

1 ARCHAEOLOGY FROM AERIAL PHOTOGRAPHS

1.1 Method of photo-examination

Vertical photographs, taken in summer 2001 at a contact scale of 1:15000, were provided as scanned images on a series of CDs. These had been compressed using ER Mapper to reduce them to files of about 11-15 MB and on-screen examination was made using ER Viewer. Scan quality was excellent and allowed a considerable degree of zooming-in to examine detail.

The photographs had been taken for stereoscopic viewing so adjacent frames overlapped by 60%. This meant that the complete route could be examined on screen by viewing alternate frames. Since the route of the pipeline was not necessarily central to the photographs, examination was made of the complete frame.

Before work commenced on the photographs, DM and RP met and examined several known archaeological sites on prints and scanned images. Not all were visible and it remained uncertain how useful that particular set of photographs might be for archaeological investigation. Their summer date and lack of shadows do not make them ideal for recording slight earthwork features or minor colour changes and use of the digital images precluded stereoscopic examination that may have helped identify certain types of feature.

Photo-examination was made using an initial magnification of about 4x, with enlargement as appropriate to examine features identified. This scale of enlargement was sufficient to find obvious, and probably recent, features, but it became apparent that many of the more interesting possible archaeological features were noticed because the view had been zoomed to look at something else. It is possible, therefore, that some features were not identified. The alternative – to examine the photos at the level required – would probably have needed several months of work.

Photo-examination was carried out with two people (the author and Lidka Žuk, a Polish post-graduate student currently completing an MA and based at Air Photo Services, Cambridge) simultaneously viewing the screen. The two-person approach allowed discussion of problem sites as necessary and provided an efficient way of tabulating results and manipulating the images.

There were two immediate problems due to use of digital images:

- 1 Stereoscopic examination was not possible;
- 2 Photographs had been set with approximate North to the top. This meant that shadows fell away from the viewer and so caused problems with the correct interpretation of topography. [Vertical photos are best viewed with shadows falling towards the viewer. This helps the brain correctly read 'up' and 'down'.]

Photo examination began at the Azerbaijan-Georgia border and progressed to the East. An initial list (Table 1) was compiled of features identified. This used CD number, line number and photo number as the main source, and screen co-ordinates. In all but two cases (Lines 53 and 54) the origin was the Northwest corner of each frame and co-ordinates give distances from the West and then the North. Conversion of these to centimetres using a factor of 11000/23 to give a value of pixels per centimetre that enables sites to be located on the photographic prints.

1.2 Results

Some 1460 features are listed in Table 1, many of which are likely to be 'recent' in date. Some features were duplicated where they were recorded on overlapping but different flight lines

although editing of the Table should have deleted those. Features thought to be archaeological, or possibly archaeological, are identified using an 'A'. Among the 'recent' features is a high number that are thought likely to remain from shepherds' camping and gathering sites. These were particularly dense south of the road between Udžar and Syghyrly and, in places, showed superimposition that suggests that 'recent' could span a considerable time.

Check numbers of sites, etc at end of checking list!

Table 1 was refined and shortened to produce a list of 230 sites that fulfilled the following criteria:

Archaeological sites anywhere on the photographs. 65 were identified that were thought to be archaeological, or possibly archaeological.

Cemeteries anywhere on the photographs. 38 cemeteries or probable cemeteries were identified.

Features lying within approximately 200m of Route 9. 134 are listed and include some archaeological sites and cemeteries.

The 230 sites were given Pulkova co-ordinates of their estimated position on the reduced 1:10000 maps, and site numbers using an easting value followed by a unique identifying number (eg 8517/1). Sites were also referenced to a 1:10000 map number and the nearest kilometre point. This shortened list is Table 2.

Reference to maps in the tables is divided between two sets. Map numbers 347 to 377 refer to the Revision FC1 (25-01-01), other sheets are Revision D2 (19-10-01) that shows the more recent pipeline route and was received after photo interpretation had begun. No checks were made to verify whether sites tabulated as 'not on map' are within the maps of Revision D2.

