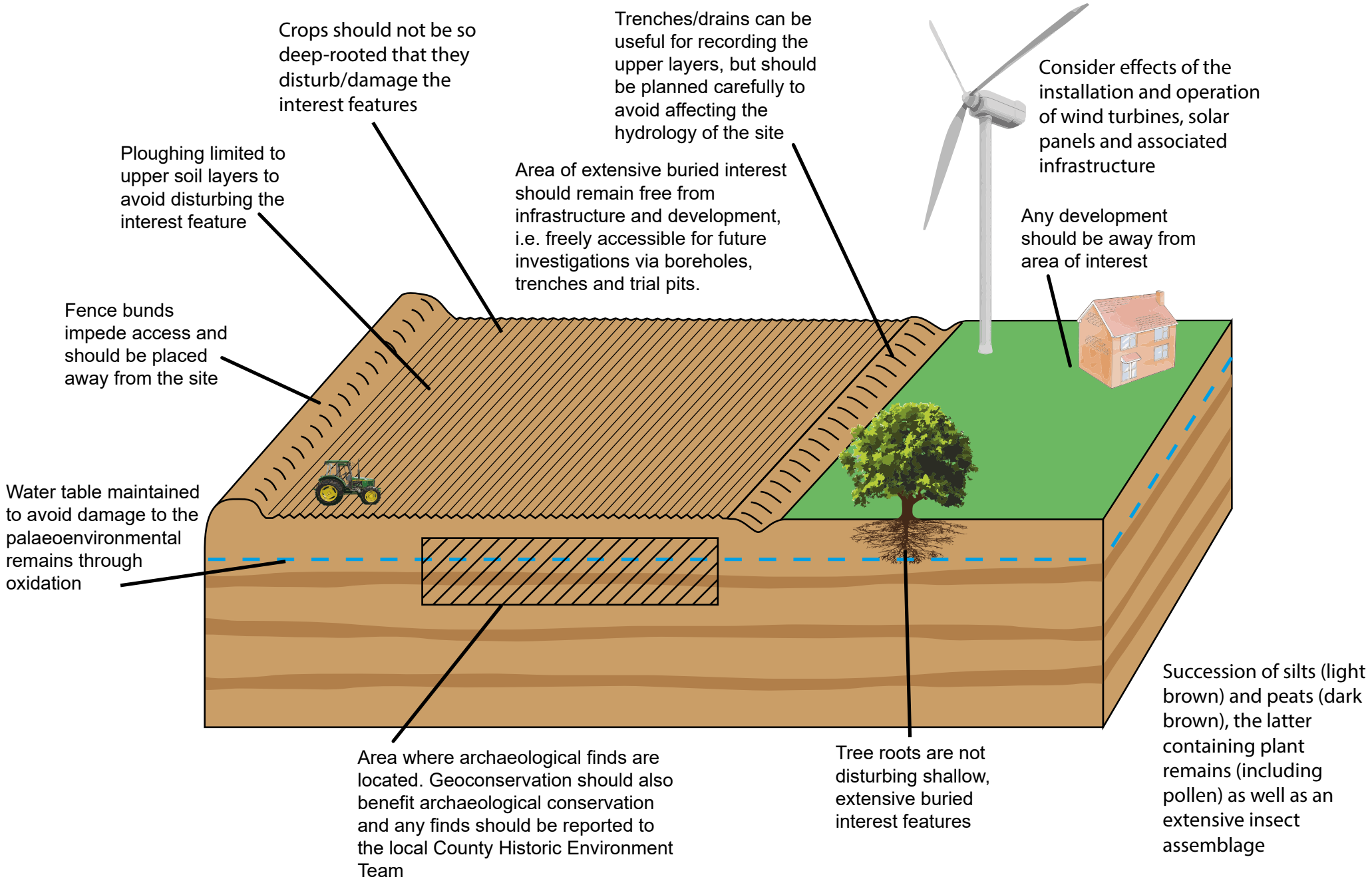
Potential threats and management issues

- **Inappropriate agricultural practices**
- **Tree planting and afforestation**
- **Development**
- **Quarrying**
- **Inappropriate recreational activities**

The primary management principles on buried interest sites are to limit disturbance or removal of material of interest and to maintain the sites in a condition whereby it is possible to access the interest features by boreholes and temporary trenches. Activities which can cause permanent damage to buried interest sites include deep ploughing, digging of drains, deep-rooted crops, tree planting, afforestation, quarrying and general development works, such as construction of buildings on top of the interest features. Recreational activities such as off-road driving and mountain biking may be damaging if they disturb the buried interest features. When assessing the potential impacts of such activities on extensive buried sites, it is important to understand the distribution of the interest features, as these may be laterally variable.

Kenn Church, Kenn Pier & Yew Tree Farm SSSI, Somerset. An extensive succession of sediments recording the Pleistocene history of the Somerset Levels underlie the orchard. Tree roots could potentially disturb the sediment. The grubbing up of the orchard would damage the interest feature. ©Natural England/ Matthew Bennett

Buried interest underneath agricultural fields (EB)



3.8: ER: Road, Rail and Canal Cuttings

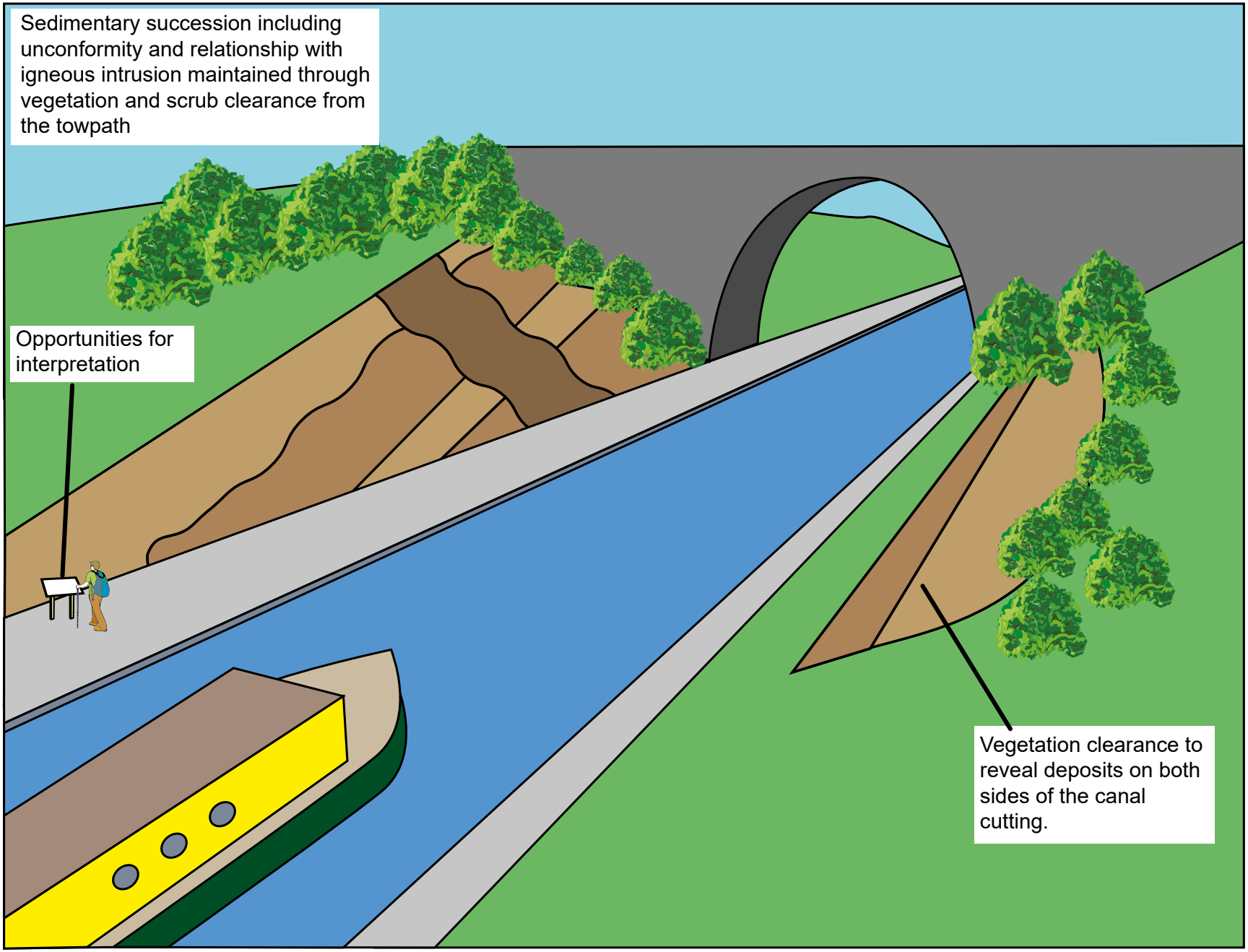
Potential threats and management issues

- **Vegetation encroachment**
- **Slumping of faces**
- **Face stabilisation**
- **Tree planting**
- **Development**
- **Roadbase and trackbase widening**
- **Re-grading of slopes**
- **Securing access for scientific / conservation purposes on active roads and railway lines**
- **Road and rail upgrade schemes**

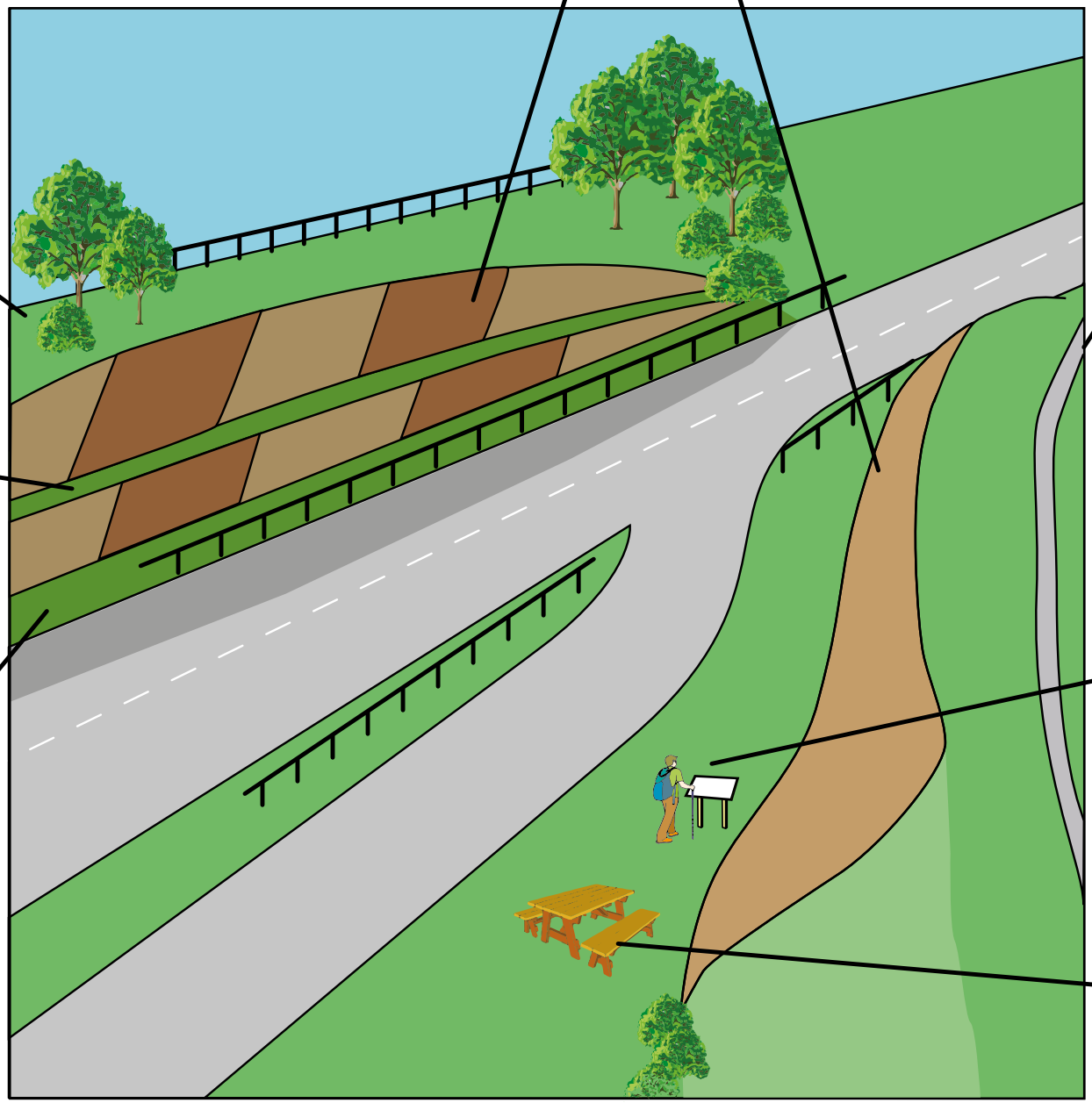
Ongoing vegetation management and removal of slumped material is often required at road, rail and canal cuttings to maintain geological exposures. Face stabilisation is an important safety issue at many cuttings. Engineering solutions, such as meshing and concreting, which prevent access to or conceal geological features, should be avoided. Rock bolting may be a more acceptable alternative. Cut-off drains placed behind an exposed face may help to alleviate the effects of slumping and degradation. Tree planting should be avoided close to geological features. Developments should be sited so as to avoid concealing geological features, provide sufficient space for on-going management and avoid risks from potential slope instability.

Road and rail widening and upgrade schemes may affect existing geological sites and may also create new exposures. Any activities which result in concealment of the exposure should be avoided. Ideally, the faces should be steep to inhibit scrub growth. Steep faces, however, are more likely to be unstable, particularly if the rocks are relatively soft. Stepped sections, with vertical faces and horizontal benches, may satisfy conservation and safety requirements and also facilitate access to the exposures. Incorporate measures for managed access, particularly for geological research.

