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**LAND AT CHADWELL ST MARY,
AREA CENTRED TQ658790,
ESSEX:**

AERIAL PHOTOGRAPHIC ASSESSMENT

REPORT No: 2009/12

OCTOBER 2009

Commissioned by:
Archaeological Solutions Ltd
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**LAND AT CHADWELL ST MARY,
AREA CENTRED TQ658790,
ESSEX:
AERIAL PHOTOGRAPHIC ASSESSMENT**

SUMMARY

This assessment of aerial photographs examined an area of some 24 hectares (centred TQ658790) in order to identify and accurately map archaeological, recent and natural features.

The gravel soils offer good potential for crop-marked archaeological features but there is an area of deeper soil that may mask information in the southern part of the Development Area.

Archaeological features comprise an apparently unstructured series of ditched features of more than one phase. One ditch links these with a larger group of rectangular enclosures to the south-east. Features within the Development area include rectangular fields(?), small enclosures, parts of features of unidentified form, a large (c.40m diameter) circular feature of unknown function, and part of a multi-ditched boundary and/or track.

Original photo interpretation and mapping was at 1:2500 level.

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Rog Palmer MA MIFA

INTRODUCTION

This assessment of aerial photographs was commissioned to examine an area of some 24 hectares (centred TQ658790) in order to identify and accurately map archaeological, recent and natural features and thus provide a guide for field evaluation. The level of interpretation and mapping was to be at 1:2500.

ARCHAEOLOGICAL AND NATURAL FEATURES FROM AERIAL PHOTOGRAPHS

In suitable 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. 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.

Grass sometimes shows sub-surface features through the withering of the plants above them. This may occur towards the end of very dry summers and usually indicates the presence of buried walls or foundations. Such dry summers occurred in Britain in 1949, 1959, 1975, 1976, 1984, 1989 and 1990 (Bewley 1994, 25) and more recently in 1995, 1996 and 2006. This does not imply that every grass field will reveal its buried remains on these dates as local variations in weather and field management will affect parching. However, it does provide a list of years in which photographs taken from, say, mid July to the end of August may prove informative.

Such effects are not confined only to archaeological features as almost any disturbance of soil and bedrock can produce its own range of shadow, crop and soil differences. In and around the present Development Area are pockets of deeper soil that can mask archaeological features as seems probable in the south-western part of the Development Area. The recorded edges of deeper soil deposits may change with the date of photography and the moisture content of the soil. Other features may remain of unknown origin that cannot be classified without specialist knowledge or input from field investigation.

PHOTO INTERPRETATION AND MAPPING

Photographs examined

The most immediately informative aerial photographs of archaeological subjects tend to be those resulting from observer-directed flights. This activity is usually undertaken by an experienced archaeological observer who will fly at seasons and times of day when optimum results are expected. Oblique 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 information.

Vertical photographs cover the whole of Britain and can provide scenes 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. 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. 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.

Cover searches were obtained from the Cambridge University Collection of Aerial Photographs and the National Monuments Record: Air Photographs (NMRAP), Swindon. Photographs included those resulting from observer-directed flights and routine vertical surveys. A small number of additional photographs were taken and held by Air Photo Services. Images current on Google Earth and Flashearth (which includes the Microsoft layer) at the time of this work (September-October 2009) were also examined.

A phone conversation with Sally Gale, Essex HER, established that observer-directed aerial photographs taken by Essex would be duplicated at NMRAP and that the most recent photos, which were not yet at NMRAP, did not cover the Development Area. There may be vertical photographs elsewhere in the County Council offices, but on the basis of what had been mapped from other sources it was decided that these were unlikely to include new information in the Area and they were not examined.

Photographs consulted are listed in the Appendix to this report.

Base maps and control points

Digital data from original survey at 1:2500 or larger scale was used as a background map for this Assessment.

Study Area

Because of the density of archaeological features in this area the Study Area extended about 100m from the Development Site and was sufficient to identify features there that may continue into the Development Area.