Table 1 includes some known inconsistencies. Some features were noted when they were first identified but as photo examination progressed their nature became apparent and not all examples were tabulated. An example is the so-called 'keyboard' or 'piano keys' whose function was unknown when they were first noticed but which, it was later seen, appeared to derive from construction of roads. In some areas, and often associated with the shepherds' structures, were ponds. Some appeared to be artificially enclosed, others more natural. Some, but by no means all of these, are listed in Table 1.

Figures used in this report have been rotated 180° to help read form and topography. Photographic north (see flight traces) is now at the bottom of each figure.

1.2.1 Archaeological

In Britain, 'archaeological sites' may have dates between the distant past and 1945. The most recent cut-off date for Azerbaijan archaeological sites is not known but those listed as such in the Tables are thought to have origins well before the medieval period. If a more recent date is acceptable for archaeological monuments, then many more of the sites identified are likely to qualify as such, although confirmation of that can only come from field investigation.

The abbreviated descriptions in the Tables tend to identify shapes of features rather than their function although it is likely that most indicate the presence of former occupation sites. Use of 'enclosure' and 'feature' in the Tables may require clarification. 'Enclosure' is used to identify features that were constructed to enclose, and examples include walled enclosure, embanked enclosure, or rectangular enclosure. 'Features' may often have the same shape as 'enclosures' but are usually smaller and were constructed for other purposes. Examples include sub-

rectangular feature, circular feature. In most cases structures are defined by walls or banks that sometimes had an accompanying ditch. Walls and banks were often eroded or reduced in height. Ditch-defined enclosures were identified in only one locality, un-named but south of KP 118 (Pulkova 8777 area).

Surface discoloration can indicate archaeological sites in this part of the world (Donoghue *et al* 2002) but were not noted during on-screen examination of the photographs. Colour change plus height, as would be apparent from stereoscopic examination of prints, may identify possible sites, but all would require surface confirmation. The work involved to investigate the complete pipeline corridor for such evidence may prove prohibitive.

A small number of known archaeological sites, or features adjacent to them, were independently identified on aerial photographs. Most features in the tables were recognised only on the photographs and are unknown from ground investigation. The distribution shows concentrations of sites on the uncultivated higher ground at the east and west of Route 9. This is an expected result as the central part of the route crosses low-lying arable land over which this particular set of photographs was unresponsive to any sub-surface features (archaeological or natural). Cultivation in that area may have destroyed evidence of former land use, but its intensity and longevity is unknown to this writer.

Only three suggested archaeological sites lie within 200m of route 9. They are illustrated and briefly described as follows:

Site 8543/1 comprises a group of at least three adjoining walled or embanked enclosures on locally high ground. The site is coincident with NB75.



Fig 1.1. Archaeological site 8543/1. Walled or embanked enclosures on high ground. Site NB75. Source photograph: 6126.

Site 8575/1 was identified as an isolated mound with parts of a possible enclosing wall and an irregular internal surface. On the basis of the air photo evidence it was suggested to be a settlement. It coincides with known site NB56.



Fig 1.2. Archaeological site 8575/1. An isolated mound that appears to have parts of an enclosing wall. Site NB56. Source photograph: 6075.

Site 8585/2 is a rectangular walled or embanked enclosure with internal features. It is likely to be a settlement site and its eroded appearance suggests it to be of some antiquity.



Fig 1.3. Archaeological site 8585/2. A rectangular embanked or walled enclosure with internal features that may indicate that the site was a settlement. Source photograph: 6056.

Comments on other archaeological sites identified are in section 1.2.4 below.

1.2.2 Cemeteries

Cemeteries were fairly easy to identify on the aerial photographs. Most were within enclosed areas and all showed a mixture of small graves and larger tombs. They are also marked on the 1:10000 maps, and that helped confirm their identification on the photographs. It was not possible from the photographs to determine which cemeteries were in use, which disused, but several of them had space for expansion within their boundaries.

