



**The Coal
Authority**

Site Inspection Report

Pen y Graig Arw Quarry, Ystalyfera



Client: Neath Port Talbot County Borough Council

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Date: May 2018

Contents

- 1.0 Introduction**
- 2.0 Site Conditions**
- 3.0 History**
- 4.0 Observations**
- 5.0 Consequences of Failure**
- 6.0 Recommendations**

Appendices

- A. Figures**
- B. Photographs**

1.0 Introduction

The Coal Authority was instructed by Neath Port Talbot County Borough Council to undertake an inspection of Pen Y Graig Arw Quarry, Ystalyfera.

The purpose of the inspection was to provide an assessment of stability, to identify safety issues pertaining to the site and to supplement an inspection undertaken on the 20th November 2017.

The site was inspected by Darren Bryant and Robert Sullivan of the Coal Authority, on Tuesday 8th May 2018.

Weather conditions at the time of inspection were dry with sunny spells.

The inspection has taken account of features observable at the time of inspection, and may not characterise all aspects of the site due to restrictions on access for safety reasons and vegetation coverage. It is possible that evidence of ground movement may be present that could not be observed at the time of inspection.

2.0 Site Conditions

The site comprises a disused quarry, within private ownership, located on the western slopes of the Swansea valley, above the village of Ystalyfera at NGR 275872E 208137N. It extends from an elevation of around 175m AOD at the eastern edge of the site to 200m AOD at the crest of the former high wall. The quarry floor is elevated at approximately 185m AOD, with local mounds of spoil rising to 195m AOD. The quarry occupies an area of approximately 200m x 100m. The site location is shown on Figure 1.

The topography includes a near vertical high wall along the north western boundary, with a partially infilled quarry floor. Numerous mounds of quarry spoil are situated within the site boundary.

The majority of the site is well vegetated with dense undergrowth and tree cover.

The eastern perimeter is defined by a near vertical cliff face, at the base of which is the recently failed landslide area at Panteg. Several spoil tips comprising quarry waste are located along the crest of this cliff face.

A drainage system comprising a series of manhole chambers and pipes (both above and below ground) is located at the approximate locations shown on Figure 10. This system is understood to have been installed during the 1950's / 1960's and is recorded in previous reports as the 'Penygraig System'. The drainage system is understood to collect surface water flows from the quarry area and also to convey minewater from recorded mine adits within the area.

A significant amount of vegetation clearance has been undertaken since the previous inspection, allowing access to the route of the elevated pipe drainage system at the southern boundary.

Inspection of the British Geological Survey sheet (Figure 5) for the area indicates the strata at the site to comprise Llynfi Beds sandstones with interbedded siltstones, dipping south at relatively shallow angles. The stratigraphic boundary of this sandstone unit is identified on the geological plan as being approximately at the base of the cliff to the eastern boundary, at the general outcrop position of the Lower Pinchin coal seam. The strata below the sandstone unit are indicated as comprising un-differentiated sandstone and mudstone units.

The geological plan also indicates the site to be immediately adjacent a large area of landslip deposits.

3.0 History

Inspection of historic Ordnance Survey plans dating from 1877 to present indicates the quarry to have developed from some time prior to 1877, being noted as 'disused' by 1961. The historic plans show the site to have developed to its current position by the early 19th Century, with very little obvious changes since.

A drainage system was installed around the perimeter of the quarry in the 1950's / 1960's as described in Section 2 above.

The site is currently utilised for rough grazing.

4.0 Observations

Inspection on the 8th May 2018 began at the north-eastern boundary of the site, within the quarry floor, at the foot of the high wall. The inspection then took an anti-clockwise route through and around the quarry, followed by an inspection of the various spoil mounds and drainage features present. The approximate route is shown on Figure 10.

Access was limited to accessible areas and generally along routes cut through the dense vegetation by NPTCBC staff.

As outlined within the previous report, the quarry high wall is generally vertical, with the exposed strata comprising moderately weathered thin to thickly bedded sandstone units, with occasional subordinate siltstones.

Occasional moderate groundwater seepages were observed from the face, generally at the interface of sandstone / siltstone units and at main joint sets. Several areas of loose overhanging blocks were observed, with occasional small rock-fall areas noted. Vegetation clearance permitted the inspection of scree slopes at the base of the high wall.

The high wall did not appear to have adequate fencing at the crest and no warning notices were present. As outlined in the previous inspection, areas of fly tipping, comprising gas bottles, corrugated steel sheets and a burnt out car were observed within the quarry floor.