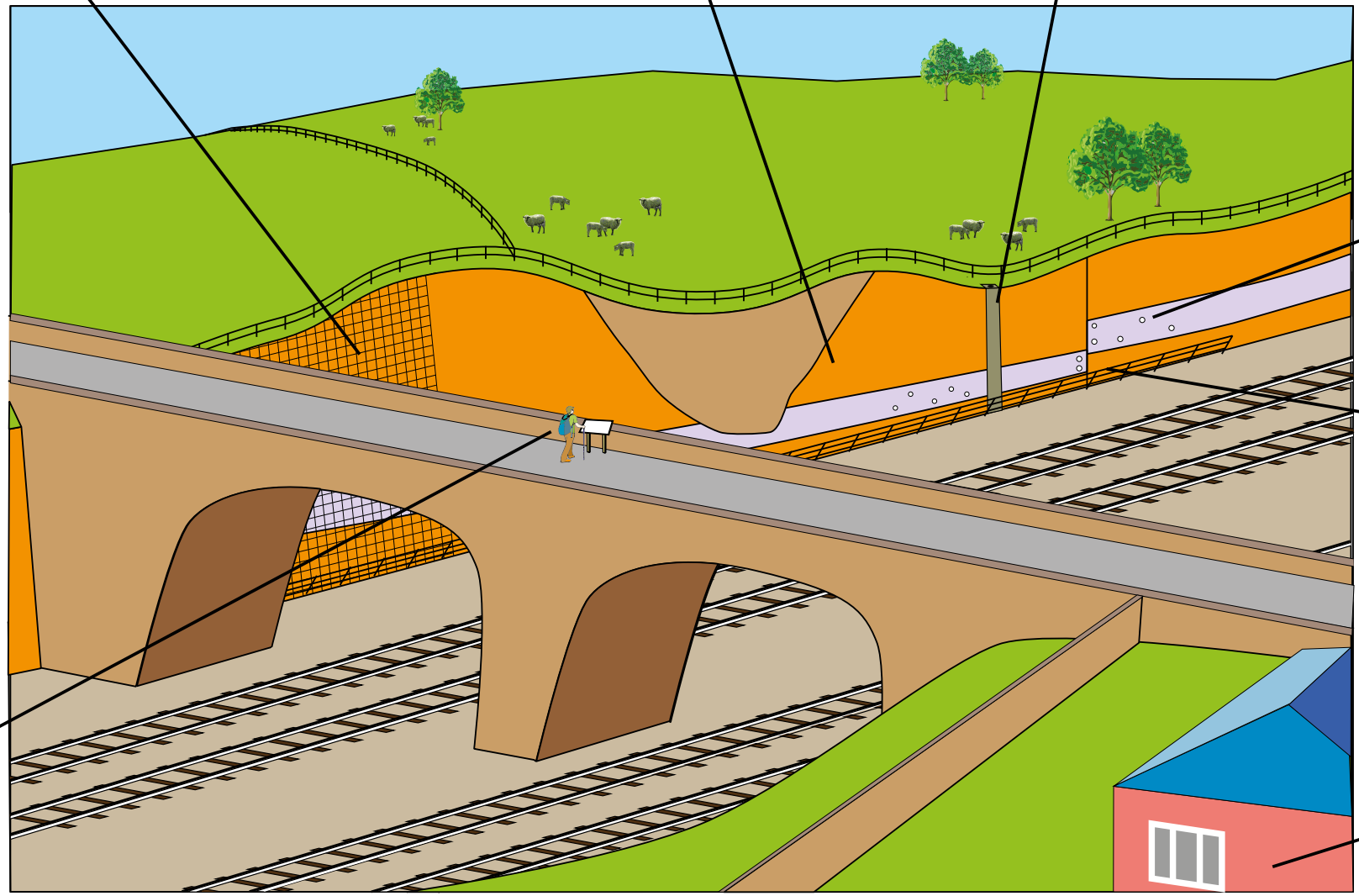
Management of exposures in a canal cutting (ER)



Management of exposures in road cuttings (ER)



Management of exposures in railway cuttings (ER)



3.9: IS: Static (Fossil) Geomorphological

Potential threats and management issues

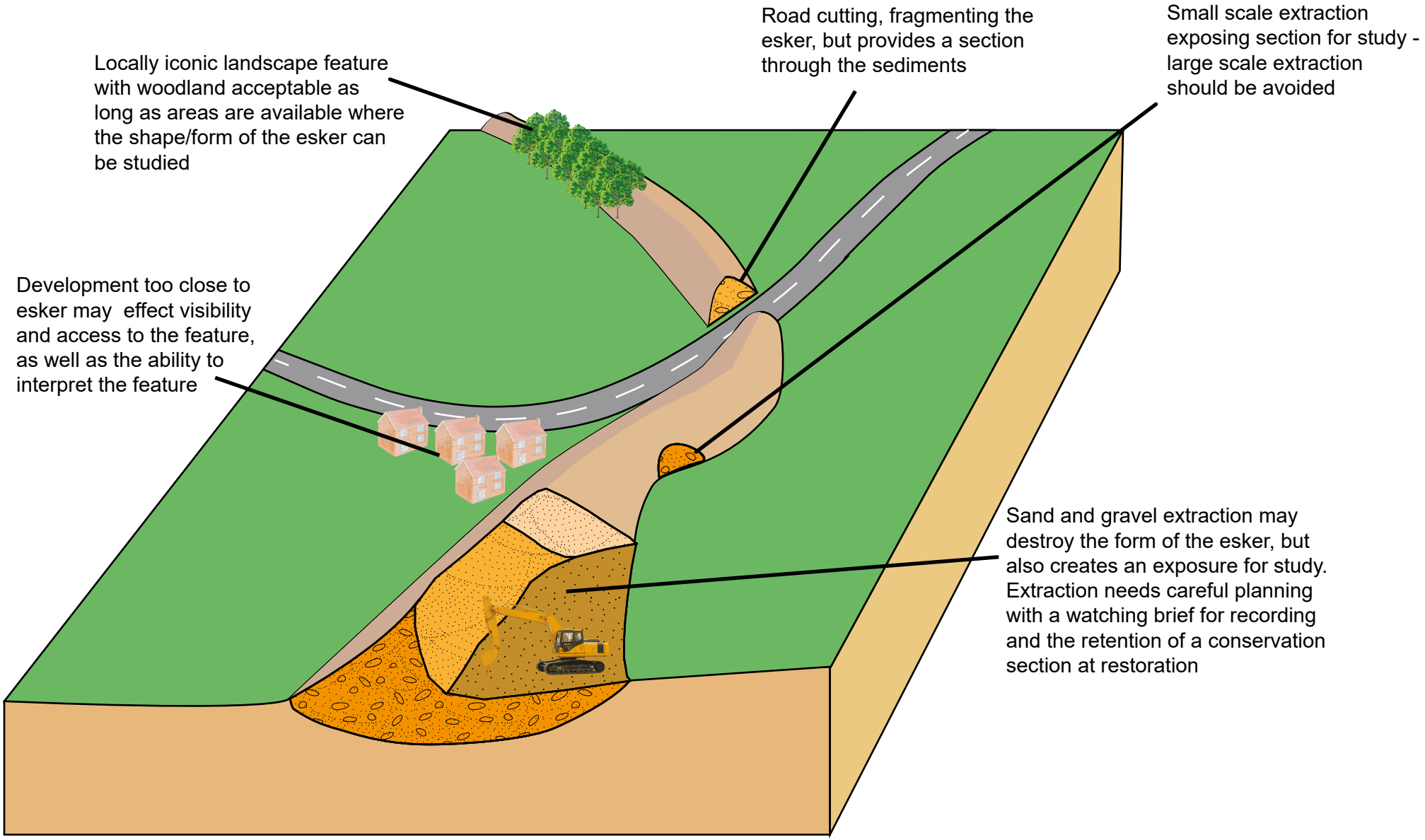
- **Coastal protection**
- **Development**
- **Quarrying and dredging**
- **Infilling of natural depressions**
- **Vegetation encroachment**
- **Tree planting and afforestation**
- **Inappropriate recreational activities**
- **Irresponsible specimen collecting**

Static geomorphological sites consist of landforms or features where the processes that produced them are no longer operating. They are very vulnerable and irreplaceable if destroyed. There is a large range in scale between sites, but the general management principle is to minimise human interference with the features of interest.

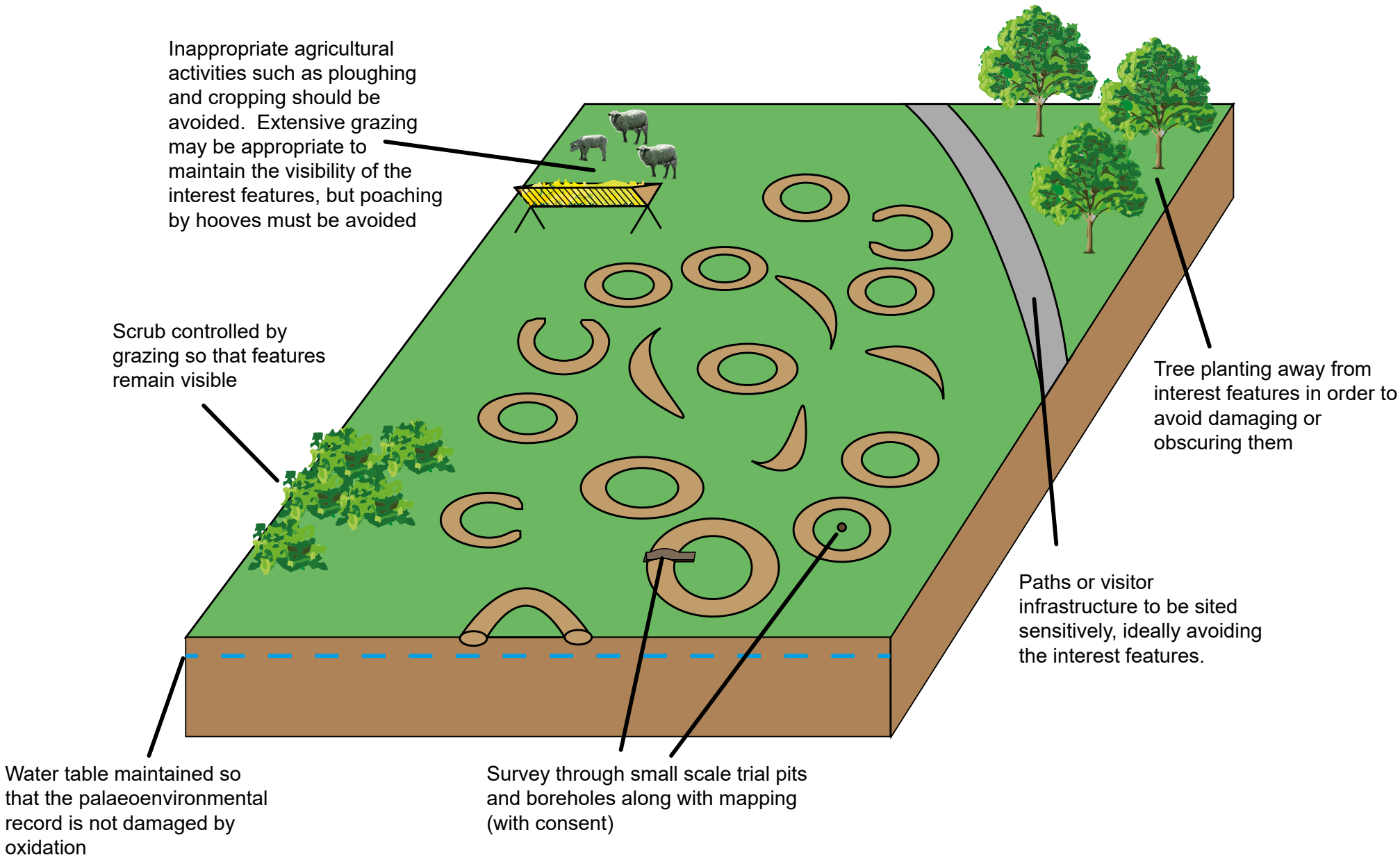
Developments, coastal protection schemes and quarrying may damage or obscure interest features. Dumping of waste and infilling of depressions is highly damaging. Vegetation management may be necessary on some sites. Tree planting and afforestation should be avoided. Certain recreational activities such as off-road driving, mountain biking and irresponsible rock climbing may be damaging. Some smaller-scale features could be damaged by collecting of geological specimens.