Photo interpretation and mapping

All photographs were examined by eye and under slight (2x) magnification, viewing them as stereoscopic pairs when possible. Digital copies of the most informative were transformed to match the digital background map using the specialist program AirPhoto (Scollar 2002). When it seemed beneficial, digital photographs were enhanced using the default setting in AirPhoto before being examined on screen. An area from the current layer of Google Earth showed some archaeological features and was automatically located and calibrated using AirPhoto (Scollar and Palmer 2008). Transformed and geolocated files were set as background layers in AutoCAD Map, where features were overdrawn, making reference to the original prints, using standard conventions. Layers from this final drawing have been used to prepare the figure in this report and have been supplied to the client in digital form.

Accuracy

AirPhoto computes values for mismatches of control points on the photograph and map. In all transformations prepared for this assessment the mean mismatches were less than $\pm 1.50\text{m}$.

COMMENTARY

Soils

The Soil Survey of England and Wales (SSEW 1983) shows the Development Area to be located on well drained soils commonly over gravel (soil association 571w: Hucklesbrook). This soil would account for the excellent record of crop-marked archaeological sites in the general area. South of the Area is a deposit of marine alluvium (soil association 813f: WALLASEA 1). The Soil Survey map shows this deposit to be well south of the Development Area but the map's small scale makes depiction of soil boundaries general rather than very detailed and possibly the areas of deeper soil mapped for this Assessment indicate some of this marine deposit. This soil could cover archaeological deposits and so stop the development of differential crop growth that otherwise and elsewhere indicates the presence of buried archaeological features.

Archaeological features (Figure 1)

In general terms, features in the Development Area comprise a series of variously-shaped ditched enclosures of more than one phase that are linked to a larger group of enclosures (mostly rectangular) to the south-east beyond the present Study Area (see Figure 2: extracted from a more extensive survey by Palmer and Bacilieri 2004).

The ditch coming into the Site from the south-east appears to turn and continue to the north and it may be contemporary with the more rectangular features, possibly fields, to its west. There is a suggestion on the aerial photographs of slightly-deeper soil in the north-east corner of this field which may obscure indications of some buried features. It is, however, too diffuse to map.

Most other features are of more fragmentary appearance and comprise apparent enclosures of small size (to the north of the Area) and larger, rectangular, features in the south. The circular ditch, cut by a modern hedge, is some 40m in diameter which makes it rather large for a burial site unless it was of special significance.

Close to the west edge of the northern field in the Development Area are parts of what may be a multi-ditched track and/or boundary. This was not identified in the 2004 survey and appears to have no continuation north or south of the extent mapped for this Assessment.

Features may be present below the area of deeper soil mapped in the south-west of the Development Site.

Context (Figure 2)

The gravel soils of the area were much used by past communities and aerial photographs have recorded traces of former settlements and land division features. Figure 2 is taken from a recent project whose task was to update maps created by English Heritage's National Mapping Programme for the *Thames Gateway* area (Palmer and Bacilieri 2004). The figure shows some of the sites that surround the Development Area and clarify the link with that Area to the south-east – even though parts of this are lost below deeper soil cover. Continuity of alignment also suggest that a ditch extends west from the Development Area.

It should be pointed out that Figure 2 comes from a low-resolution copy of the original map and that it includes duplicate lines in places where the NMP mapping and the revision did not quite coincide. In the original files [now lost, or held only by CgMs] these were colour coded, but that distinction has been lost in the reduced copy.

Non-archaeological features

Some former field boundaries have been mapped as have the major pockets of deeper soil. One of these is in the south field of the Development Area and shows on some photographs as an area of deeper soil and patterned ground that covers the south-western part of that field. This would effectively mask and indication of archaeological features in that area.

Land use

The Development Area comprises parts of two modern fields separated by a hedge aligned roughly east-to-west. The northern field was in pasture between 1944 and 1955 but has been in arable use on later photographs. The southern field has had occasional arable use (1944, 1970, 1977 and 2007) but otherwise has been pasture or (in 2004 and 2006) possibly set aside. This and the deeper soil deposits explain why the archaeological record is more detailed in the north field.