The area of ponding water within the quarry floor, identified in the previous report, has now been drained by the installation of a new pipe and headwall, with associated trash screen (Photographs 1 to 3). This feature connects to the existing Pen Y Graig drainage system and appeared to be functioning satisfactorily. The inlet headwall appeared incomplete and requires further work to formalise the structure.

The inspection then followed recently cleared routes along the line of the drainage system. The drainage system generally appeared to be conveying water flows reasonably well. The previously observed manhole chambers have now had covers fitted, although not all are complete and require setting in mortar bedding (Photographs 33 and 34).

A new section of unlined ditch has been constructed, conveying flows to the collection chambers at the head of the elevated pipe drainage system. Flows within the ditch were seen to disappear at several locations into the underlying bedrock via small fractures within the rock. A section of pipe in this area requires backfilling, and investigation of a possible leak in the system should be carried out (Photographs 13 to 16).

The route of the elevated pipe drainage system was inspected, with the pipe work and supports being in reasonable to poor condition. Attempts have been made to seal joints using waterproof tape in several areas, and some supports have been replaced or repaired. New side branch connections have been made at locations to capture groundwater seepages (Photographs 20 to 26).

The collection chambers at the head of the elevated pipe drainage system were free of debris, but would benefit from protective fencing around the perimeter (Photographs 17 to 19).

The inspection then proceeded to the south eastern area, where a vertical cliff forms the site boundary. The spoil mounds in this area are in close proximity (<1m in places) to the cliff edge (Photographs 27 to 32).

Numerous mature trees are located along the cliff edge. The root systems of these trees are likely to have penetrated the weathered bedrock and will likely destabilise the cliff edge in the future.

The inspection then viewed the various spoil mounds within the centre of the site. The mounds comprise quarry discard generally comprising flat sandstone within a matrix of finer material.

The mounds are generally set at the maximum angle of repose, having been end tipped with little or no compaction. Where the spoil is un-vegetated, the materials appeared relatively loose.

There was no evidence of significant slope failures on any of the spoil mounds, with only localised scour and erosion, probably due to surface water erosion.

On leaving site, it was noted that a new gabion basket wall has been constructed at the carriageway edge at the toe of the most recent Panteg landslide (Photograph 35).

5.0 Consequences of Failure

The consequences of failure have not changed since the November 2017 inspection.

Localised spalling and surface erosion of the quarry waste mound sections adjacent the cliff edge may result in small amounts of spoil escaping over the cliff edge during extreme weather events. There was no visual evidence of significant spalling and erosion reaching the cliff edge, but the potential for this to occur presents a low to moderate risk. It is clear that in the past some quarry waste has spilled over the cliff edge, directly above the most recent (2012) Panteg landslide.

A significant failure of the eastern cliff edge would result in destabilising of the adjacent spoil mounds, leading to collapse and deposition onto the plateau area at the base of the cliff. Such a failure would surcharge the existing landside and would likely cause further downslope movement. Based on a visual assessment this scenario is considered to present a low to medium risk under current conditions. Due to access restrictions and dense vegetation cover, it was not possible to inspect the condition of the interface of the cliff base and head of the Panteg landslide.

6.0 Recommendations

It is recommended that a further inspection is undertaken when all currently on-going works are completed, in order to assess any unidentified areas of instability which could affect the quarry site.

The quarry location is in very close proximity to a recorded landslide. Although there is no obvious visual evidence of active landslide activity affecting the site at present, it is recommended that the site should be inspected on an annual basis to monitor conditions and should also be visited following reports of instability in the general area.

The condition of the surface water drainage system should be monitored after heavy rainfall to ensure flows are adequately captured and conveyed. Dye testing could be utilised to determine flow routes and the ultimate discharge location.

Under ideal conditions a CCTV survey of the full drainage system should be carried out, however, access restrictions may preclude this exercise.

Newly installed manhole covers require bedding in mortar.

The recently installed headwall and screen structure in the quarry floor should be inspected at regular intervals to ensure blockages do not occur.

The recently excavated unlined ditch should be completed by providing an impermeable liner to ensure flows are conveyed along its length and do not disappear into underlying fractures within the bedrock.

Fencing to the collection chambers at the head of the elevated pipe drainage system should be considered.

Consideration should be given to a scheme for upgrading / replacing the elevated pipe drainage system in order to ensure continued functionality. Attempts have been made to seal leaking joints using waterproof tape - this should be seen as a temporary, short term solution.

