

### Land at Needingworth Road, St Ives, Cambridgeshire

**Assessment of Aerial Photographs for Archaeology** 

July 2015



### Land North of Needingworth Road, St Ives, Cambridgeshire

### TL 327 720

Assessment of Aerial Photographs for Archaeology

Planning Application reference: 140871OUT

Client: Archaeological Solutions Ltd

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Plan 1 Assessment of aerial photographs for archaeology



### **SUMMARY**

- S1 This assessment of aerial photographs was commissioned by Archaeological Solutions Ltd to support a planning application for the erection of a warehouse building with office and open storage space.
- S2 The object of the assessment was to provide information on the location and nature of archaeological features which are visible on aerial photographs within and immediately adjacent to the site.
- Part of the site contains traces of ridge and furrow which indicates that it was ploughed in the medieval period. These features are recorded as Cambridgeshire Historic Environment Record (CHER) numbers 08272 and CB15347. A linear feature and possible enclosures, part of CHER 08272, situated to the immediate south of the ridge and furrow is caused by modern ploughing over the terminations of the ridges at a former headland and some likely modern field drains. A possible buried feature, of unknown origin, is also recorded from aerial photos. There are further traces of heavily eroded medieval fields to the immediate north of the site on the north side of Needingworth Road.
- S4 The south east part of the site contains a buried D-shaped ditched enclosure, CHER 09180, with associated linear and curvilinear ditches. This may be the remains of a premodern stock enclosure and is undated.
- An extensive complex of buried curvilinear and linear ditches and enclosures, bounded in the north and west by a straight sided double ditched enclosure with sharp corners lies immediately to the north of Needingworth Bypass, less than 100m from the northern boundary of the site (CHER 082751 and 01490). This is a likely focus of former settlement, quarrying and stock enclosures. It was assessed by Palmer and Cox in 1994 ahead of the construction of the Needingworth bypass road, when it was noted that colluvium may mask further deposits downslope to the south of the visible crop marked features. Excavations in advance of the construction revealed a further enclosure surrounded by a palisaded ditch with an entrance way, CHER 11668 to the immediate north east of the site beneath a layer of colluvium. Pottery from this site indicates a Romano-British date.
- S6 Crop marks show a further rectilinear ditched enclosure with attached linear ditches, probably a smaller focus of buried former settlement, less than 100m to the south of the site at CHER 09179.
- S7 It is likely that further settlement features may be buried within undeveloped areas in the site beneath residual medieval fields.
- S8 Original photo interpretation and mapping was at 1:2500 scale.



### 1 INTRODUCTION

- 1.1 This assessment of aerial photographs was commissioned by Archaeological Solutions Ltd to inform an archaeological evaluation in support of a planning application to develop a warehouse building with office and open storage at Needingworth Road Industrial Estate, St Ives, Cambridgeshire.
- 1.2 The evaluation requirement is set out in a brief issued by Cambridgeshire County Council Historic Environment Team in regard of Planning Application 1401871OUT for Barford and Company (Thomas 2015).
- 1.3 The object of this assessment was to provide information on the location and nature of any archaeological sites and areas which are visible on aerial photographs within and adjacent to the site.
- 1.4 It is important to note that aerial photographs usually only show part of the horizontal and vertical extent of buried and upstanding features. Their capacity to reveal features as crop marks, vegetation marks, soil marks or as the shadows cast by banks, ditches and walls, depends upon a number of environmental and agricultural factors prevalent at the time of the photographic survey.
- 1.5 Archaeological features within and immediately adjacent to the site were mapped in detail at 1:2500 scale to a digital Ordnance Survey map base.



### 2 THE ASSESSMENT AREA

### Location

- 2.1 The site is located on agricultural land to the east of St Ives. The western side of the site is bordered by the A1096, and the north by the A1123 Needingworth Bypass.
- 2.2 The site is centred at National Grid Reference 5327 2720 (TL 327 720).
- 2.3 Plan 1 shows the extent of the site and the archaeological features recorded from aerial photographs within and adjacent to it.

### Topography, geology and soils

- 2.4 The site lies on level ground at approximately 10m above Ordnance Datum. The site lies over two similar soil associations: well drained fine loamy soils, often over gravel, of the Efford 1 association, interfacing with slowly permeable calcareous clayey and fine loamy over clayey soils of the Evesham 3 association. (SSEW 1983 and www.landis.org.uk).
- 2.5 Sites which lie over clay soils of this type are not always responsive to the formation of strong cropmarks, whereas sites over gravel tend to be more responsive, producing clearer cropmarks.