REFERENCES

- Bewley, R. H., 1994. *Prehistoric Settlements*. Batsford/English Heritage, London
- Palmer, R. and Bacilieri, C., 2004. *East Tilbury Thames Gateway, area centred TQ6779, Essex: aerial photographic revision and update*. Air Photo Services Report 2004/31
- Scollar, I., 2002. Making things look vertical, in Bewley, R.H. and Rączkowski, W., (ed). *Aerial archaeology: developing future practice*. NATO Science Series, Vol 337, 166-172
- Scollar, I. and Palmer, R., 2008. Using Google Earth Imagery. *AARGnews* 37, 15-21
- SSEW, 1983. *Soils of England and Wales: sheet 4: Eastern England (1:250,000)*. Soil Survey of England and Wales, Harpenden

APPENDIX

*Aerial photographs examined**Source: Cambridge University Collection of Aerial Photographs (searched 1 October 2009)*

Oblique photographs

PHOTO	SUBJECT	NGRE	NGRN	DATE
YG68	Crop marks, 2.5 miles E of Grays Thurrock	565700	178500	16 Jun 1959
ADI33	Cropmarks, 3 miles E of Grays Thurrock	566200	178700	14 Jun 1961
ADI34	Cropmarks, 3 miles E of Grays Thurrock	566200	178700	14 Jun 1961
ADI35	Cropmarks, 3 miles E of Grays Thurrock	566200	178700	14 Jun 1961
ADI36	Cropmarks, 3 miles E of Grays Thurrock	566200	178700	14 Jun 1961
AFK13	Cropmarks, 3 miles NE of Grays Thurrock	565600	179700	14 Jun 1962
BBS71	Cropmarks, Mucking, 3 miles ENE of Grays Thurrock	566200	178700	13 Jun 1970
BBS72	Cropmarks, Mucking, 3 miles ENE of Grays Thurrock	566200	178700	13 Jun 1970
BBS73	Cropmarks, Mucking, 3 miles ENE of Grays Thurrock	566200	178700	13 Jun 1970
BBS74	Cropmarks, Mucking, 3 miles ENE of Grays Thurrock	566200	178700	13 Jun 1970
BBS75	Cropmarks, Mucking, 3 miles ENE of Grays Thurrock	566200	178700	13 Jun 1970
BBS76	Cropmarks, West Tilbury, 3 miles ENE of Grays Thurrock	565800	179300	13 Jun 1970
BBS77	Cropmarks, West Tilbury, 3 miles ENE of Grays Thurrock	565900	179100	13 Jun 1970
BBS78	Cropmarks, West Tilbury, 3 miles ENE of Grays Thurrock	565900	179100	13 Jun 1970
BBS79	Cropmarks, West Tilbury, 3 miles ENE of Grays Thurrock	565900	179100	13 Jun 1970
BBS80	Crop patterns, West Tilbury, 3 miles ENE of Grays Thurrock	565600	179000	13 Jun 1970
BIU72	Crop marks, 2.75 miles ENE of Grays	565600	178600	20 Jun 1972
BIU77	Crop marks, 2.75 miles ENE of Grays	565600	178600	20 Jun 1972
BJD10	Crop marks, 2.75 miles ENE of Grays	565600	178600	29 Jun 1972
BJD11	Crop marks, 2.75 miles ENE of Grays	565600	178600	29 Jun 1972
BNB65	Crop marks, Chadwell St. Mary, 3 miles ENE of Grays	565800	179300	11 Jun 1973
BNB82	Crop marks, 3 miles ENE of Grays	565900	178500	11 Jun 1973
BNB83	Crop marks, 2.75 miles ENE of Grays	565600	178600	11 Jun 1973
BPZ38	Crop marks, West Tilbury, 2.75 miles ENE of Grays Thurrock	565900	178500	19 Jun 1974
BPZ39	Crop marks, West Tilbury, 2.75 miles ENE of Grays Thurrock	565600	178600	19 Jun 1974
BVX48	Cropmarks, West Tilbury, 3 miles ENE of Grays	566100	178700	03 Sep 1975
BVX49	Cropmarks, West Tilbury, 3 miles ENE of Grays	566100	178700	03 Sep 1975
BVX50	Cropmarks, West Tilbury, 3 miles ENE of Grays	566100	178700	03 Sep 1975
BVX51	Cropmarks, West Tilbury, 3 miles ENE of Grays	566100	178700	03 Sep 1975