Selective removal of trees along the cliff edge may reduce the risk of instability along the cliff edge. The opinion of a specialist tree surgeon should be sought as access to the cliff edge presents a significant risk to operatives.

Edge protection fencing and warning signs should be placed along the quarry high wall, and warning signs should be placed at the head of the Panteg landslide to warn the general public of the risk from falling rocks.

Appendices

Figures

Photographs

Figure 1 – Site Location

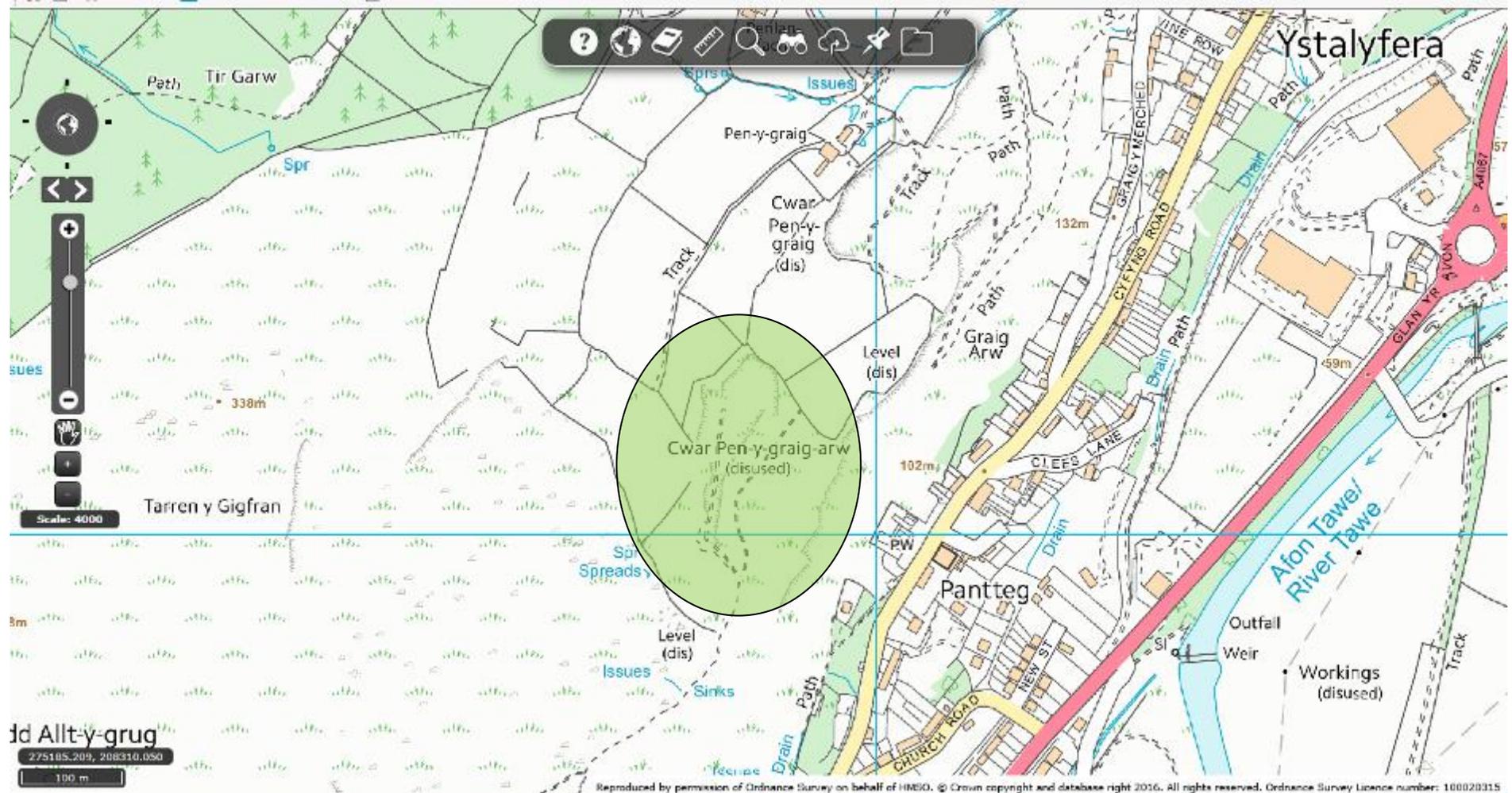


Figure 2 – Google Earth Image