### Previously recorded heritage assets

- 2.6 Within the site, the Cambridgeshire Historic Environment Record (CHER) identifies traces of ridge and furrow which indicates that it was ploughed in the medieval period, CHER 08272 and CHER CB15347. A linear feature, CHER 08272, situated to the immediate south of the ridge and furrow is a headland to the medieval ploughing and there are various traces of field drainage and marks in the ground caused by modern agriculture, initially identified as possible medieval enclosures.
- 2.7 The south east part of the site contains a buried D-shaped ditched enclosure, CHER 09180, with associated linear and curvilinear ditches. This may be the remains of a pre-modern stock enclosure and is undated.
- 2.8 An extensive complex of buried curvilinear and linear ditches and enclosures, bounded in the north and west by a straight sided double ditched enclosure with sharp corners lies immediately to the north of Needingworth Bypass at Giffords Farm, CHER 082751, is situated less than 100m from the northern boundary of the site. Excavation to the immediate southeast of this feature revealed a palisaded ditched enclosure in association with Romano-British pottery (CHER 11668), buried beneath colluvium.
- 2.9 Further crop marked features, which may be archaeological and associated with CHER 082751, lie to its immediate west at CHER 01490. Further crop marked ditched enclosures are recorded to the south of the site at CHER 09179.

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### 3 ARCHAEOLOGICAL AND NATURAL FEATURES FROM AERIAL PHOTOGRAPHS

- 3.1 In suitably cultivated soils, sub-surface features including archaeological ditches, banks, pits, walls or foundations may be recorded from the air in different ways in different seasons. In spring and summer these may show through their effect on crops growing above them.
- 3.2 Such indications tend to be at their most visible in ripening cereal crops, in June or July in this part of Britain, although their appearance cannot accurately be predicted and their absence cannot be taken to imply evidence of archaeological absence. In winter months, when the soil is bare or crop cover is thin (when viewed from above), features may show by virtue of their different soils. Upstanding remains, which may survive in unploughed grassland, are also best recorded in winter months when vegetation is sparse and the low angle of the sun helps pick out slight differences of height and slope.

### Limitations of the data

- 3.3 Aerial photographic evidence is limited by seasonal, agricultural, meteorological and environmental factors which affect the extent to which either buried or upstanding archaeological features can be detected from the air. The visibility of archaeological features may differ from year to year, dependent on the type of crop or land use, prevailing weather and levels of moisture in the soil over the crop growing season.
- 3.4 Individual photographs often thus record only a small percentage of the actual extent of buried or upstanding features, and a wide range of photos taken over a long timescale may be needed to reveal the extent of buried features from the air.
- 3.5 It is thus advantageous to be able to examine a range of photos taken under a variety of environmental conditions in order to build up a comprehensive interpretation of the archaeological landscape.



### 4 AIR PHOTO INTERPRETATION AND MAPPING

### Photographs which were examined

- 4.1 The most immediately informative aerial photographs of archaeological subjects tend to be those resulting from observer-directed flights.
- 4.2 This activity is usually undertaken by an experienced archaeological observer who will fly at seasons and times of day when optimum results are expected.
- 4.3 Oblique aerial photographs, taken using a hand-held camera, are the usual products of such investigation. Although oblique photographs are able to provide a very detailed view, they are biased in providing a record that is mainly of features noticed by the observer, understood, and thought to be of archaeological relevance. To be able to map accurately from these photographs it is necessary that they have been taken from a sufficient height to include surrounding control point information to match fixed points on both the photograph and the ground.
- 4.4 Vertical aerial photographs have been taken over the whole of Britain and provide information on a series of dates between (usually) 1946–7 and the present. Many of these vertical surveys were not flown at times of year that are best to record the archaeological features sought for this assessment and may have been taken at inappropriate dates to record crop and soil responses that may be seen above sub-surface features.
- 4.5 Vertical photographs are taken by a camera fixed inside an aircraft and with its exposures timed to take a series of overlapping views that can be examined stereoscopically. They are often of relatively small scale and their interpretation requires higher perceptive powers and a more cautious approach than that necessary for examination of obliques.
- 4.6 Use of these small-scale images can also lead to errors of location and size when they are rectified or re-scaled to match a larger map scale.
- 4.7 Aerial photographic cover searches were obtained from the Cambridge University Collection of Aerial Photographs (CUCAP), and the Historic England Archive.
- 4.8 Photographs used for the assessment included those resulting from observer-directed flights and routine vertical surveys.
- 4.9 The ortho-rectified mosaics of vertical aerial photographs at Google Earth (www.earth.google.com) were consulted online for this assessment in July 2015. These sites displayed photographs which the website states were taken (or accessioned to the site) between 1945 and 2008.
- 4.10 Photographs which were consulted are listed in the Appendix to this report.