Vertical photographs

PHOTO	DATE	SUBJECT	SCAL	NGRE	NGRN
K17U142	16 Jun 1970	Crop marks, Mucking	3000	565369	179835
K17U143	16 Jun 1970	Crop marks, Mucking	3000	565374	179610
K17U144	16 Jun 1970	Crop marks, Mucking	3000	565379	179385
K17U145	16 Jun 1970	Crop marks, Mucking	3000	565384	179160

Source: National Monuments Record: Air Photographs (cover search 43579)

Specialist collection

<i>Photo reference</i>	<i>Film and frame number</i>	<i>Date</i>	<i>NGR</i>
TQ 6578 / 4	NMR 405 / 152-153	27 JUL 1972	TQ 658785
TQ 6578 / 8	NMR 1144 / 8-11	29 JUL 1977	TQ 655788
TQ 6578 / 14	NMR 18085 / 11	19 JUN 1998	TQ 655788
TQ 6578 / 15	NMR 18085 / 12	19 JUN 1998	TQ 655788
TQ 6578 / 16	NMR 18085 / 13	19 JUN 1998	TQ 655788
TQ 6579 / 1	IMM 9812 / 42	JUN 1970	TQ 659790
TQ 6579 / 2	IMM 9812 / 24	JUN 1970	TQ 658790
TQ 6579 / 4	NMR 405 / 160-162	27 JUL 1972	TQ 655792
TQ 6579 / 5	NMR 405 / 163-164	27 JUL 1972	TQ 655792
TQ 6579 / 7	NMR 398 / 373-375	23 JUN 1972	TQ 657792
TQ 6579 / 8	NMR 398 / 379-383	23 JUN 1972	TQ 655791
TQ 6579 / 10	NMR 498 / 206-209	05 JUL 1973	TQ 657792
TQ 6579 / 12	NMR 707 / 101-114	29 MAY 1974	TQ 655790
TQ 6579 / 13	NMR 810 / 121-123	02 MAY 1975	TQ 658793
TQ 6579 / 19	NMR 1144 / 20-25	29 JUL 1977	TQ 655791
TQ 6678 / 7	NMR 405 / 165-166	27 JUL 1972	TQ 660789
TQ 6678 / 9	NMR 398 / 376-378	23 JUN 1972	TQ 660789
TQ 6678 / 13	NMR 707 / 88-89	29 MAY 1974	TQ 662788
TQ 6678 / 27	NMR 18085 / 07	19 JUN 1998	TQ 662788
TQ 6678 / 28	NMR 18085 / 08	19 JUN 1998	TQ 662788
TQ 6678 / 29	NMR 18085 / 09	19 JUN 1998	TQ 661788
TQ 6678 / 30	NMR 18085 / 10	19 JUN 1998	TQ 662788
TQ 6679 / 8	NMR 707 / 90-98	29 MAY 1974	TQ 662792

Vertical collection (selection)

<i>Sortie number</i>	<i>Library number</i>	<i>Camera position</i>	<i>Frame number</i>	<i>Centre point</i>	<i>Date</i>	<i>Scale 1:</i>
RAF/540/731	1255	RS	4031	TQ 647 790	15 MAY 1952	11000
RAF/540/731	1255	RS	4032	TQ 654 790	15 MAY 1952	11000
RAF/540/731	1255	RS	4033	TQ 662 791	15 MAY 1952	11000
RAF/540/731	1255	RS	4034	TQ 669 792	15 MAY 1952	11000
RAF/58/1017	1342	V	23	TQ 667 796	06 FEB 1953	4680
RAF/58/1017	1342	V	24	TQ 663 796	06 FEB 1953	4680
RAF/58/1017	1342	V	25	TQ 659 796	06 FEB 1953	4680
RAF/58/1017	1342	V	26	TQ 655 796	06 FEB 1953	4680
RAF/58/1017	1342	V	27	TQ 651 796	06 FEB 1953	4680
RAF/58/1019	1344	V	106	TQ 668 784	06 FEB 1953	5000
RAF/58/1019	1344	V	107	TQ 664 784	06 FEB 1953	5000
RAF/58/1019	1344	V	108	TQ 661 784	06 FEB 1953	5000
RAF/58/1019	1344	V	109	TQ 658 784	06 FEB 1953	5000
RAF/58/1019	1344	V	110	TQ 654 784	06 FEB 1953	5000