Figure 3 – Contour Plan

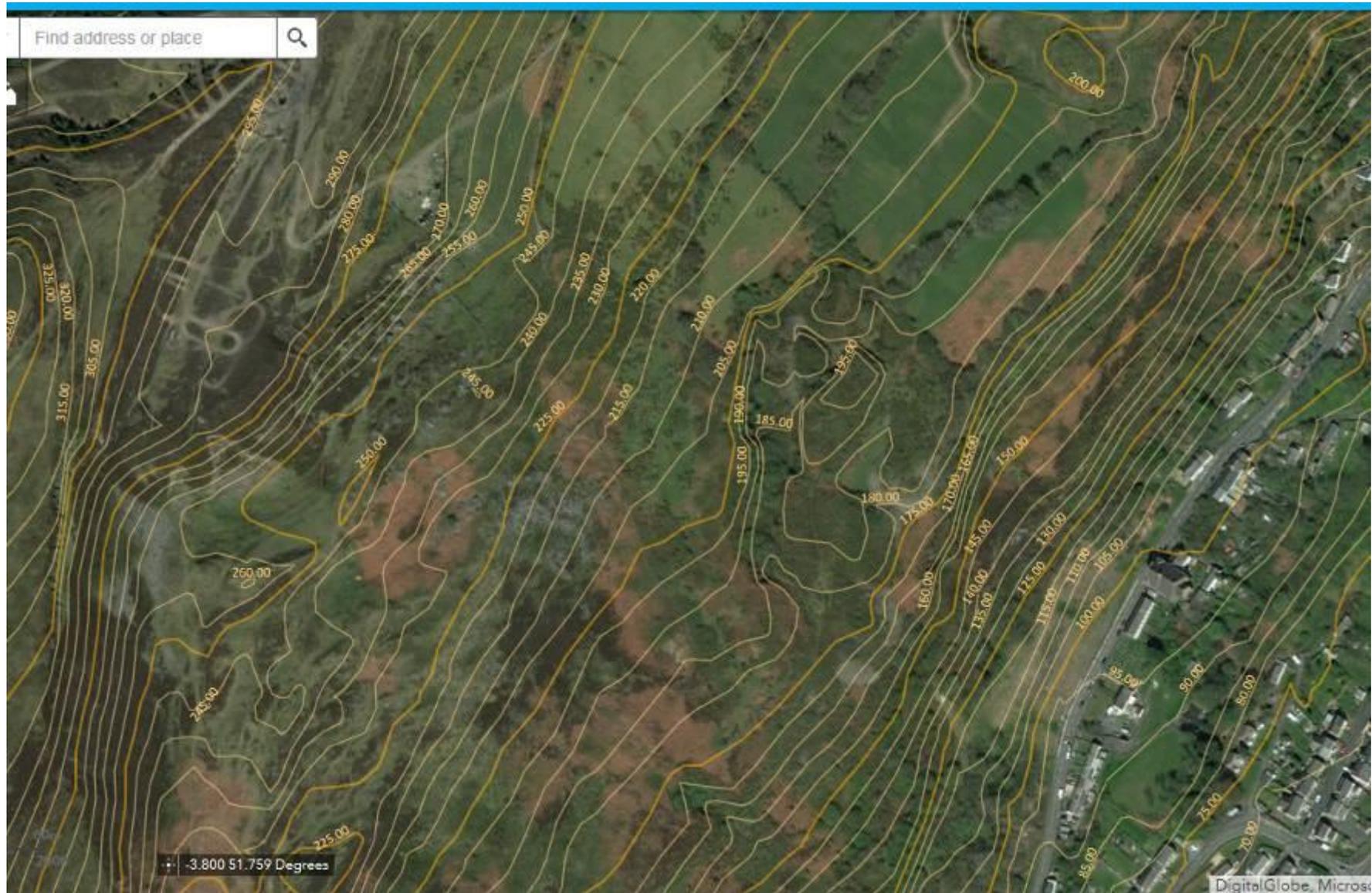


Figure 4 – LIDAR Relief Map

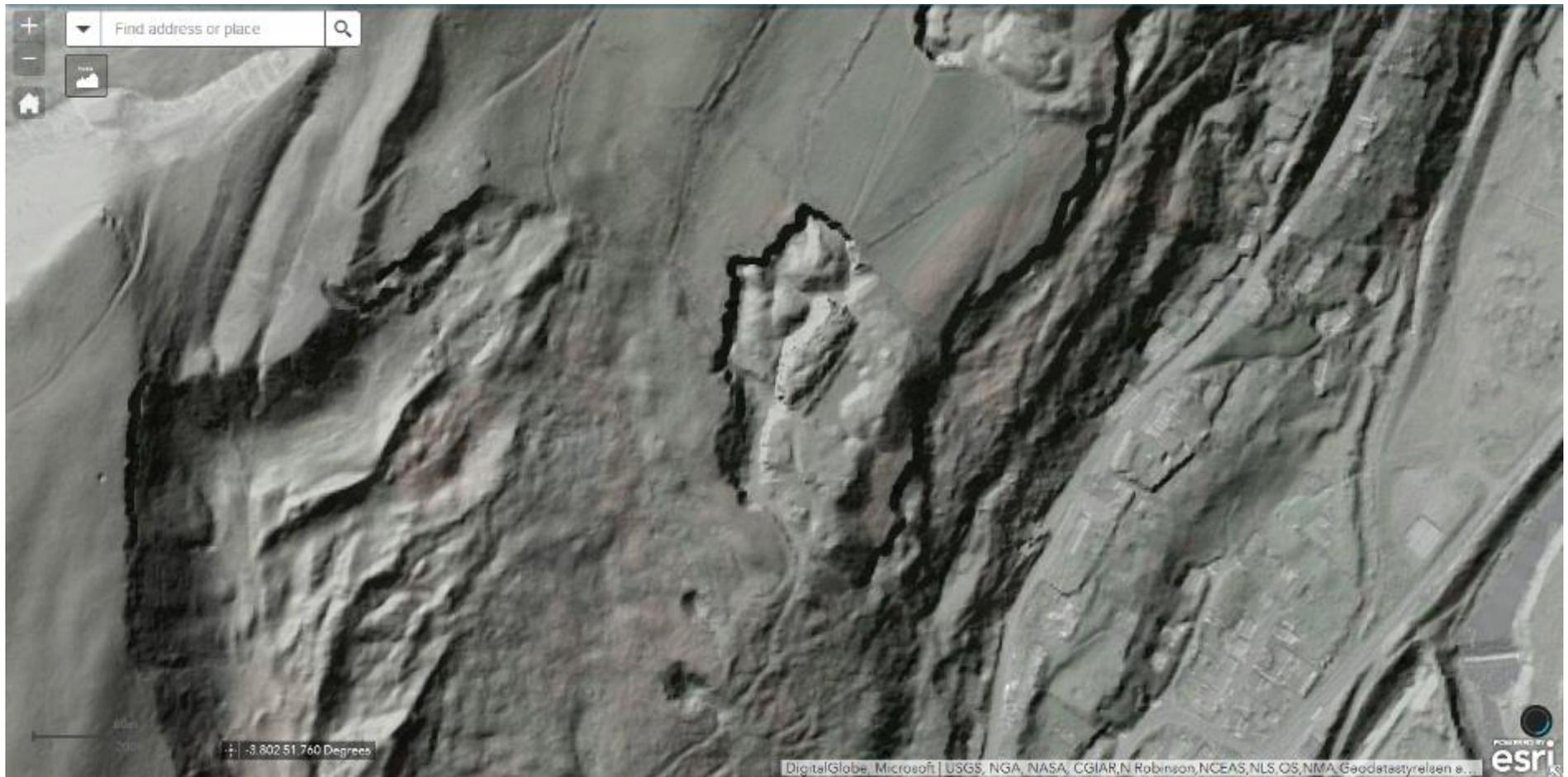


Figure 5 – Geological Plan



Figure 6 – 1877 Ordnance Survey (www.old-maps.co.uk)



Figure 7 – 1889 Ordnance Survey (www.old-maps.co.uk)