Seven cemeteries are within 200m of the pipeline. One, 8587/1, has the WREP route immediately to its north (Map 359) and the BTC pipeline is mapped about 50m north of the

WREP route. Some 500m east of 8587/1 is another cemetery, 8586/2. The BTC pipeline is shown 50m to its south. The other five cemeteries are between 80m and 200m from the BTC pipeline.

1.2.3 Features within 200m of the pipeline

Features located within 200m of the pipeline are indicated in the tables and include the above categories of site and others of less certain types and dates. Many are described simply as 'sub-rectangular features' but show variations in size, form and grouping that may be of relevance to understanding them. They are thought likely to remain from transhumant shepherds' camps and individual structures are likely to be short-lived and seasonal. Superimposition of features shows that locations were revisited but the photographs give no indication of the time-span that these features represent. Examination of the photographs suggested each feature to comprise parallel long sides that may be slightly embanked and within which there is darker soil that could be slight hollowing and/or occupation debris. Ground visits by D Maynard in February 2002 confirmed this interpretation and noted that 'sub-rectangular features' are the remains of reed and mud structures. Although the structures themselves may be insubstantial, their ruined form, on non-arable land, may be capable of long-term survival and raises the question of the duration of use that occurred at some of these sites. The pipeline is routed through some of these structures and may provide opportunities for samples of these features to be examined by excavation.

Examples of the types and groupings of these sites are provided by the following small selection of illustrations.



Fig 1.4. Site 8813/2 and 3. The left-right line on the print is the WREP route. In this area, the BTC pipeline will be some 70m to its north (bottom) and cuts through a densely-packed area of features of various forms. This group (8813/2) comprises mostly sub-rectangular features but includes some of rectangular form and a number of small circular or near-circular enclosures. Group 8813/3, at the top of the figure, includes a line of sub-rectangular features, all with 'entrances' on the south side, and some of which abut larger trapezoid enclosures that may be for stock. Source photograph: 6230.



Fig 1.5. This figure is to illustrate the apparent clustering of sub-rectangular features around modern buildings or sites of buildings. The photograph also shows some of the groupings and forms of design of these features. At the upper right centre of the photograph is a pond. This group of features is in easting 8813 and the central buildings are some 600m south of the pipeline. Source photograph: 6230.



Fig 1.6. Site 8619/3. The figure includes several listed sites of which 8619/3 is near the left-centre of the frame and provides an example of eroded rectangular features. This site is very close to the pipeline route. Just left of the upper centre is 8619/12 which shows the pairing of large with small rectangular features that can also be seen elsewhere. Source photograph: 6412.



Fig 1.7. Sites 8777/2 and 3. The group of features on the right of the photograph includes 'scoops' (so-called because their raised edges almost surround the interior) and somewhat eroded rectangular features. Some superimposition of features can be seen in this group and the modern track overlays or abuts others. The smaller group on the left of the photograph also includes both types of feature. Details of both sites are surveyed on the 1:10000 map suggesting they are of some antiquity. Source photograph: 6289.



Fig 1.8. Part of Site 8815/1. This further illustrates the range of shapes and groupings of the sub-rectangular features and their associated enclosures. It also shows some of the stages of decay that occur after abandonment of the temporary structures. Of interest near the top of this figure is the walled or embanked rectangular enclosure with its cultivated land within. The walls, it may be suggested, are to exclude stock. This enclosure and its approach track are mapped at 1:10000 as are many of the sub-rectangular features. Source photograph: 6230.



Fig 1.9. Sites 8816/1-3. The arc of sub-rectangular features and variants on the right of the photograph (8816/1) surrounds an area of lighter ground, possibly indicating wear from stock. Left of that site are two enclosures or features each within a slight circular enclosure. A smaller circular enclosure, with no internal structure, is immediately below the more centrally placed circle (8816/2). On the left of the figure is one end of an arc of wide-spaced features (see Fig 1.10, 8816/4). Source photograph: 6228.