Chadwell St Mary, area centred TQ658790, Essex: Aerial Photographic Assessment

RAF/58/1019	1344	V	111	TQ 651 785	06 FEB 1953	5000
RAF/58/1019	1344	V	146	TQ 668 789	06 FEB 1953	5000
RAF/58/1019	1344	V	147	TQ 664 790	06 FEB 1953	5000
RAF/58/1019	1344	V	148	TQ 660 790	06 FEB 1953	5000
RAF/58/1019	1344	V	149	TQ 656 790	06 FEB 1953	5000
RAF/58/1019	1344	V	150	TQ 652 791	06 FEB 1953	5000
RAF/58/1019	1344	V	151	TQ 648 791	06 FEB 1953	5000
RAF/540/1543	1638	F22	35	TQ 671 791	04 MAR 1955	10000
RAF/540/1543	1638	F22	36	TQ 666 791	04 MAR 1955	10000
RAF/540/1543	1638	F22	37	TQ 661 790	04 MAR 1955	10000
RAF/58/1779	1649	F22	343	TQ 670 778	06 JUN 1955	10000
RAF/58/1779	1649	F22	344	TQ 664 778	06 JUN 1955	10000
RAF/58/1779	1649	F22	345	TQ 657 777	06 JUN 1955	10000
RAF/58/1779	1649	F22	346	TQ 651 777	06 JUN 1955	10000
RAF/82/1230	1667	F21	30	TQ 669 801	06 JUL 1955	10000
RAF/82/1230	1667	F21	31	TQ 662 801	06 JUL 1955	10000
RAF/82/1230	1667	F21	32	TQ 655 800	06 JUL 1955	10000
RAF/82/1230	1667	F21	33	TQ 648 800	06 JUL 1955	10000
RAF/58/720	3436	Vp3	5088	TQ 654 794	06 JUN 1951	2880
RAF/58/720	3436	Vp3	5089	TQ 660 795	06 JUN 1951	2880
RAF/58/720	3436	Vp3	5106	TQ 663 787	06 JUN 1951	2880
RAF/58/720	3436	Vp3	5107	TQ 657 786	06 JUN 1951	2880
RAF/58/720	3436	Vp3	5108	TQ 651 785	06 JUN 1951	2880
RAF/HLA/694	8600	RP	3007	TQ 662 782	26 MAR 1944	10750
RAF/HLA/694	8600	RP	3008	TQ 666 787	26 MAR 1944	10750

Most informative photographs

CUCAP:

BBS 77, 79, 80
BNB 65
K17-U 145

NMRC:

TQ6579/2
TQ6579/4/161
TQ6579/7/374
TQ6579/10/208
TQ6676/13/89
TQ6679/8/91

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Air Photo Services has consulted only those aerial photographs specified. It cannot guarantee that further aerial photographs of archaeological significance do not exist in collections that were not examined.

Due to the nature of aerial photographic evidence, Air Photo Services cannot guarantee that there may not be further archaeological features found during ground survey which are not visible on aerial photographs or that apparently 'blank' areas will not contain masked archaeological evidence.