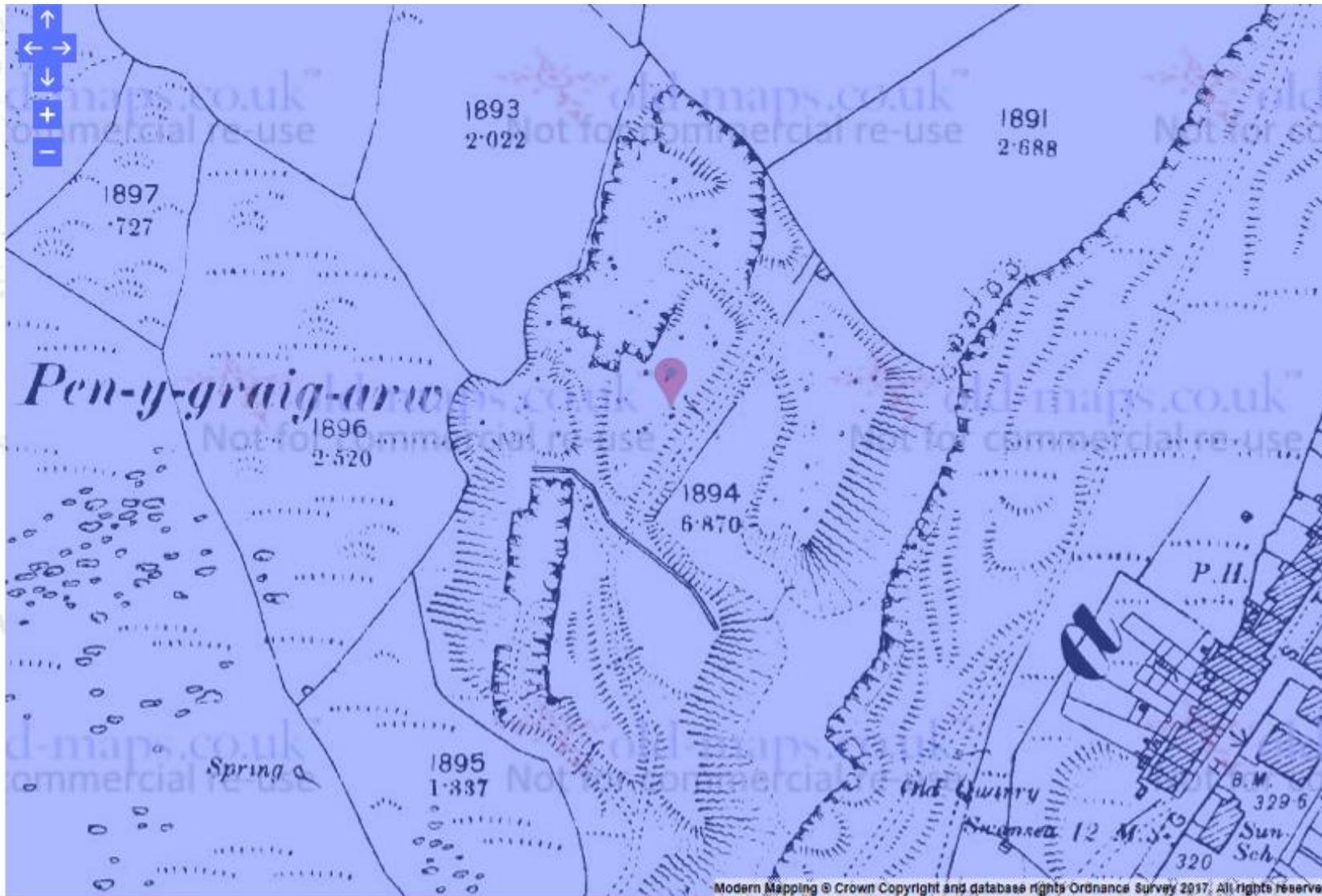


Figure 8 – 1918 Ordnance Survey (partial) (www.old-maps.co.uk)