The tors and blockfields of stone circles and stone stripes on Stiperstones and the Hollies SSSI (Stiperstones NNR) provides an assemblage of periglacial features probably formed during the last glaciation. Although fairly robust, tree-planting or attempts at cultivation would both impact significantly on the integrity of the site. Recreational activities (particularly where the moving of blocks is involved) would also lead to damage. ©Natural England/ Dave Evans

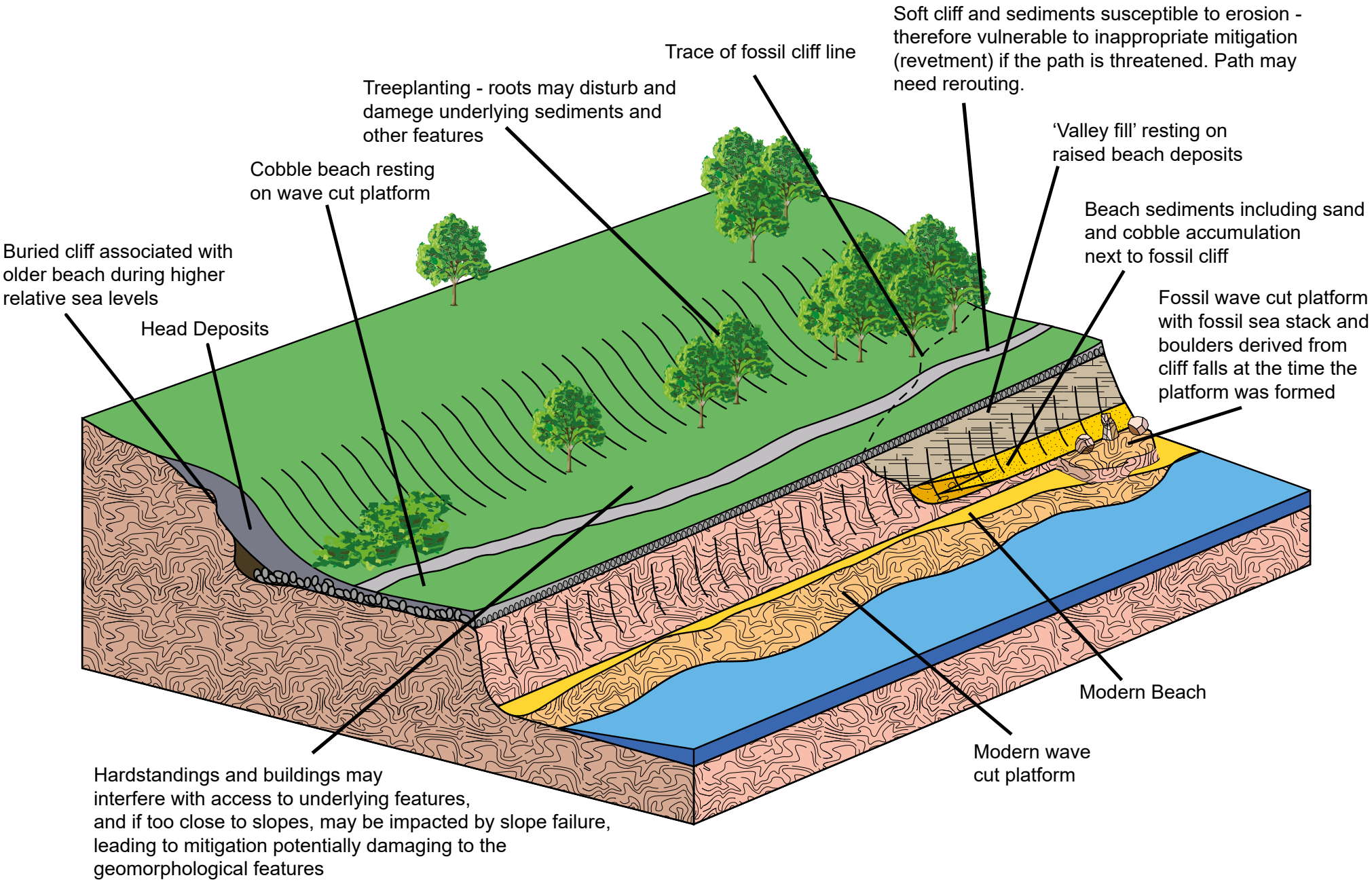
Management of a large landscape feature - an esker (IS)



Management of a complex of small features and their context - pingos (IS)



Raised beaches, fossil cliffs and associated sediment (IS)



3.10: IA: Active Process Geomorphological

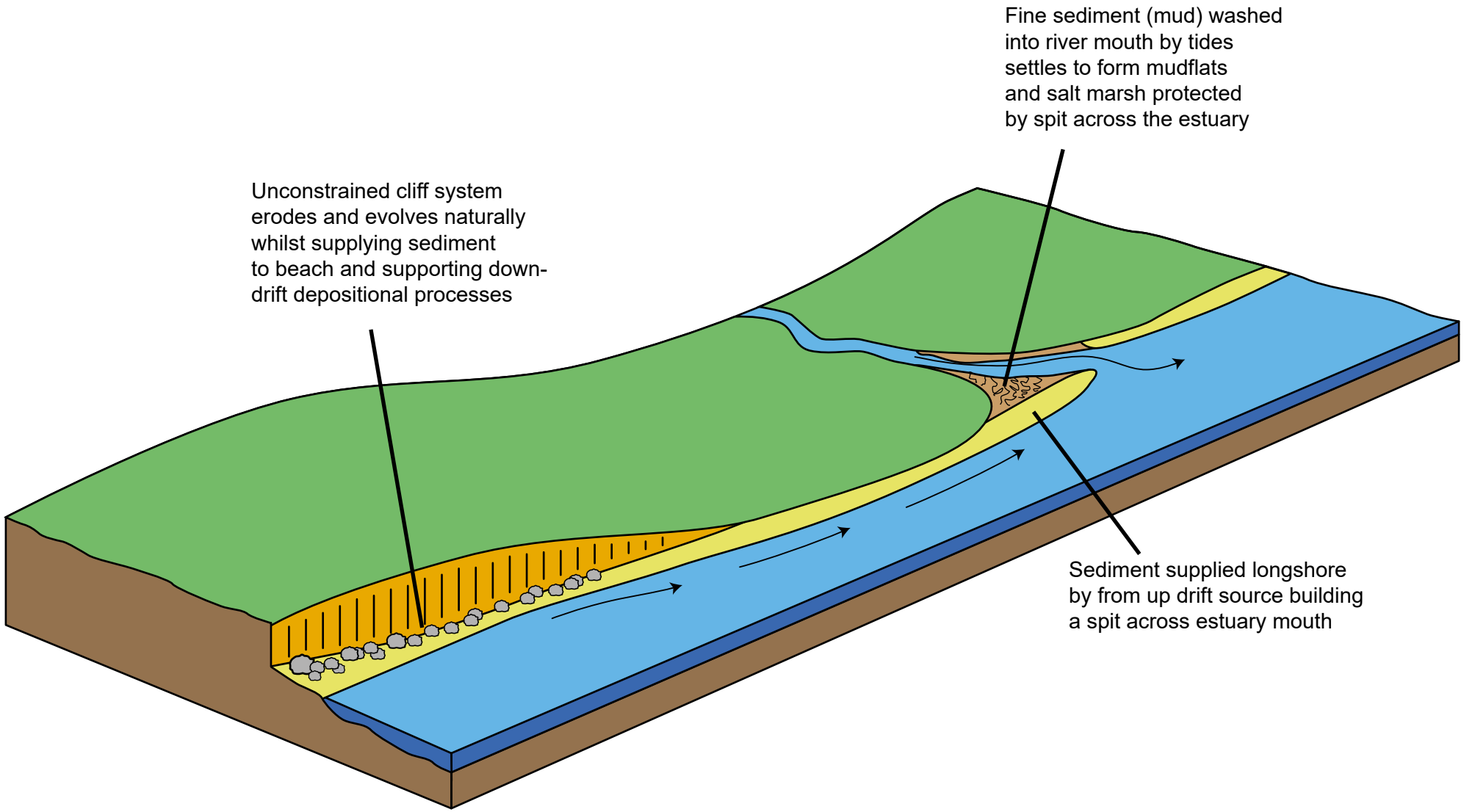
Potential threats and management issues

- **Coastal protection**
- **River and land management schemes**
- **Development**
- **Quarrying and dredging**
- **Tree planting and afforestation**
- **Inappropriate recreational activities**

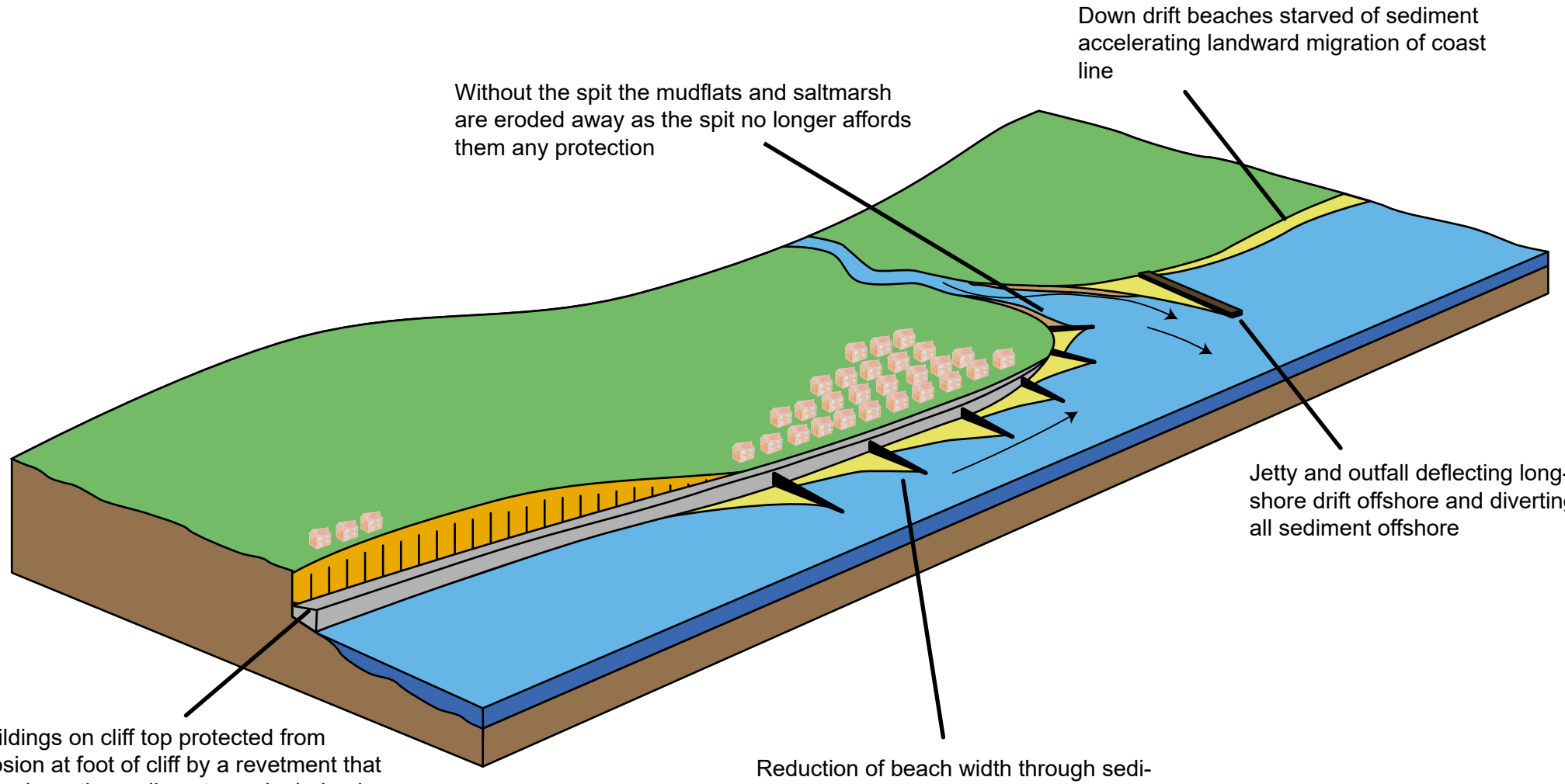
For active processes include coastal systems, rivers and mass movement sites, the common factor is that the natural processes which have produced the important scientific features are still occurring. The primary management principle is to minimise interference with the features and the natural processes that support them. Any development activity, such as coastal protection, quarrying or tree planting, that inhibits natural processes, is likely to damage the interest features. Damaging activities do not necessarily have to take place within the boundary of the site. For example, coastal protection outside a site can have indirect effects within the site. In some cases inappropriate recreational activities may be damaging, including erosion arising from high visitor numbers.

Porlock Ridge and Saltmarsh SSSI, Somerset. Since being breached in 1999, this shingle ridge has evolved rapidly, rolling back inland and providing opportunities to study the dynamics of such beach systems. ©Natural England/Dave Evans

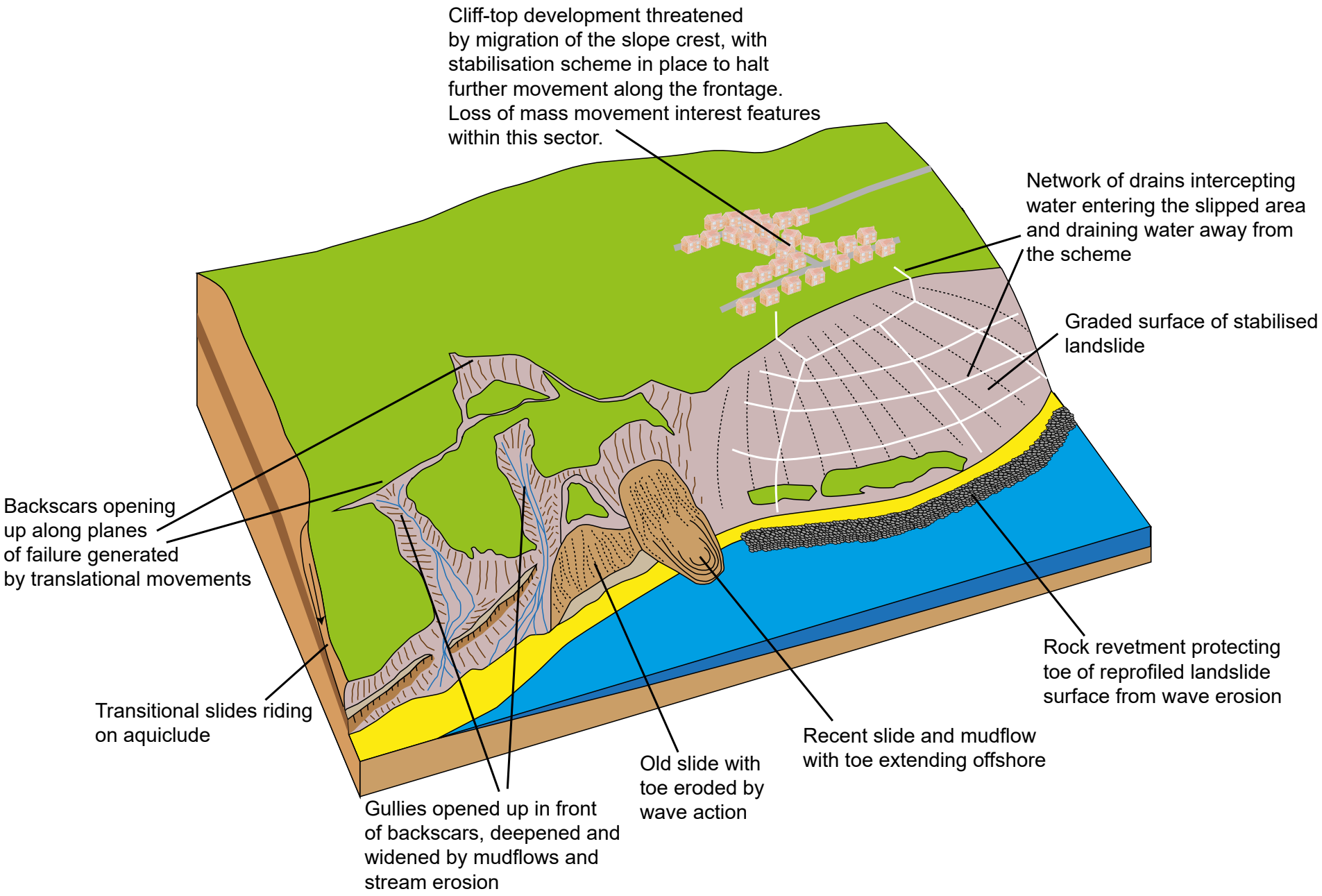
A naturally functioning coastal system (IA)