### Methodology

- 4.11 All photographs were interpreted and mapped at a level compatible with a 1:2500 scale base map.
- 4.12 The photographs were closely examined by eye and under 1.5x and 3x magnification and interpreted with the aid of a mirror stereoscope where appropriate, or in detail on screen when consulted as digital files.
- 4.13 Aerial photographs were digitally rectified to an OS map base using AirPhoto 3.58 software in order to remove perspective distortion and ensure correct rectification of aerial photographs to the OS map (Scollar 2002 & 2014). Images from Google Earth were also interpreted and rectified to OS map bases (Scollar and Palmer 2008).
- 4.14 AirPhoto calculates mismatch values of control points taken from the photos and the map base. In all transformations prepared for this assessment the mean mismatches were less than  $\pm$  1.5m.
- 4.15 The rectified files were set as background layers in Quantum GIS 2.6 where features were interpreted and drawn over the rectified photographs.
- 4.16 Layers from this final drawing have been used to prepare the illustration for this report and are provided digitally for import to a Geographic Information System (GIS) in ESRI Shapefile SHP format.



### 5 RESULTS

- 5.1 The assessment area was photographed on a number of occasions when crop or soil marked features were visible over the site and its immediate environs.
- 5.2 Palmer and Cox assessed aerial photographs in advance of road construction in 1994 and recorded extensive buried settlement to the north of the site and areas of medieval fields. These data were considered and updated for this assessment.

### Features recorded within the site

- 5.3 The site contains traces of eroded ridge and furrow which indicates that it was ploughed in the medieval period. These features are recorded as CHER numbers 08272 and CB15347.
- 5.4 A linear feature and possible enclosures, part of CHER 08272, situated to the immediate south of the ridge and furrow, is caused by modern ploughing over the terminations of the ridges at a former headland and some likely modern field drains. This effect is shown clearly in vertical aerial photograph number MAL/6860 054. A possible buried feature, of unknown origin, is also recorded on this photo and some obliques as a light toned line. There are further traces of heavily eroded medieval fields to the immediate north of the site on the north side of Needingworth Road.
- 5.5 The south east part of the site contains a buried D-shaped ditched enclosure, CHER 09180, with associated linear and curvilinear ditches. This may be the remains of a pre-modern stock enclosure and is undated.

### Features outside but adjacent to the site

- 5.6 An extensive complex of buried curvilinear and linear ditches and enclosures, bounded to the north and west by a straight sided double ditched enclosure with sharp corners, lies immediately to the north of Needingworth Bypass, less than 100m from the northern boundary of the site (CHER 082751 and 01490). This is a likely focus of former settlement, quarrying and stock enclosures. It was assessed by Palmer and Cox in 1994 ahead of the construction of the Needingworth bypass road, when it was noted that colluvium may mask further deposits downslope to the south of the visible crop marked features.
- 5.7 Excavations in advance of road construction revealed a further enclosure surrounded by a palisaded ditch with an entrance way, CHER 11668, to the immediate north east of the current site beneath a layer of colluvium (Schlee 1994 & 1995). Pottery from this site, which is likely to be a southerly continuation of CHER 082751, indicates a Romano-British date.
- 5.8 Crop marks show a further rectilinear ditched enclosure with attached linear ditches, probably a smaller focus of buried former settlement, less than 100m to the south of the site at CHER 09179.
- 5.9 It is likely that further settlement features may be buried within undeveloped areas in the site, beneath residual medieval fields.



### 6 CONCLUSION

- 6.1 This assessment has demonstrated the presence of a D shaped ditched probable settlement enclosure with other associated ditches, of unknown date, within the site.
- 6.2 The site was ploughed in the medieval period and contains traces of eroded ridge and furrow and a possible buried feature of unknown type.
- 6.3 Linear features previously recorded within the site are likely to be caused by modern field drainage rather than buried enclosures.
- 6.4 The wider area was settled and used heavily in the past, and detailed cropmarks reveal traces of a former enclosed settlement, bounded by a substantial straight double ditched enclosure, which contains curvilinear enclosures, ditches, pits and small quarries to the north of the site. Excavations in 1994 revealed a further Romano-British enclosure and palisade just outside the north east corner of the site.
- 6.5 A further enclosure has been recorded to the immediate south of the site.
- 6.6 It is therefore likely that the site will contain further archaeological features which are not visible on aerial photographs, or are masked by ridge and furrow and/or colluvial deposits.