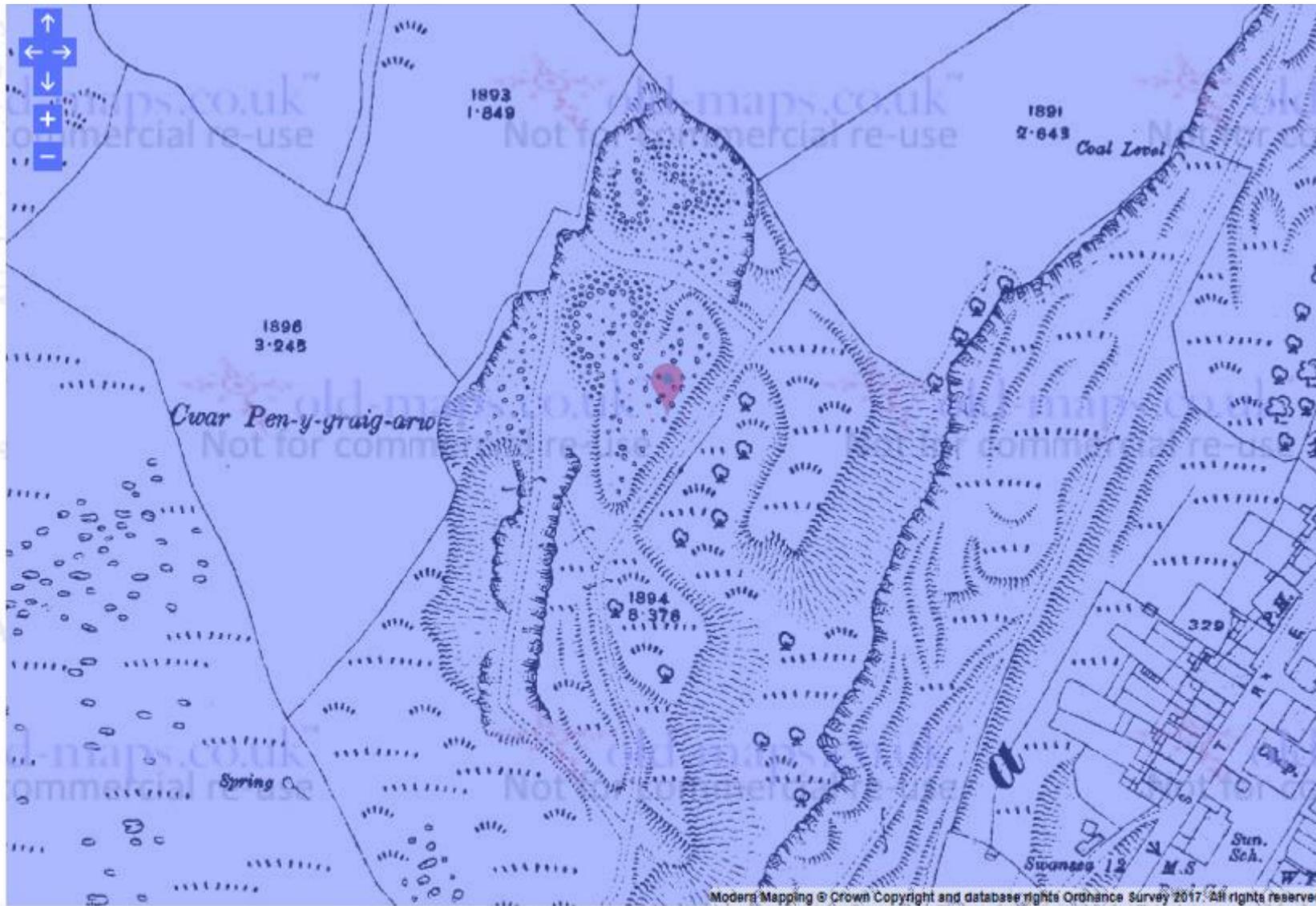
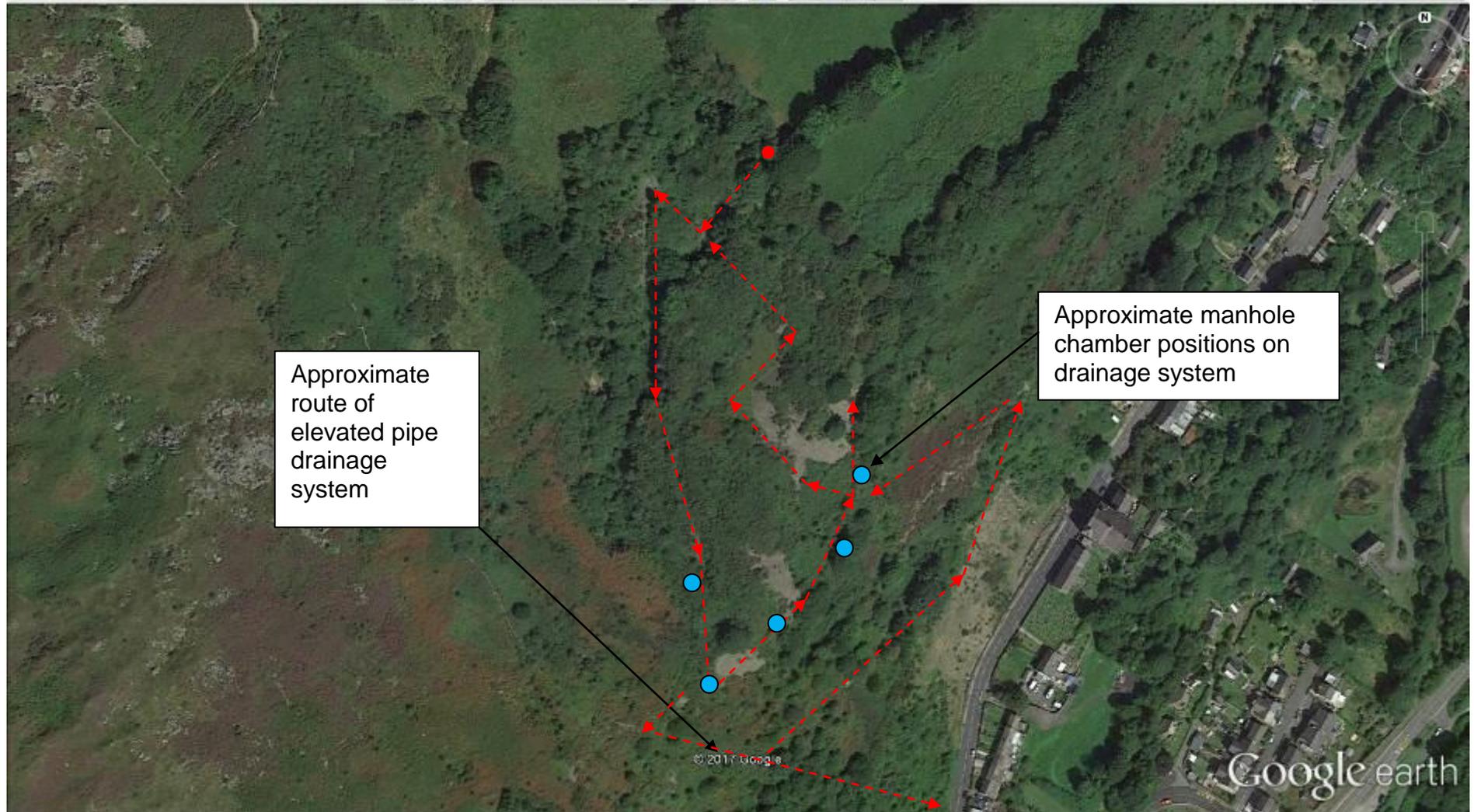