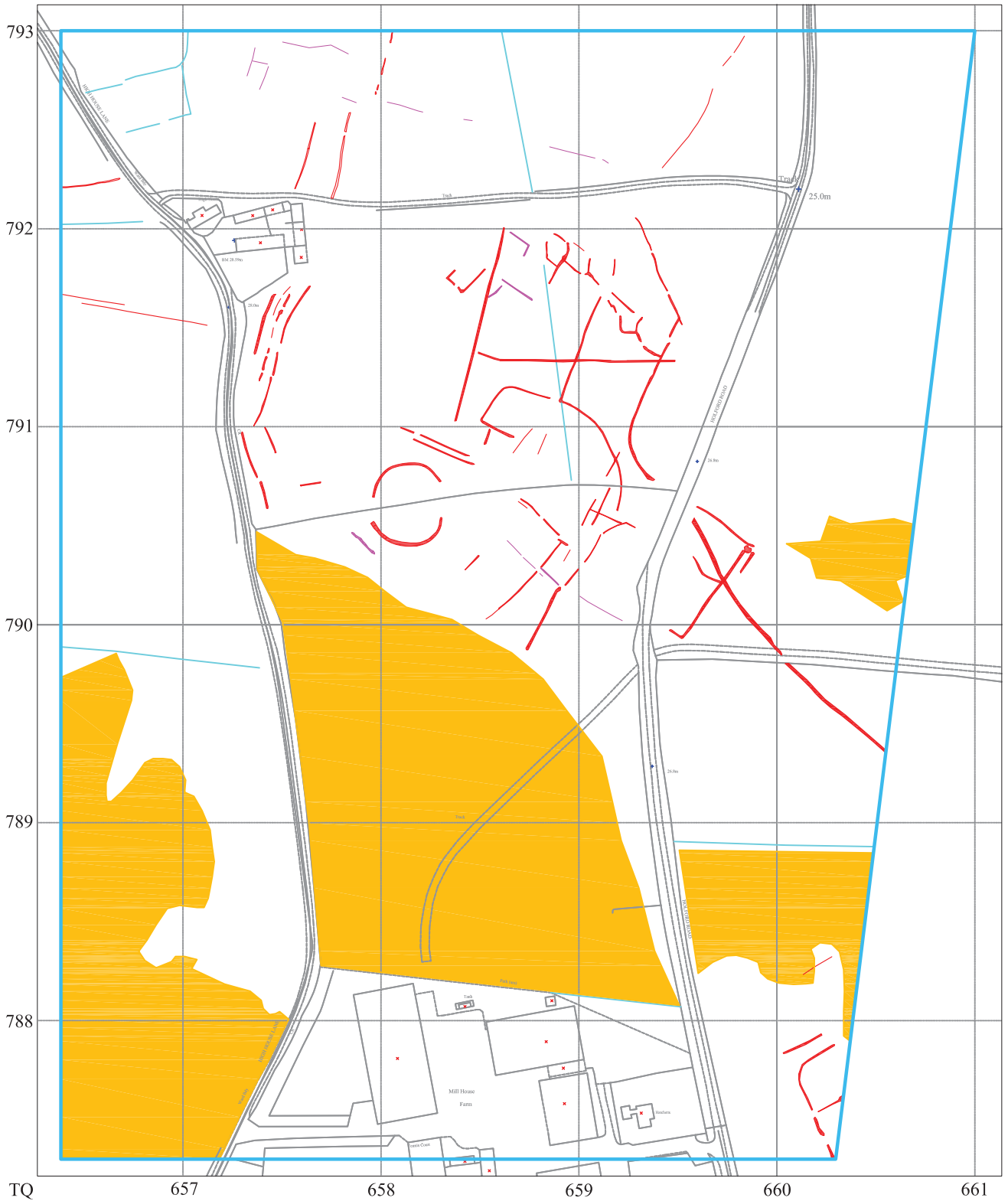
We suggest that if a period of 6 months or more elapses between compilation of this report and field evaluation new searches are made in appropriate photo libraries. Examination of any newly acquired photographs is recommended.

That the original working documents (photo lists, comments, control information, and digital data files) will remain the property of Air Photo Services and be securely retained by it for a period of three years from the completion date of this assessment after which only the digital files may be retained.

It is requested that a copy of this report be lodged with the relevant Sites and Monuments Record within six months of the completion of the archaeological evaluation.