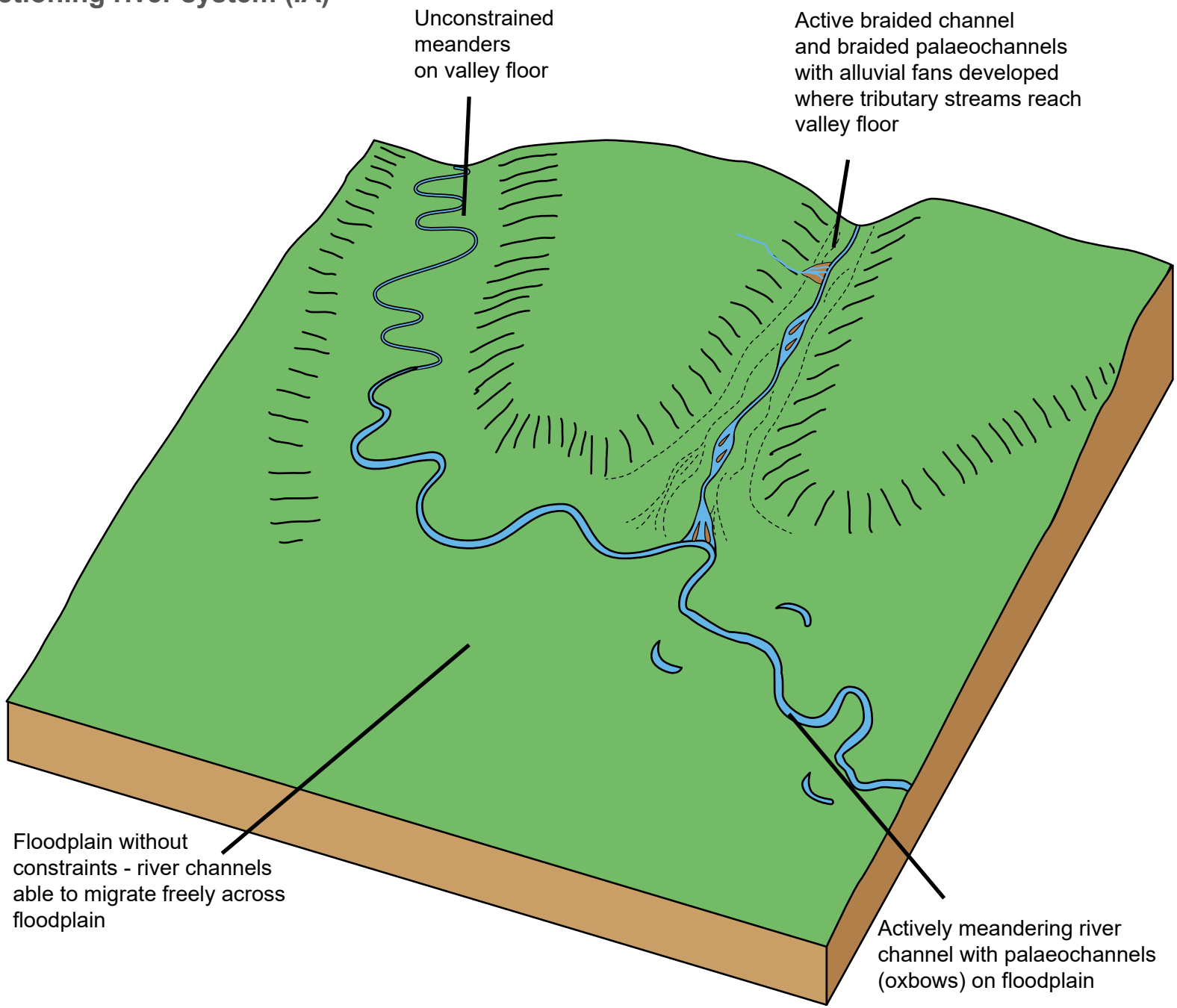
Coastal system constrained by development and coastal engineering schemes (IA)



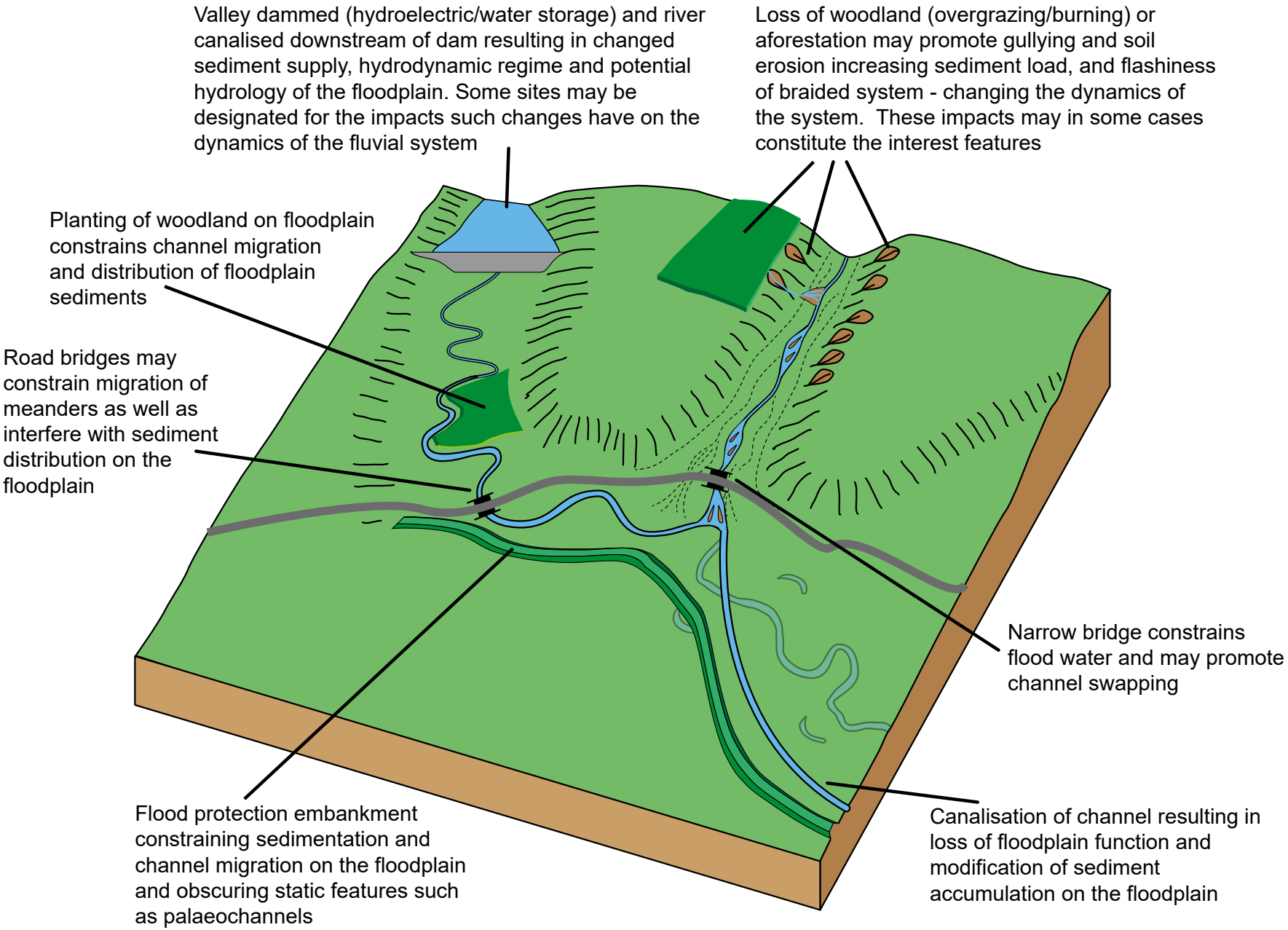
Naturally functioning mass movement system and engineered constraints applied to halt activity



Naturally functioning river system (IA)



River systems constrained by transport routes, dams, canalisation and flood defences (IA)



3.11: IC: Caves

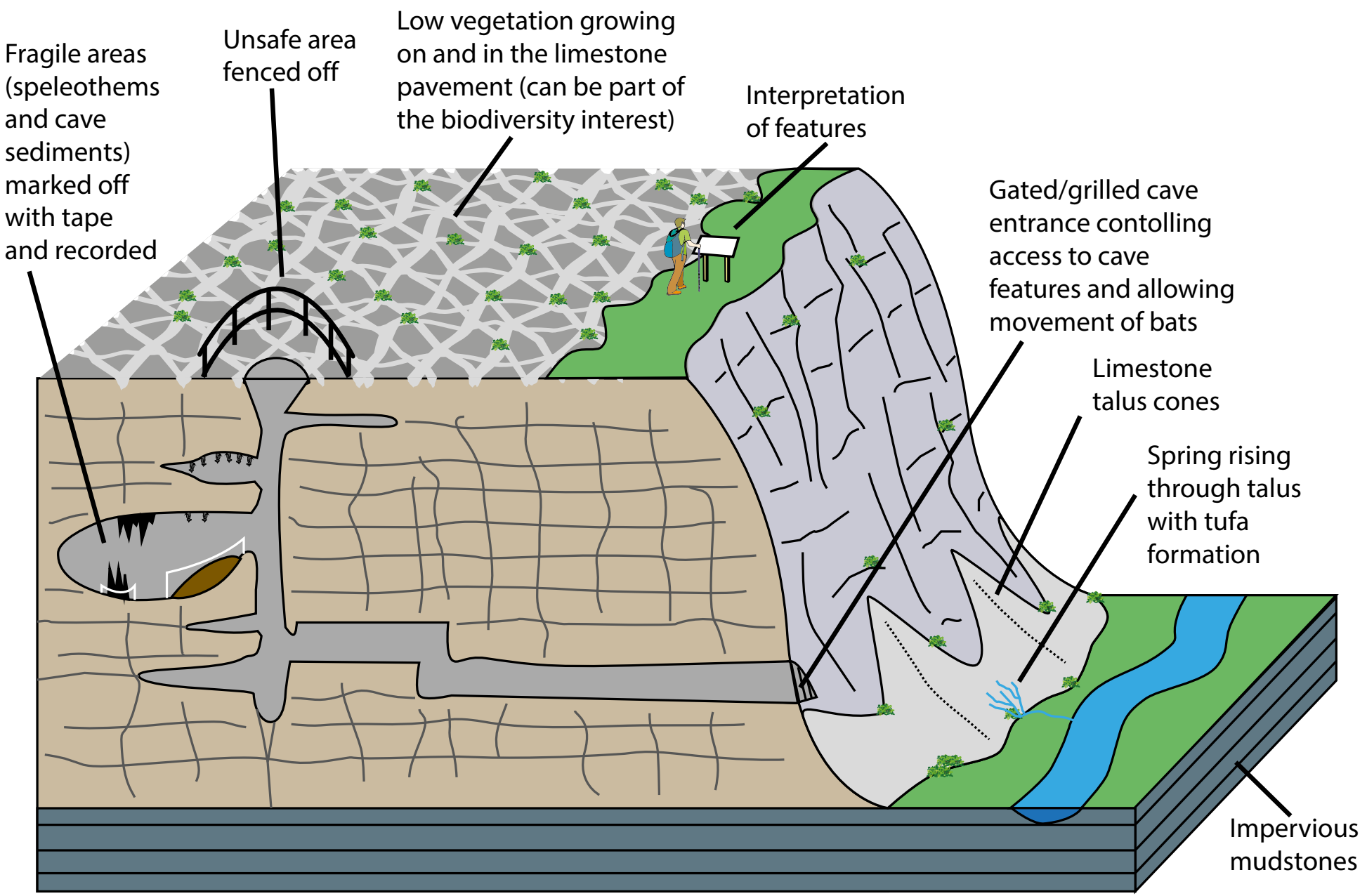
Potential threats and management issues

- **Quarrying**
- **Inappropriate agricultural practices**
- **Changes in the water environment**
- **Development**
- **Irresponsible recreational activities**
- **Irresponsible specimen collecting**
- **Differing needs of different cave users**
- **Fly tipping**
- **Vandalism**