Fig 1.10. Sites 8816/1-5, 8817/1. This figure shows a broader context to sites in the previous figure (seen here at the upper right). The line of wide-spaced sub-rectangular features (8816/4) extends from the vicinity of 8816/3 (upper right centre) and appears to end by a cluster and line of smaller variants on the left of the photograph. This line of features has been cut by the WREP pipeline, and the BTC pipeline will lay parallel to this and about 100m north. Site 8817/1 is a double walled square enclosure (or three sides of an enclosure) with sub-rectangular features at its open end. This has been listed as 'archaeological' but the freshness of the walls suggest it may be somewhat recent in origin. The more degraded feature of similar size to the right of 8817/1 may be the remains of an earlier and similar enclosure. Source photograph: 6228.

Other types of site close to the pipeline include:



Fig 1.11. Site 8566/1. An area of conjoined long rectangular features showing as possible scoops with raised or embanked edges. Each has an open end facing a modern track and they are likely to be recent in date. Areas of light colour may indicate worn ground or levelled features. Source photograph: 6114.



Fig 1.12. Site 8863/1. One of several rows of 'spots' identified during photo examination. No explanation can be given for these features. Source photograph: 6189.



Fig 1.13. Site 8869/5. Part of a long straight row of 'spots' that appears to lay parallel to a linear feature – although the latter may be a vehicle track. The cause or purpose of the spots is unknown. Source photograph: 6177.

1.2.4 A selection of other archaeological features identified on the photographs

Examination of the complete area photographed has identified a total of ## archaeological or possible archaeological sites, the majority of which are at distances greater than 200m from the pipeline route. These sites provide a wider range of examples that give context that may help interpretation of those on the route. The increased numbers of sites also suggest there to be some local types – something that would not have been apparent with a narrower search corridor.

In very general terms, the enclosed sites identified are of three main types:

Walled enclosures, of rectilinear or curvilinear plan, which are sometimes conjoined. Some may be mis-identifications of ponds – which can also be walled. They occur more often in the western parts of the route.

Ditch-defined enclosures, sometimes with an accompanying bank. Rectilinear and curvilinear forms occur as does at least one hybrid example. Some superimposition occurs, suggesting reuse of a favoured location. These features make a local group towards the east of the route and, within the area photographed, have a densely-packed distribution centred on easting 8777. Their date, or date range, is unknown but many of them would not be out of place in Neolithic Apulia (Bradford 1957; and recent unpublished aerial survey by Braasch and Musson).

Small circular features that are either mounds or open rings and may indicate burial sites. Some single examples have been identified, others form small groups, and there are two large concentrations, both on adjacent local outcrops cut by easting 8641.

Traces of cultivation have also been observed. On the higher western ground these tend to be terraces and include many examples that are likely to be recent or in current use. The densest terraces occur on maps 367 and 368 and are north of the pipeline route.

Towards the east of the route are small areas of ridged cultivation that are reminiscent of ridge and furrow of the English midlands. The slightly curved strips suggest that they may have been

ploughed using animal traction and a simple heavy plough (Bowen 1960, 8). Some of these strips are walled, others are apparently unfenced. Tracks may cut across ridges, but in at least one case (8775/1) ridges overlay a linear feature that is likely to have been a track. Much of the ridged cultivation occurs in the area of ditched enclosures but their chronological relationships are not always clear.

Types of feature identified are illustrated by the following examples in which the relevant features are central to each figure unless otherwise noted. The figures span the pipeline from west to east and include a number of sites with X-prefixes. These did not fall within the area of the 1:10000 maps provided and could not be assigned accurate eastings references. Their neighbours in Table 1 will indicate an approximate location and greater precision will be obtained by use of the photo numbers and co-ordinates.