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Chadwell St Mary, Essex:
 Figure 1. Features identified on aerial photographs

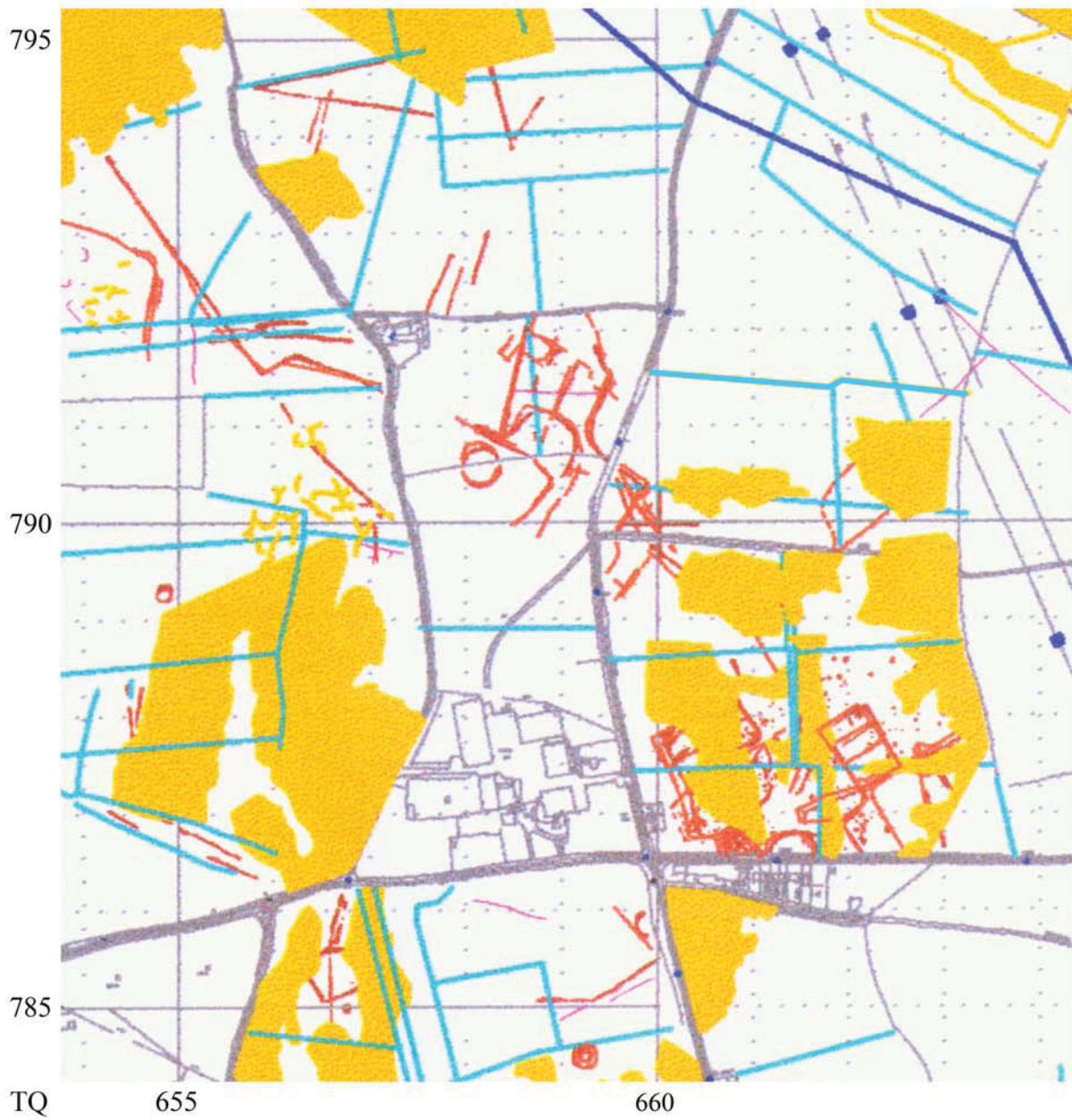


- Study area
- Archaeological features
- Ditch or pit
- Possible ditch
- Recent features
- Field boundary
- Natural features
- Deeper soil

Original photo interpretation and mapping at 1:2500 level based on photographs at CUCAP, NMRC and internet sources.

Air Photo Services Cambridge
 October 2009
 Drawing: 0912ChadStMary.dwg

Chadwell St Mary, Essex:
Figure 2. Context from aerial photographs



- Archaeological ditch
- Deeper soil
- Recent field boundary
- Pipeline

From Palmer and Bacilieri 2004:
revision of 1:10,000 mapping