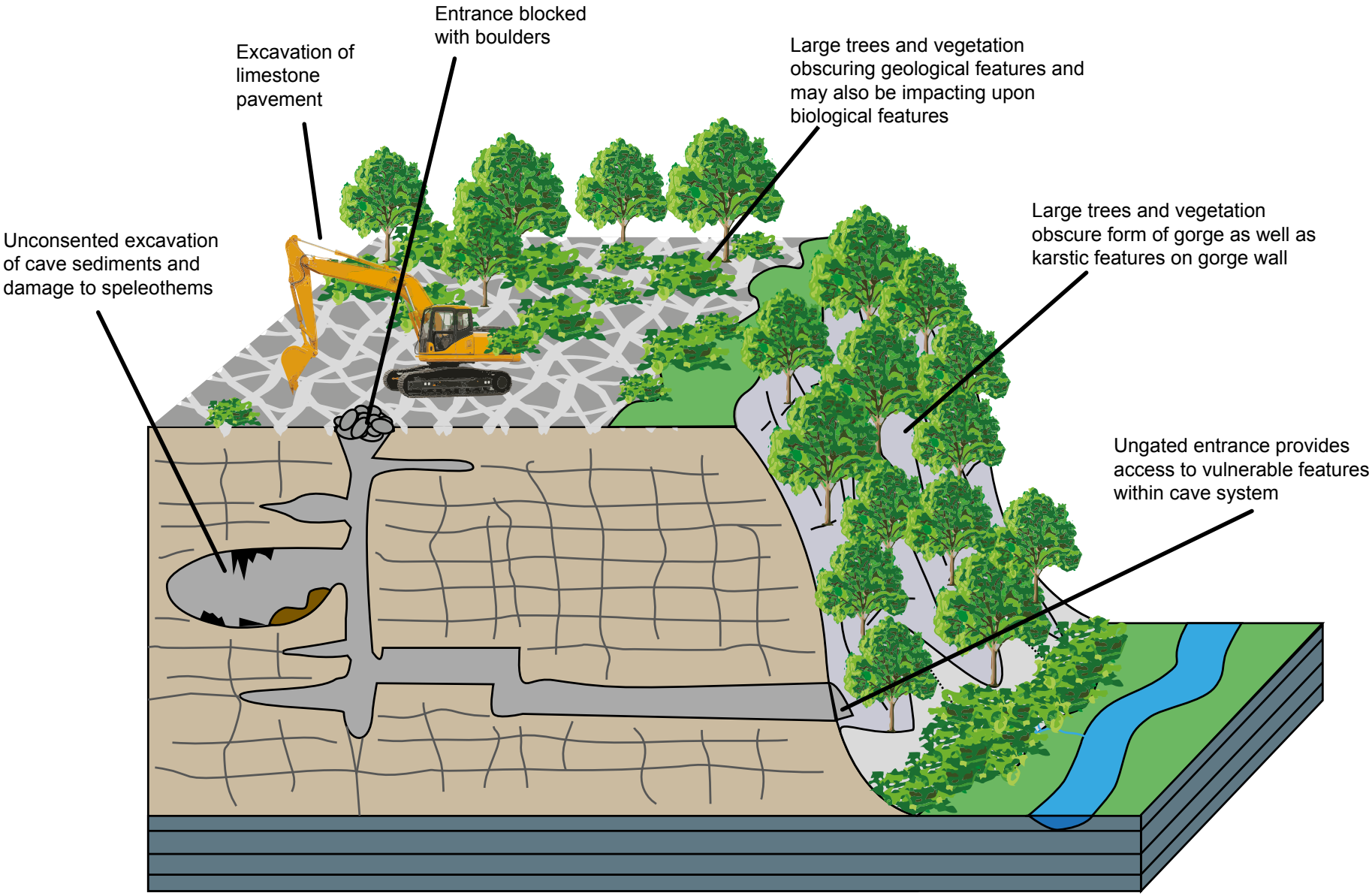
Caves are sensitive systems affected directly and indirectly by a range of processes. Quarrying can directly destroy cave systems. Indirect effects, which may originate outside of site boundaries, can be difficult to pinpoint and manage. Processes affecting the water table level or causes water pollution can damage or destroy cave systems. These include water abstraction, use of fertilisers, distribution of certain types of waste material on farmland and dumping of effluent. Caves are also susceptible to damage by inappropriate caving activities, such as removal of cave sediments. Fly tipping in or near cave entrances causes access problems. Irresponsible collecting of speleothems, cave sediments, fossils or minerals and vandalism can also be serious problems.

Stump Cross Caves, North Yorkshire. Maintaining the integrity of the cave passages, together with cave deposits and cave furniture (e.g. stalactites) helps conserve the interest features for future study. ©Natural England/Mick Murphy

Managed cave system below karst pavement and cliffs (IC)



Limestone caves and karst pavement subjected to neglect and irresponsible caving activities (IC)



3.12: IK: Karst

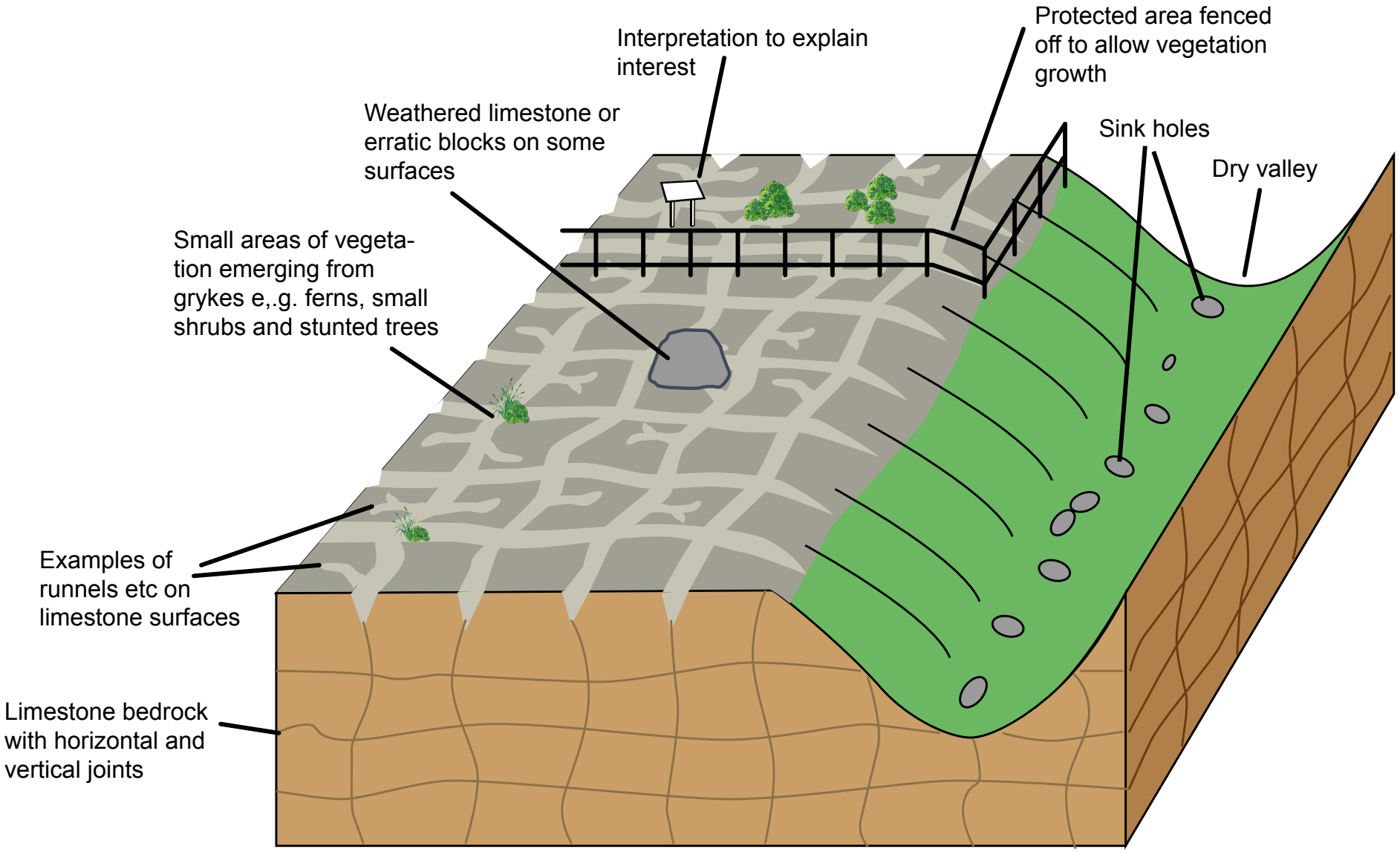
Potential threats and management issues

- **Quarrying**
- **Inappropriate removal of rock**
- **Infilling of natural depressions**
- **Vegetation encroachment**
- **Development**

Features in karst landscapes range from small-scale solution features to large landforms, such as dolines, limestone pavements and dry valleys. Karst features are sensitive and essentially irreplaceable if removed. Quarrying and any other forms of rock removal are highly damaging activities on karst. Limestone pavement is a particularly sensitive type of karst and is completely destroyed by removal of rock. Dumping of waste and infilling of karstic depressions is highly damaging. Vegetation management, including controlled grazing where appropriate, is often necessary to retain the open nature of karst features, but any vegetation management should also consider biological features. Developments, such as buildings, may be damaging and should be sited away from important or sensitive features.

Malham Arncliffe SSSI, North Yorkshire. Limestone pavements form an integral part of the assemblage of cave systems and dry valleys that constitute the geomorphological interest of this SSSI. ©Natural England/ Richard Cottle

Limestone pavement (IK)



3.13: FM: Finite Mineral, Fossil or Other Geological Feature

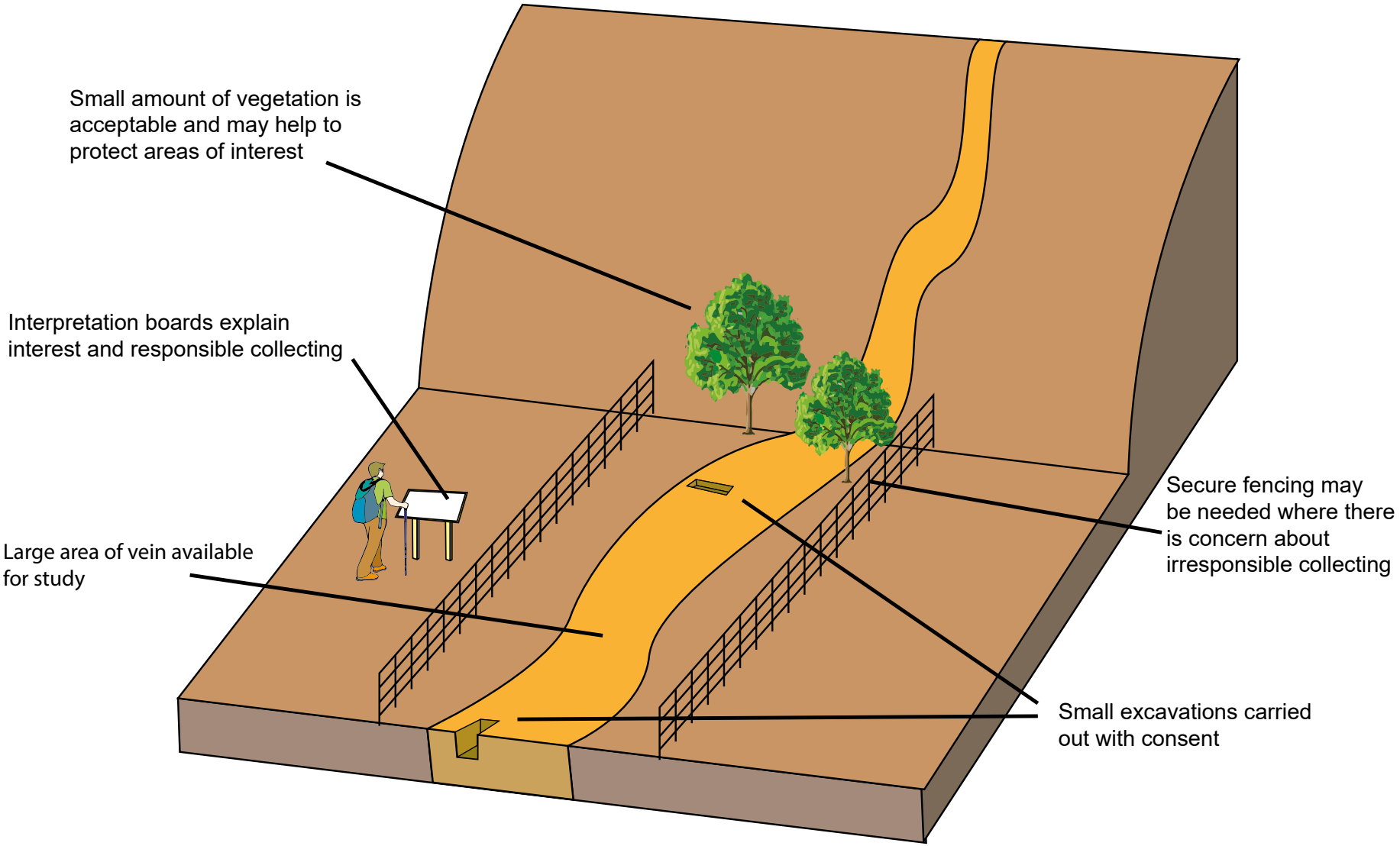
Potential threats and management issues

- **Irresponsible specimen collecting**
- **Quarrying and mining**
- **Development**
- **Vegetation encroachment**
- **Tree planting and afforestation**
- **Fly tipping**
- **Inappropriate recreational activities**
- **Vandalism**