Figure 10 – Inspection Route and Key Locations





Photograph 1 – Pipe inlet and screen within quarry floor



Photograph 2 – Pipe inlet and screen within quarry floor



Photograph 3 – Water flows toward pipe inlet in quarry floor



Photograph 4 – Cleared vegetation showing quarry face scree



Photograph 5 – Quarry high wall showing seepages



Photograph 6 – Quarry high wall showing seepages



Photograph 7 – Burnt out car in quarry floor



Photograph 8 – Access track cut through vegetation



Photograph 9 – Exposed manhole cover following vegetation clearance



Photograph 10 – Exposed manhole cover following vegetation clearance



Photograph 11 – Seepage downstream of manhole cover



Photograph 12 – Excavation into bank with tools left on site



Photograph 13 – New unlined drainage ditch



Photograph 14 – Exposed pipe requiring backfill



Photograph 15 – Flows disappearing into fractured rock at ditch invert



Photograph 16 – Flows disappearing into fractured rock at ditch invert



Photograph 17 – Chamber at head of elevated pipe drainage system



Photograph 18 – Chamber at head of elevated pipe drainage system



Photograph 19 – Chamber at head of elevated pipe drainage system



Photograph 20 – Elevated pipe drainage system



Photograph 21 – Elevated pipe drainage system



Photograph 22 – Joints recently sealed with waterproof tape



Photograph 23 – Side connection to elevated pipe drainage system



Photograph 24 – Close up of connections



Photograph 25 – Side connection to elevated pipe drainage system



Photograph 26 – Elevated pipe drainage system



Photograph 27 – Quarry spoil mound at edge of cliff face



Photograph 28 – Quarry spoil mound at edge of cliff face



Photograph 29 – Quarry spoil mound at edge of cliff face



Photograph 30 – Quarry spoil mound at edge of cliff face



Photograph 31 – Quarry spoil mound at edge of cliff face



Photograph 32 – Quarry spoil mound at edge of cliff face



Photograph 33 – New manhole cover requiring bedding



Photograph 34 – New manhole cover requiring bedding



Photograph 35 – New gabion basket wall at toe of Panteg landslide



Photograph 36 – Termination of elevated pipe drainage system