Fig 1.14. Site 8525/1. Walled curvilinear enclosure on locally high ground. Possible occupation site. Source photograph: 6024.



Fig 1.15. Site 8528/1. Five or more small circles on high ground between two watercourses. Possible occupation or burial sites. Source photograph: 6026.



Fig 1.16. Site X2. A walled curvilinear enclosure with internal divisions which probably indicates a settlement site. Source photograph: 6028.



Fig 1.17. Site 8530/2. Walled curvilinear enclosure, possibly a pond rather than occupation? Source photograph: 6030.



Fig 1.18. Site 8533/6. Two (possibly more) small circles adjacent to a disturbed area that may indicate quarrying. Source photograph: 6032.



Fig 1.19. Site 8535/1. A row of at least three small circles. Their eroded appearance may suggest them to be archaeological but other similar sites in the vicinity (eg 8535/2, 8536/1) appear more recently made. Possibly burial sites, but very uncertain. Source photograph: 6032.



Fig 1.20. Site 8540/4. An oval mound of bare soil with surface irregularities. This is similar in appearance to known occupation sites but the presence of a second such mound in the upper right corner suggests they may be associated with modern farming. Source photograph: 6130.



Fig 1.21. Site X3. A mound surmounted by a circular rampart within which is uneven ground. This is likely to be a settlement site. Source photograph: 6108.



Fig 1.22. Site 8560/1. A group of circular features on high ground between watercourses. Possibly occupation sites. The rectangular features to their right are similar to others associated with shepherds' camps (see Figs 1.5, 1.6). Figure 1.23 overlaps the lower part of this photograph. Source photograph: 6091.



Fig 1.23. Site 8560/2. An area of slight rectangular features, possibly indicating a settlement site. Figure 1.22 overlaps the upper part of this photograph. Source photograph: 6091.



Fig 1.24. Site X4. A walled enclosure on high ground in a fairly mountainous area. Source photograph: 5569.

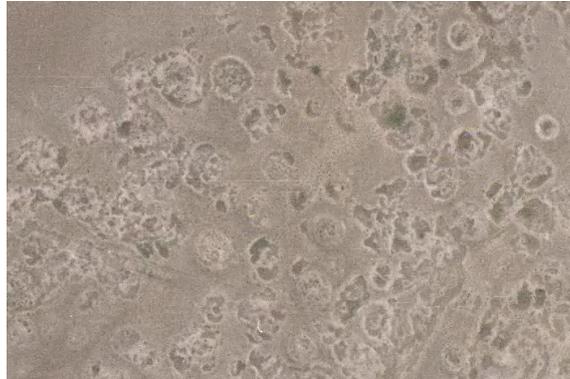


Fig 1.25. Site 8618/4. Two D-shaped conjoined enclosures at the foot of an escarpment overlooking a watercourse. Possibly an occupation site, more probably recent. Source photograph: 6412.



Fig 1.26. Site 8641/1. Local outcrop with many circular and other features that may indicate burials or may result from localised erosion. A part-enlargement is below as Fig 1.27. Some 1.5km to the

north is a similar, but larger, outcrop (site 8640/2).
Source photograph: 6384.



**Fig 1.27. Site 8641/1. An enlarged area of Fig 1.26.
Source photograph: 6384.**



Fig 1.28. Site 8735/1. An embanked or walled enclosure with internal structures. Located at the confluence of two extinct rivers. Source photograph: 6272.