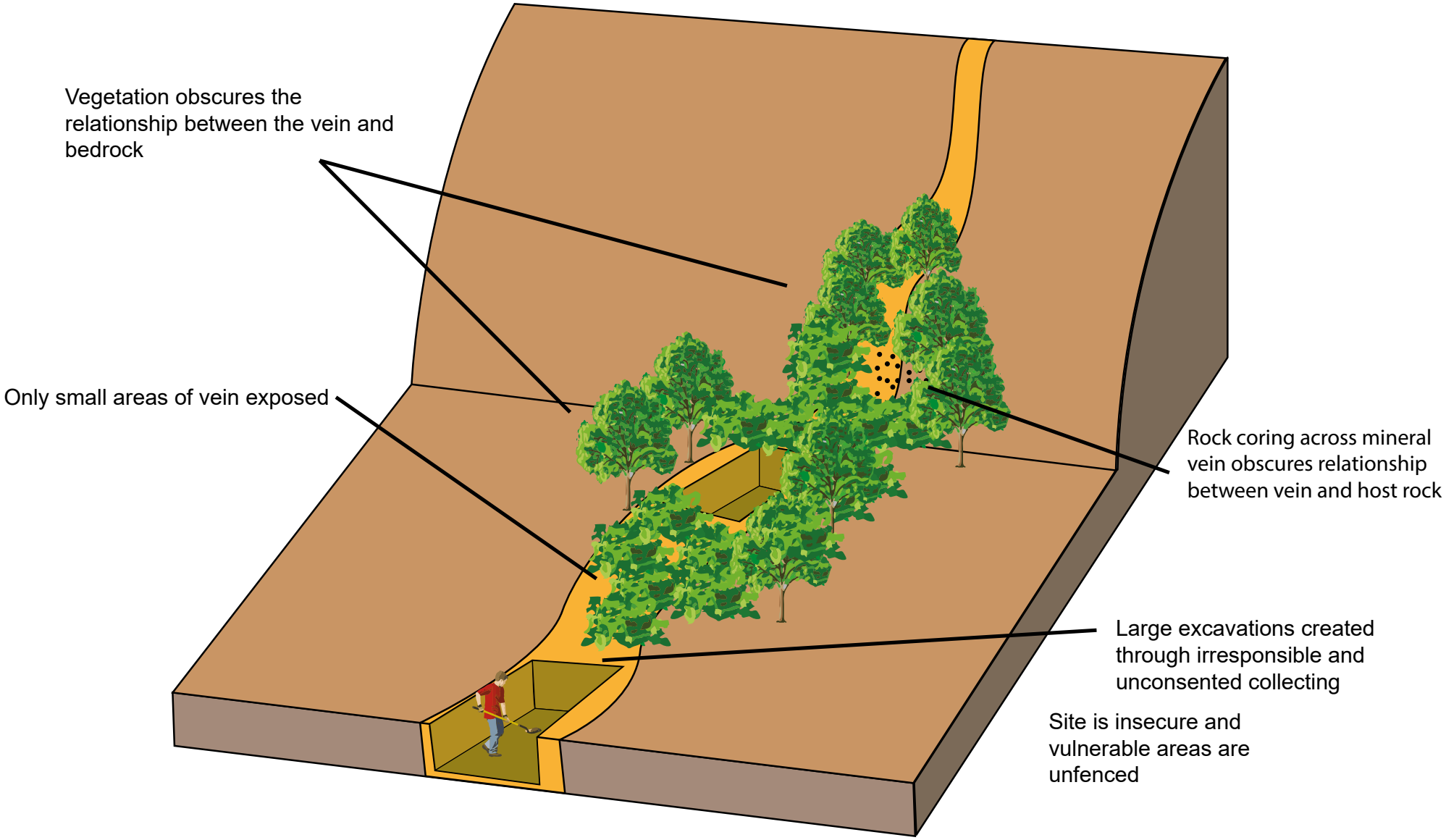
These sites have a finite and irreplaceable resource. In some cases, the interest is unique and represents the only known example of a particular feature. The main management principle is to conserve the resource in the long-term, while permitting controlled scientific usage, which often involves specimen collecting. Integrating these opposing principles is the key to positive management. Irresponsible collecting is the main threat and, in extreme cases, can result in complete destruction of a site. Any other activity which requires removal of part or all of the interest features can cause irreparable damage or destruction. Vegetation can conceal the interest features and can occasionally be damaging. Tree planting and afforestation should be avoided. Fly tipping, which could conceal features, should be prevented through fencing. Recreational activities, such as climbing, may be inappropriate depending upon the nature of the feature and antisocial behaviour, such as graffiti should be discouraged.

Horn Park Quarry SSSI and NNR, Dorset. The highly fossiliferous Middle Jurassic, Inferior Oolite of this area consists of a succession of thin, laterally discontinuous units, each containing a unique fossil assemblage. Irresponsible fossil collecting can be a problem on these sites. Here, access is controlled by secure fencing and gates whilst collecting requires a permit. ©Natural England/Dave Evans

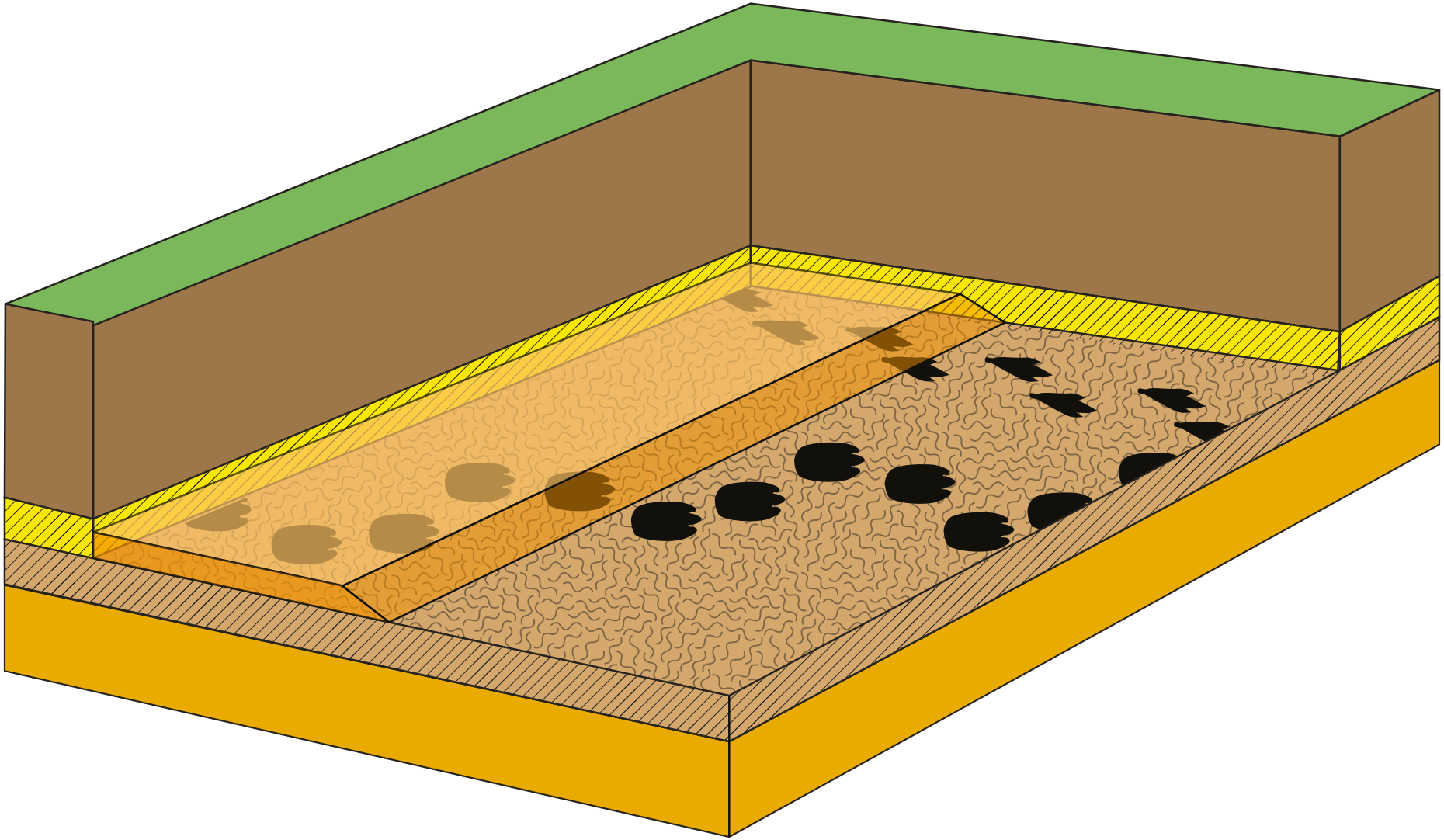
Mineral vein exposed in quarry floor and quarry face - effectively conserved (FM)



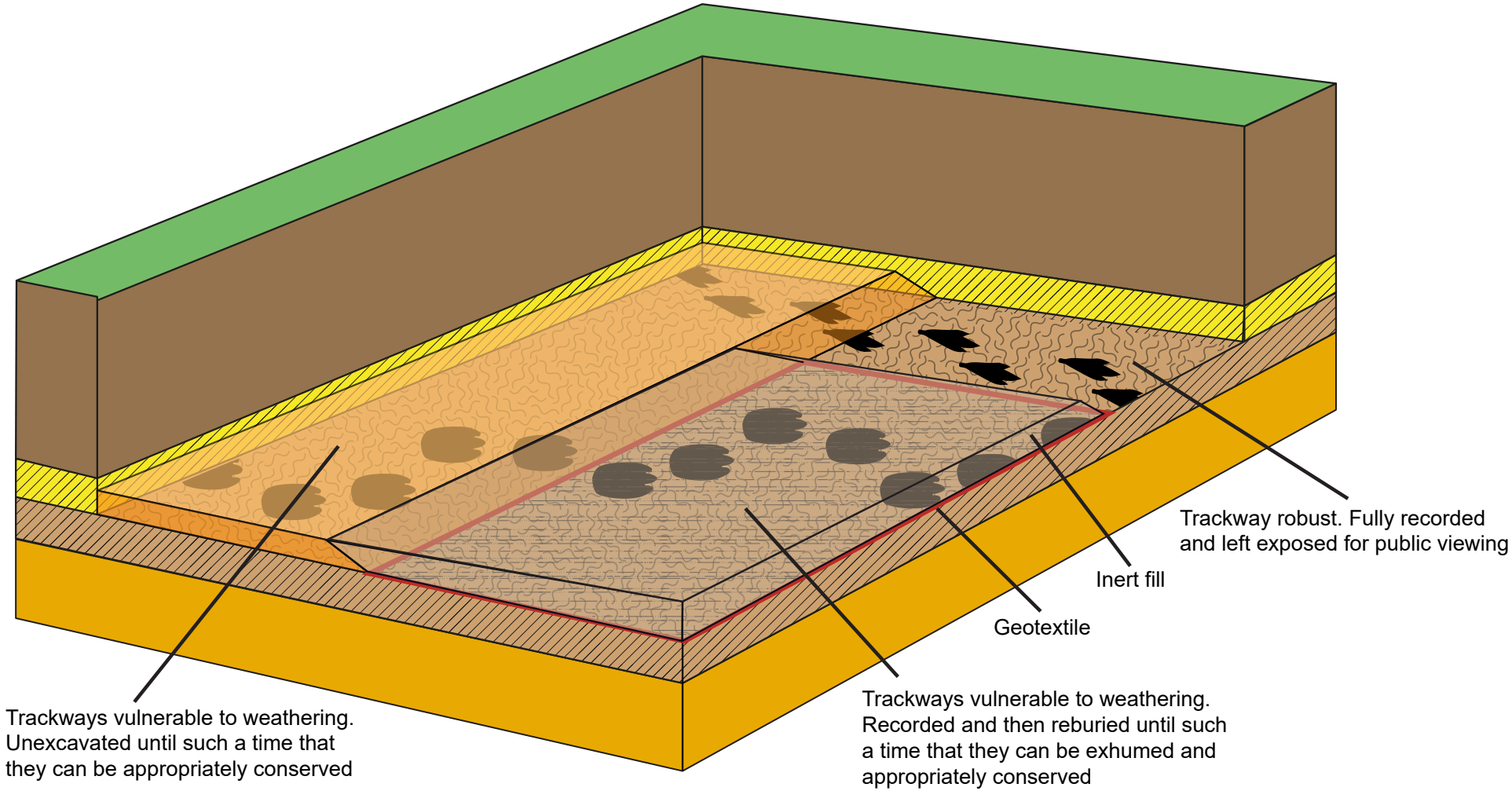
Mineral vein on quarry floor and in quarry face subjected to poor management and exploitation (FM)



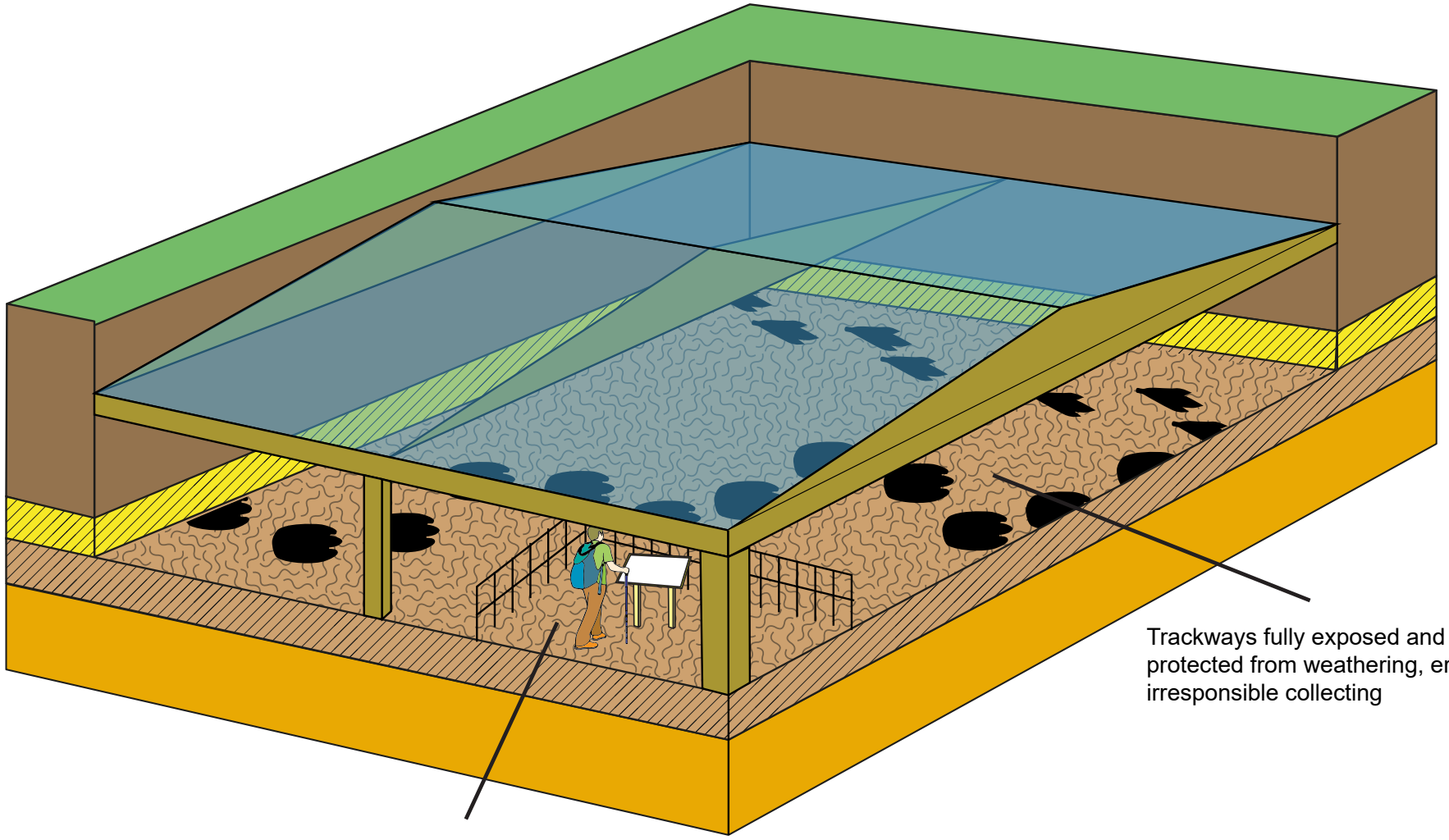
Trackways discovered on bedding plane (1). If left exposed, will be lost due to weathering, erosion, damage from machinery or attempts to collect them (FM)