### 7 ACKNOWLEDGEMENTS

7.1 Many thanks to the archives at the Cambridge University Collection of Aerial Photographs and the Historic England Archive for access to aerial photographs used in this assessment.



### 8 BIBLIOGRAPHY

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1401871OUT.

www.landis.org.uk



### **APPENDIX**

# Aerial photographs consulted for this assessment

Historic England Archive, enquiry reference AP94729

Full single listing - Oblique aerial photographs Customer enquiry reference: 94729

Map Reference (6 figure grid ref)		TL 326717	TL 328723	TL 329723	TL 329723	TL 321722	TL 321722	TL 322722	TL 322722	TL 322722	TL 322722
	0000	70mm,120,220	Unknown	70mm,120,220	70mm,120,220	51/2 "	51/2 "	51/2 "	51/2 "	51/2 "	5½"
Film type	: - -	Black& white	Black& white	Black& white	Black& white	BW Cut Roll Film					
Date		11 JUL 1976	21 JUN 1955	07 JUL 1995	07 JUL 1995	02 AUG 1951					
number		/ 123-126	/ 29	/ 43	/ 44	/ EAW038248	/ EAW038249	/ EAW038250	/ EAW038251	/ EAW038252	/ EAW038253
Film and frame number		NMR 963	CAP 8271	NMR 15333	NMR 15333	AFL 62202					
Photo reference (NGR and Index number)	7.700	TL 3271 / 1	TL 3272 / 1	TL 3272 / 2	TL 3272 / 3	TL 3272 / 4	TL 3272 / 5	TL 3272 / 6	TL 3272 / 7	TL 3272 / 8	TL 3272 / 9



rL 3272 / 10	AFL 62202	/ EAW038254	02 AUG 1951	BW Cut Roll	51/2 "	TL 322722	
				띨			
TL 3272 / 11	AFL 62202	/ EAW038255	02 AUG 1951	BW Cut Roll Film	51/2 "	TL 321721	
TL 3272 / 12	AFL 62202	/ EAW038256	02 AUG 1951	BW Cut Roll Film	5½"	TL 322722	
TL 3272 / 13	AFL 62202	/ EAW038257	02 AUG 1951	BW Cut Roll Film	5½"	TL 322722	
TL 3272 / 14	AFL 62202	/ EAW038258	02 AUG 1951	BW Cut Roll Film	5½"	TL 321721	
TL 3272 / 15	AFL 62202	/ EAW038259	02 AUG 1951	BW Cut Roll Film	5½"	TL 323722	
rL 3371 / 6	NMR 27771	/ 23	05 JUL 2013	Digital colour	35 mm	TL 334711	
rL 3372 / 1	NMR 963	/ 127-130	11 JUL 1976	Black& white	70mm,120,220	TL 332725	
TL 3372 / 2	NMR 963	/ 131-134	11 JUL 1976	Black& white	70mm,120,220	TL 330723	
TL 3372 / 3	NMR 15333	/ 42	07 JUL 1995	Black& white	70mm,120,220	TL 330723	
						Total 20 records	



## Vertical aerial photographs

# Historic England Archive, enquiry reference AP94729

Full single listing - Verticals, Standard order Customer enquiry reference: 94729

Sortie number	Library number	Camera position	Frame number	Held	Centre point	Run	Date	Sortie quality	Scale 1:
RAF/106G/UK/1557	386	RP	3368	۵	TL 327 714	21	07 JUN 1946	AC	0086
RAF/106G/UK/1557	386	ВР	3369	۵	TL 322 715	2	07 JUN 1946	AC	0086
RAF/CPE/UK/1952	554	FS	2253	۵	TL 331 718	22	25 MAR 1947	4	10000
RAF/CPE/UK/1952	554	FS	2254	۵	TL 326 718	22	25 MAR 1947	⋖	10000
RAF/CPE/UK/2405	744	PP PP	3135	۵	TL 332 715	14	24 NOV 1947	AB	10000
RAF/58/1983	1737	F22	81	z	TL 333 717	9	20 APR 1956	4	10000
RAF/543/294	1824	F21	415	۵	TL 330 722	17	05 JUN 1958	AC	2000
RAF/543/294	1824	F21	416	۵	TL 330 719	17	05 JUN 1958	AC	2000
RAF/58/4689	2040	F22	57	z	TL 330 723	23	19 SEP 1961	AB	10000
RAF/58/4689	2040	F22	28	z	TL 321 723	23	19 SEP 1961	AB	10000
RAF/58/5754	2153	F22	136	۵	TL 326 724	88	04 JUN 1963	ď	10000
RAF/58/5754	2153	F22	137	۵	TL 333 725	58	04 JUN 1963	4	10000
MAL/68061	5155	>	97	۵	TL 327 715	16	12 AUG 1968	ď	10000
MAL/69068	5422	>	54	۵	TL 329 711	2	18 JUL 1969	4	10500
OS/68138	11706	>	204	۵	TL 332 712	2	02 JUN 1968	ď	7500
OS/68138	11706	>	205	۵	TL 325 712	2	02 JUN 1968	⋖	7500
OS/68138	11706	>	242	۵	TL 321 726	က	02 JUN 1968	4	7500