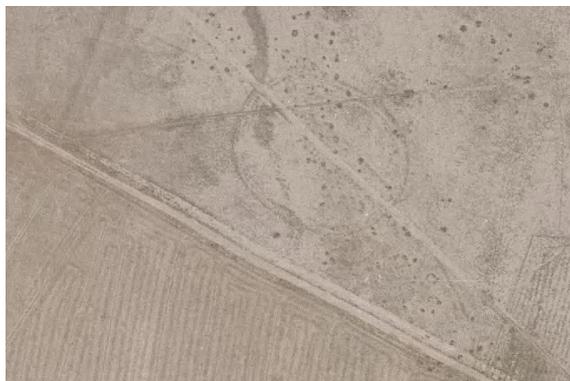


Fig 1.29. Site 8775/2. A ditched curvilinear (oval) enclosure with traces of an internal bank. Two linears cross over the enclosure and the unidentified dark spots also seem to post-date it. In the lower right corner of the figure is some ridged cultivation that possibly indicates the most recent activity in this figure. Source photograph: 6288.



Fig 1.30. Site X5. A double-ditched curvilinear (oval) enclosure with possible internal and external features. A modern hut has been placed between the two ditches suggesting that they are visible on the ground. Several tracks cross the enclosure. Source photograph: 6288.



Fig 1.31. Site 8777/5. A ditched curvilinear enclosure with superimposed cultivation. Source photograph: 6289.

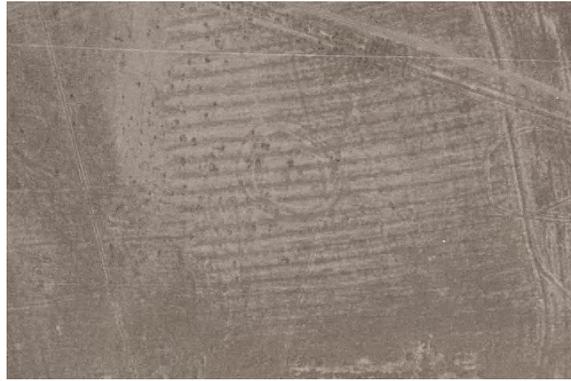


Fig 1.32. Site 8778/1. This photograph may illustrate three phases of activity. Ridged cultivation and a ditched curvilinear enclosure are superimposed in a manner which makes it difficult to identify which was earlier. Above both of these is a curvilinear wall or bank that was constructed within, but not concentric to, the ditched enclosure. Source photograph: 6289.



Fig 1.33. Site 8778/4. Central to the figure is a ditched sub-rectangular enclosure and to its lower left an oval enclosure with concentric double-ditches. Ridged cultivation appears to overlay both. Source photograph: 6289.



Fig 1.34. Site X8. Two superimposed multivallate enclosures that overlay a single ditched enclosure. Ridged cultivation on the right side of the figure may be overlain by the most recent enclosure. Source photograph: 6289.



Fig 1.35. Site X13. Central to the figure is a ditched oval enclosure that is probably overlain by ridged cultivation. The rectangular enclosure (X10) on the left of the figure has a less clear relationship to the cultivation, but appears to overlay the dark-toned linear features (?ditches) that cross within it. X10 may also overlay the curving linear ditch that crosses the figure. Source photograph: 6289.



Fig 1.36. Site 8799/2. In the centre of the figure is a small circular feature comprising an external bank, a possible ditch and a central mound or platform within which there is a pit. This may indicate a burial monument. To the left are several phases of sub-rectangular features remaining from shepherds' camps. Source photograph: 6240.



Fig 1.37. Site 8818/1. Seven, possibly more, slight walled enclosures in a range of sizes. Similar enclosing walls have been noted in areas frequented by shepherds (see fig 1.9), but there are none of their usual structures in this vicinity. Source photograph: 6228.

1.3 References

- Bowen, H C, 1961. *Ancient Fields*. British Association for the Advancement of Science.
- Bradford, J.S.P., 1957. *Ancient Landscapes: studies in field archaeology*, London.
- Donoghue, D.N.M., Galiatsatos, N., Philip G. and Beck, A.R., 2002. Satellite imagery for archaeological applications: a case study from the Orontes Valley, Syria, in Bewley, R.H. and Rączkowski, W., (ed). *Aerial archaeology: developing future practice*. NATO Science Series, Vol **337**, 211-223.

Tables 1 and 2 to be appended