Trackways discovered on bedding plane (2). Protected for future investigation/exhibition by geotextile and layer of inert fill (FM)



Trackways discovered on bedding plane (3). Trackways fully exposed and protected by covering roof (FM)



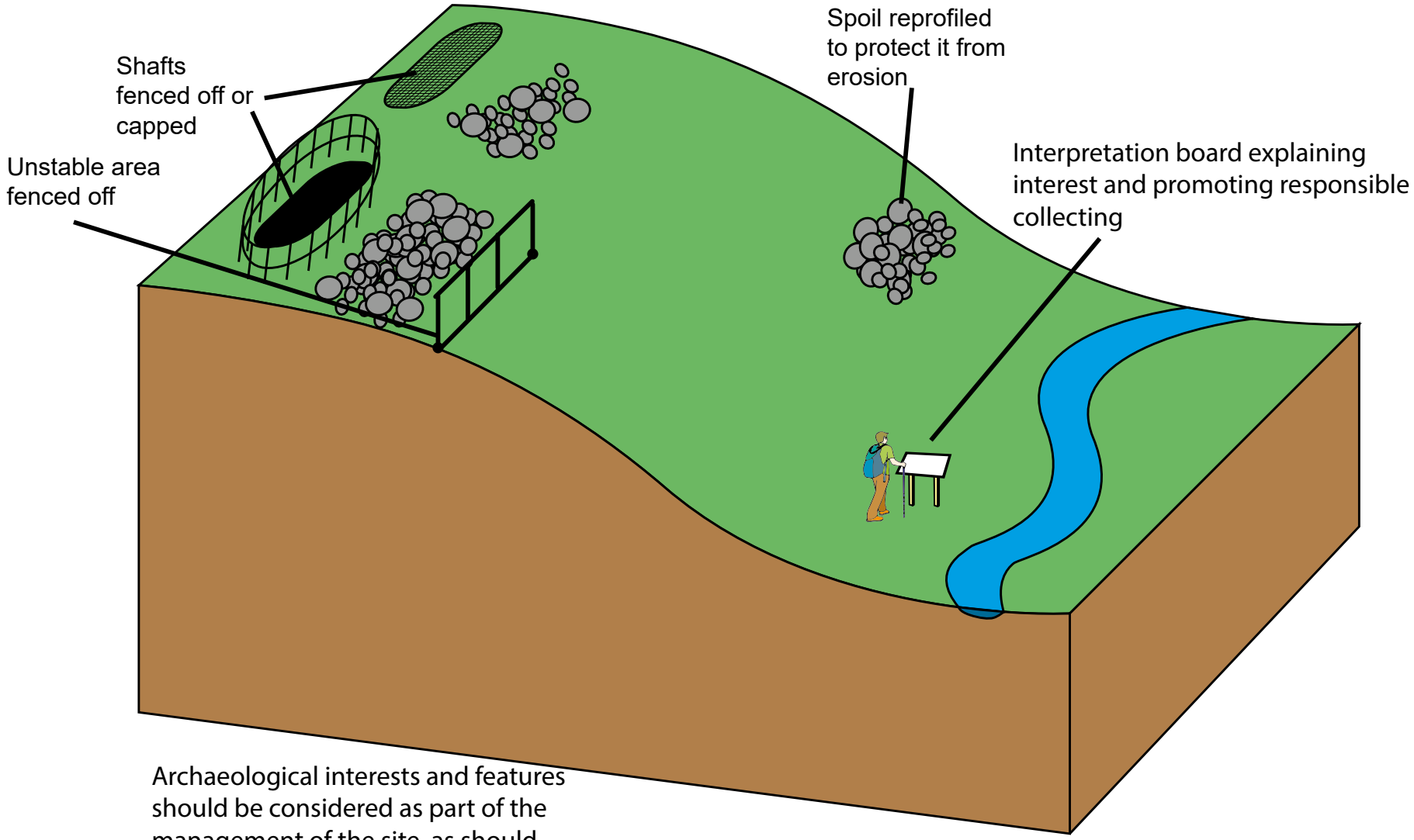
3.14: FD: Mine Dumps

Potential threats and management issues

- **Irresponsible specimen collecting**
- **Large-scale removal of spoil**
- **Re-profiling and levelling**
- **Reworking of spoil**
- **Development**
- **Vegetation encroachment**
- **Tree planting and afforestation**
- **Potentially conflicting heritage interests**
- **Fly tipping**

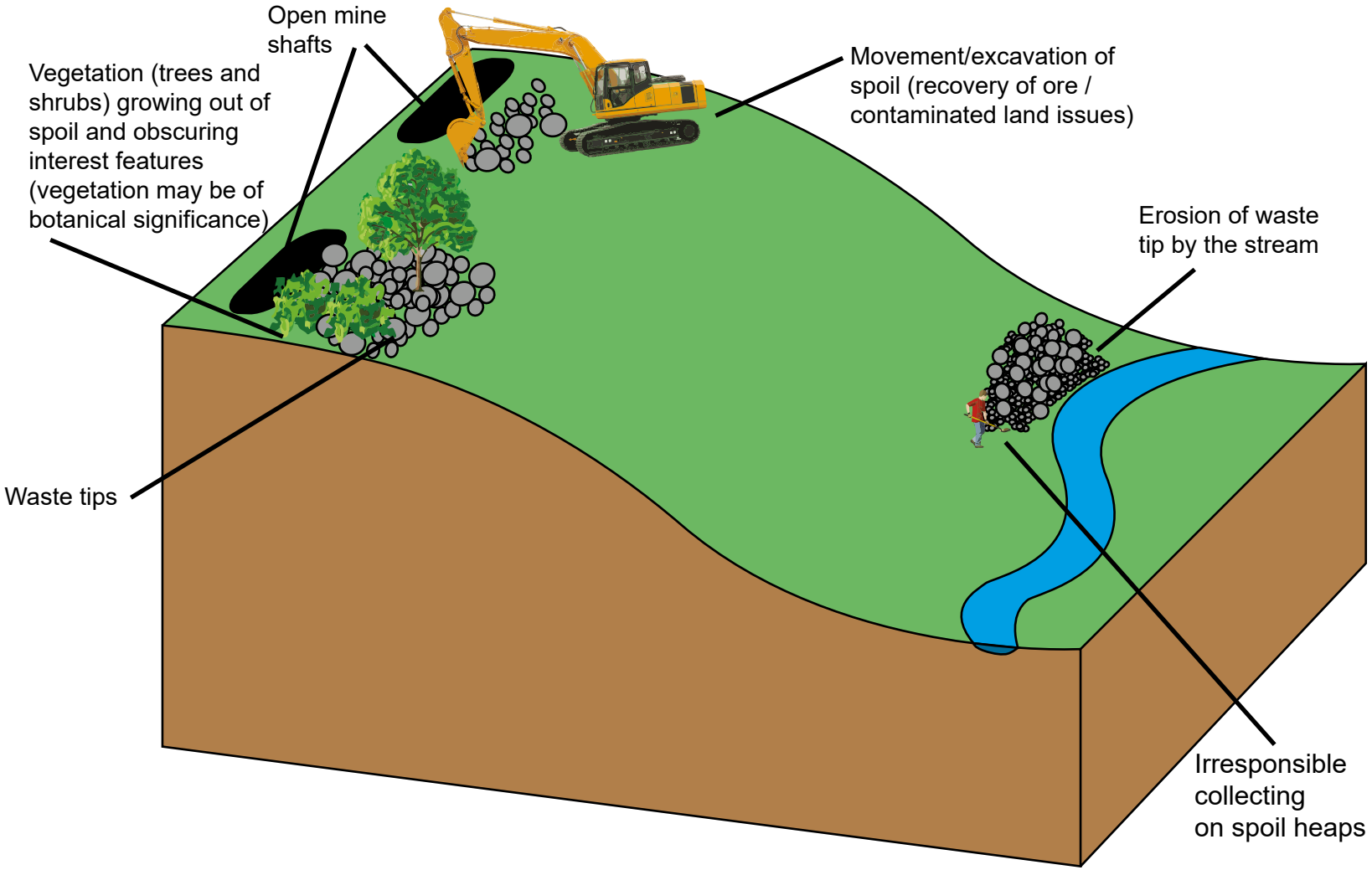
Mine dumps represent a finite and irreplaceable resource. Irresponsible collecting is a major threat to conservation of mine dumps. Tolerance to collecting depends on the extent of the resource, not necessarily the size of the dump. The use of permits, collection days and site wardens can help in deterring irresponsible collecting. Because important mineralogical material is often localised in particular parts of a dump, it is necessary to understand the distribution and quality of this material within the dump. Removal of spoil for construction, for example, is likely to be highly damaging. Reworking, re-profiling and levelling are likely to severely damage or destroy the interest. Developments such as roads and buildings are also likely to be severely damaging. However, as context is often not geologically significant, removal of material to a rock store can be used as a last resort if destruction is inevitable. Vegetation management is often necessary and tree planting and afforestation near mine dumps should be avoided. Fly tipping should be discouraged as it will conceal the interest. Mine dumps are often also of archaeological or botanical interest and the management of all interests should be integrated to prevent conflict.

Well-managed mine dumps (FD)



Archaeological interests and features should be considered as part of the management of the site, as should habiats and species - in particular, metallophyte plants

Activities damaging to mine dumps (FD)



3.15: FU: Finite Underground Mines and Tunnels

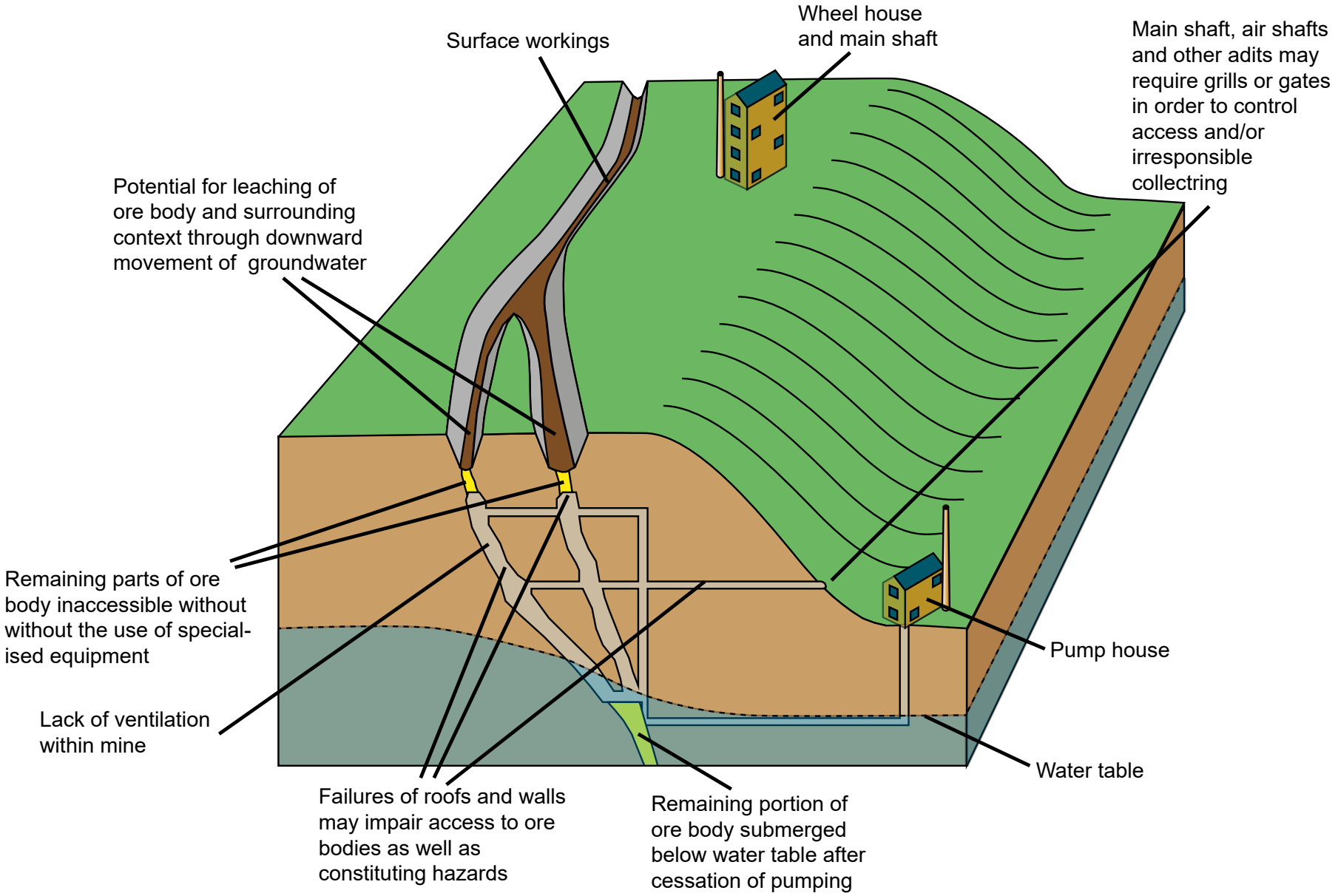
Potential threats and management issues

- **Flooding**
- **Collapse of mine passages**
- **Stabilisation by infilling of mines**
- **Irresponsible specimen collecting**
- **Fly-tipping**
- **Vandalism**

Disused mines are often unstable and can be very difficult and expensive to manage. Stabilisation methods involving infilling the mines should be avoided, as this permanently obscures the geological features and prevents any future access for study. Irresponsible mineral collecting can be problematic on some sites, as the mineral resource usually becomes effectively finite once mining operations cease. Fly-tipping and vandalism may be a problem in some cases. It is usually not financially feasible to pump out disused mines and to maintain passages in a safe and stable condition. Effective conservation in disused mines subject to collapse or flooding can be extremely difficult to achieve without substantial resources, unless a sustainable mine drainage scheme can be devised.