7500	7600	7600	7700	7700	7300	7600	10000	10000	10000	10000	10000	16		
۷	∢	∢	⋖	∢	⋖	∢	∢	∢	∢	∢	∢	Total	Sortie	S
02 JUN 1968	22 JUN 1981	22 JUN 1981	16 MAY 1989	16 MAY 1989	15 AUG 1995	25 OCT 1997	19 MAR 1993	19 MAR 1993	06 JUL 1993	06 JUL 1993	06 JUL 1993			
က	-	-	7	7	-	က	-	-	က	က	က			
TL 329 727	TL 328 714	TL 323 719	TL 324 719	TL 331 719	TL 325 721	TL 328 718	TL 329 720	TL 325 724	TL 317 718	TL 328 718	TL 338 718			
۵	۵	۵	۵	۵	۵	z	z	z	z	z	z			
243	32	33	904	902	10	55	116	117	91	95	93			
>	>	>	>	>	>	>	>	>	>	>	>			
11706	12482	12482	13499	13499	14995	22372	26789	26789	27252	27252	27252			
OS/68138	OS/81024	OS/81024	OS/89174	OS/89174	OS/95717	OS/97287	ADA/552(V)	ADA/552(V)	ADA/583(X)	ADA/583(X)	ADA/583(X)			

Total 29 Fram es



# Cambridge University Collection of Aerial Photographs

Oblique	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical											
BGU70 (	BGU71 (	BGU72 (	BYA1 (	BYA2 (	BYA3 (	BYA4 (	BYA5 (	BYA6 (	CCL22 (	CLH4 (	PW29 (	RC8AN326	RC8EI100 \	RC8knBO166 \	RC8knBO167 \	RC8knEB249	RC8knEB250 \	ZknPA161 \	ZknPA162 \



## www.google.earth.com (Google Earth) **Google Earth Pro**

Timelines from: 1945: Provided by The Geoinformation Group 1999: Provided by Infoterra and Bluesky Ltd.

2003: Digital Globe satellite 2006: Getmapping Plc 2008: Infoterra and Bluesky Ltd

Also aerial and birdseye aerial imagery at www.Bing.com



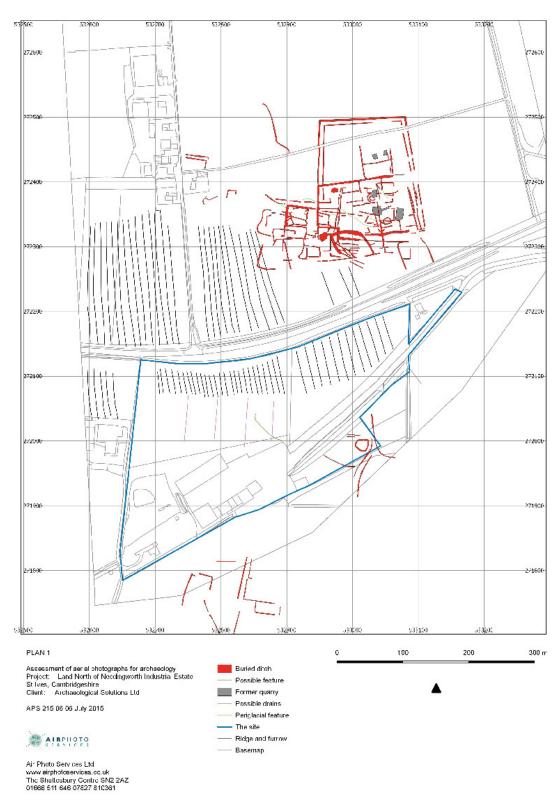
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Plan 1 Assessment of aerial photographs for archaeology





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