Copper mineralisation Clayton Mine; part of Ecton Copper Mines SSSI, Staffordshire. ©Natural England/Hannah Townley

Long disused mine complex with limited examples of mineralisation remaining (FU)



3.16: FB: Finite Buried Interest

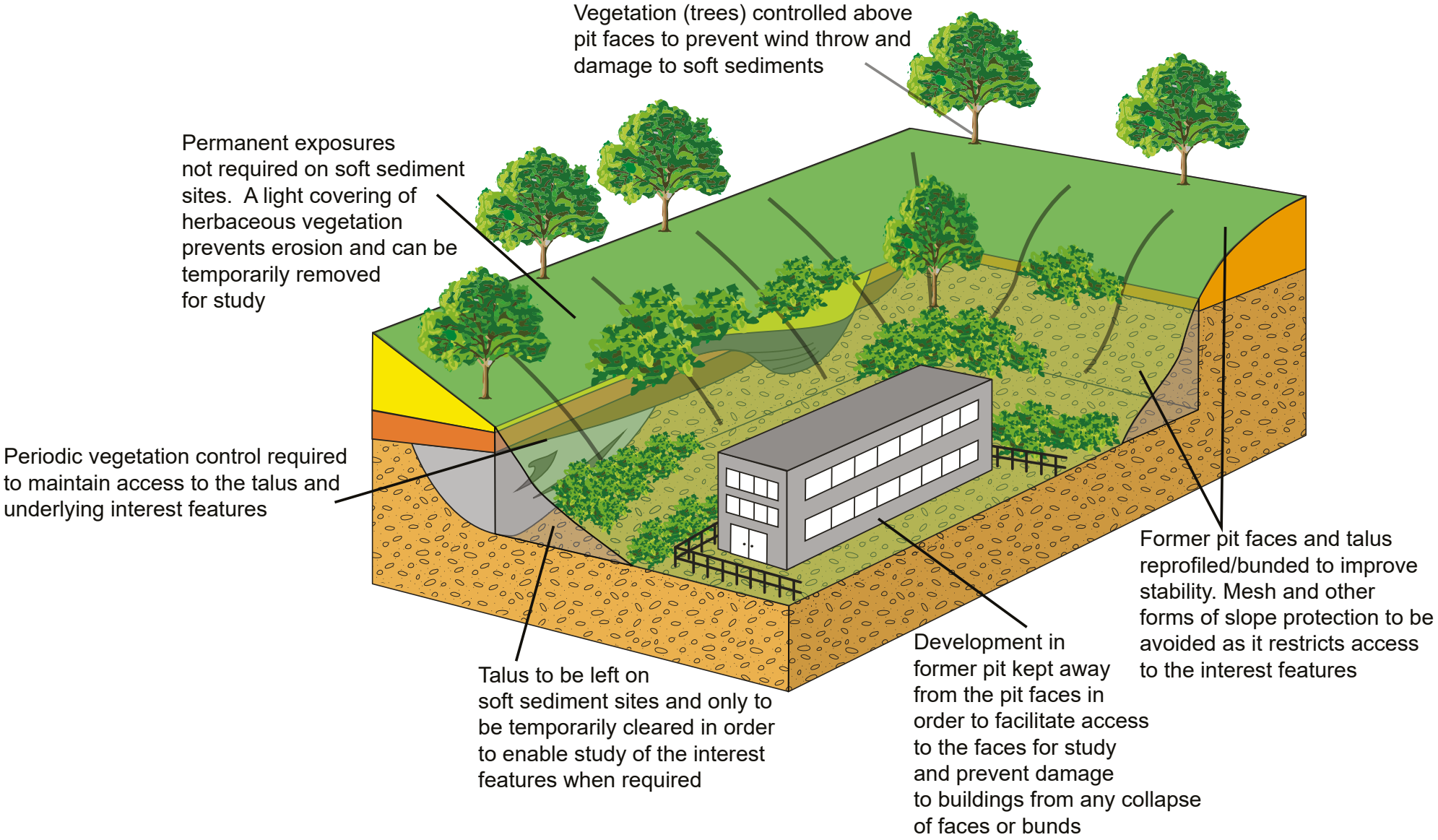
Potential threats and management issues

- **Inappropriate agricultural practices**
- **Tree planting**
- **Development**
- **Quarrying**
- **Removal of material**
- **Irresponsible specimen collecting**
- **Inappropriate recreational activities**

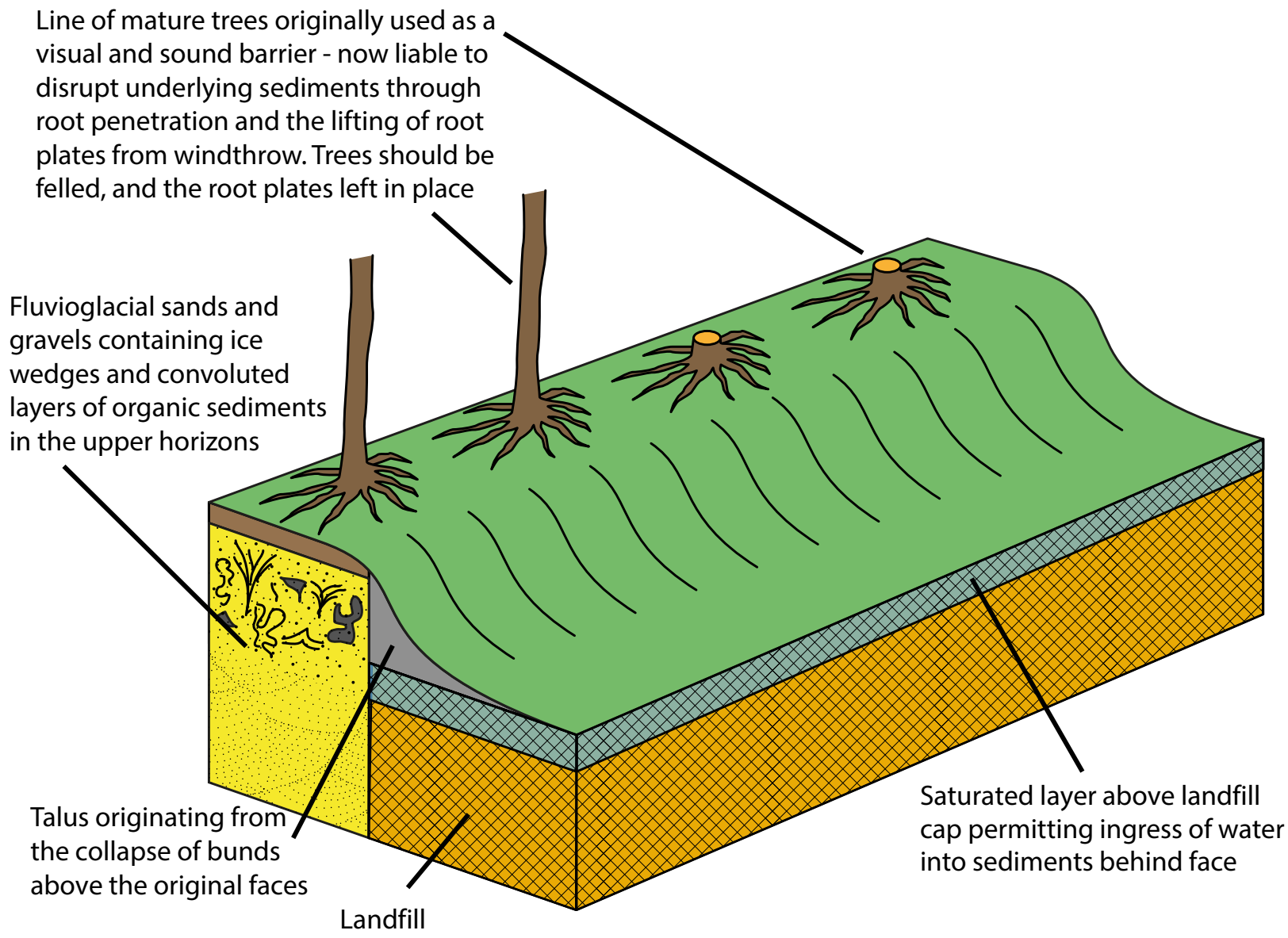
The primary management principles on buried interest sites are to limit disturbance or removal of the geological interest and to maintain the sites in a condition whereby it is possible to access the geology by boreholes and/or temporary excavations. Activities which can cause permanent damage to buried interest sites include deep ploughing, digging of drains, tree planting, quarrying and general development works, such as construction of buildings on top of the geological features. Recreational activities such as off-road driving and mountain biking may be damaging if they disturb the buried geological interest. Finite features are particularly sensitive to removal of material and other activities which can deplete or conceal the resource. When assessing the potential impacts of such activities, it is important to understand the distribution of the geological features, as these may be laterally variable.

Abbey Wood SSSI, Greater London. A shell bed of extremely limited extent lies at a depth of two metres. The shell bed has yielded a diverse assemblage of late Palaeocene vertebrates. The boundaries of the site are marked by fences. Research-led excavations are limited to two a year. The spoil from excavations contains abundant shell debris, as well as shark and ray teeth, providing a valuable outdoor educational resource. ©Geologists' Association/ Diana Clements reproduced with permission

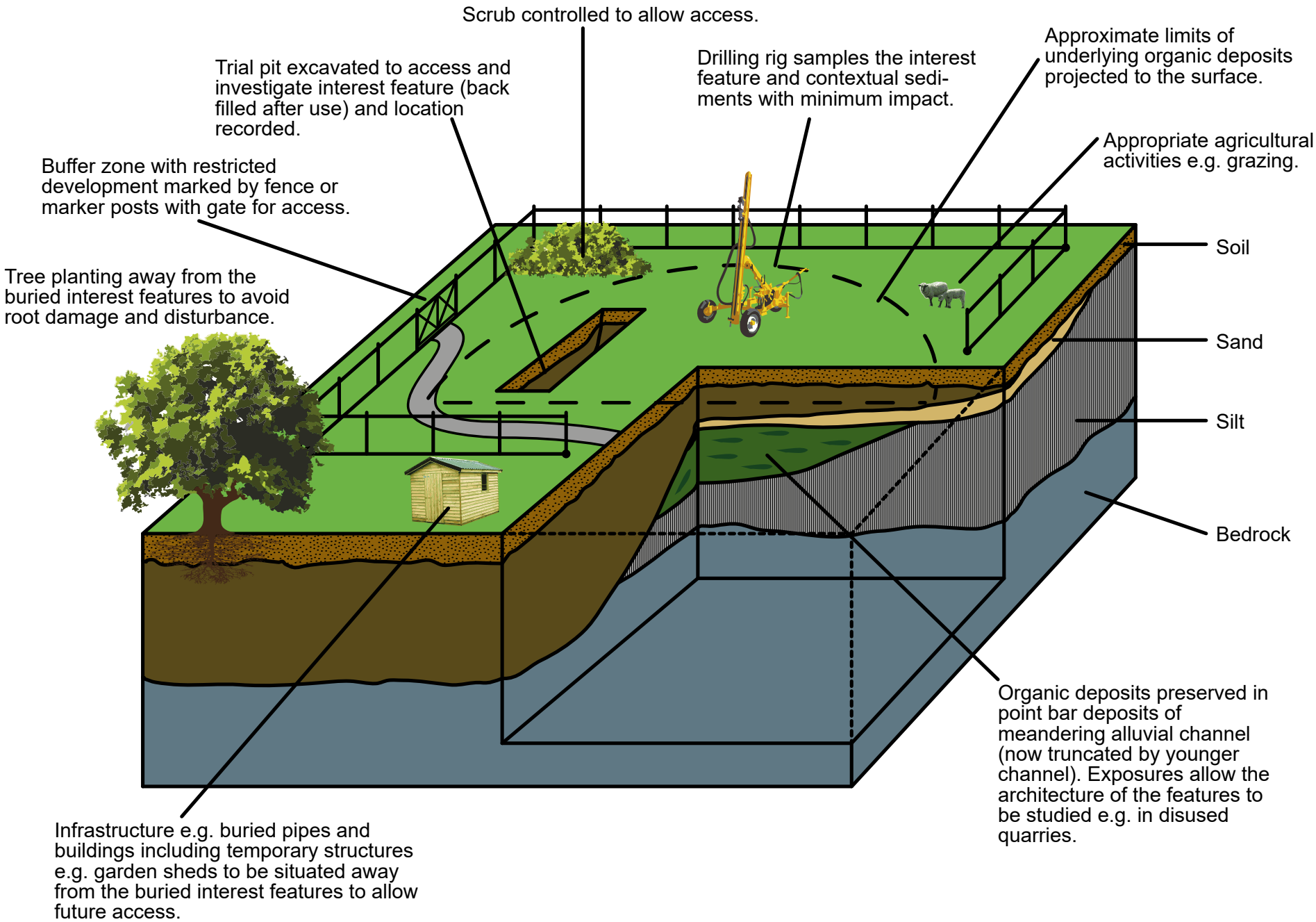
Finite interest features present in the faces of a disused quarry (FB)



Limited distribution of cryoturbated organic deposits adjacent to landfill and tree plantation (FB)



Channel deposits of limited extent below open ground (FB)



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