

Guildford Pipeline, Pewley to Netley Mill, Surrey

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land at Guildford Pipeline, Pewley to Netley Mill, Surrey (located between NGR 500562, 149017 (western perimeter) & NGR 506652, 148270 (eastern perimeter)). The project was commissioned by GHD Ltd with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site as a route for a new water pipeline linking Pewley Reservoir and Netley Mill Water Treatment Works, Shere.

The site comprises arable and pasture fields located to the East of the town of Guilford in West Surrey, England. The survey area is situated between Pewley down and Netley Mill, Surrey covering an area of 19.9 ha. The geophysical survey was undertaken between 06 – 10th March 2023. The survey has not identified any anomalies that can confidently be interpreted as archaeology.

There are however anomalies of possible archaeological origin and several features related to the historical use of the site for agriculture. The majority of the anomalies identified are most likely to be representative of medieval to post-medieval land management and cultivation, reflecting the continuing rural nature of the site as recorded in historical mapping OS and parish tithe mapping. No anomalies have been identified from the early medieval, prehistoric, or Romano-British periods, however for several anomalies no confident origin has been able to be determined from the geophysical data alone.

Ditch features in the north-west of the site likely relate to either boundaries created for a proposed early 20th century housing scheme that was never built, or infrastructure relating to the use of a post-medieval quarry immediately beyond the site boundary.

Various other ditch-like anomalies were detected across the site. One linear anomaly however may relate to an old trackway or ditch forming part of a previous field system. It is within the same field and on the same orientation (although not the same location) as a 'supposed Pilgrims Way' marked on historical mapping and may be associated with this pathway.

Variations in the underlying deposits have been detected across the site, with a clear difference in the magnetic background between the chalk to the north, and the bands of mudstone, sandstone, and siltstone that the majority of the site contains.

The remaining identified features were agricultural and likely modern in origin including drains, ploughing trends, and magnetic disturbance.

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The fieldwork was undertaken by Pamela Warne and Jake Bishop. Lydia Jones processed the geophysical data, wrote the report, and prepared the illustrations. Lydia Jones and Jake Bishop interpreted the geophysical data. The geophysical work was quality controlled by Tom Richardson. The project was managed on behalf of Wessex Archaeology by Patricia Edwards.



Guildford Pipeline, Pewley to Netley Mill, Surrey

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by GHD Ltd. to carry out a geophysical survey at Guildford Pipeline, Pewley to Netley Mill, Surrey (between NGR 500562, 149017 (western perimeter) & NGR 506652, 148270 (eastern perimeter)) (Figure 1). The survey forms part of an ongoing programme of archaeological works being undertaken in support of a planning application for the development of the site as a new water pipeline linking Pewley Reservoir and Netley Mill Water Treatment Works, Shere.

1.2 Scope of document

1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The site

- 1.3.1 The site is located east of the town of Guilford in the county of Surrey. The survey area is situated between Pewley down and Netley Mill.
- 1.3.2 The survey comprises 19.8 ha of agricultural land, currently utilised for a mixture of pasture and arable, and Pewley Down Nature Reserve. The site is bounded by Guildford to the west, with agricultural land and woodland to the south and north. The village of Shere bounds the south-eastern extent of the site. Various roads run alongside and bisect the site including Halfpenny Lane in the west, and Guildford Lane and Water Lane in the centre. The eastern extent of the site is bounded to the south by the A25.
- 1.3.3 The site is undulating and varies in elevation from 114 m above Ordnance Datum (aOD) in LP_001 at the western extent, up to 120 m aOD in LP_009, and then decreases to 90 m aOD in LP_020 at the eastern extent.
- 1.3.4 The site runs along the interface between various solid geologies. To the north-west are deposits of Chalk of the Holywell Nodular Chalk Formation and New Pit Chalk formation which LP_001 003 sit within. To the east of this, are deposits of Chalk of the West Melbury Marly Chalk formation and Zig Zag Chalk formation which is recorded within LP_010 and LP_011. To the very south is Sandstone of the Folkestone formation. The Chalk and Sandstone are separated by narrower bands of Mudstone of the Gault formation, and Siltstone and Sandstone of the Upper Greensand formation. The majority of the site is a combination of east-west oriented bands of Mudstone, Sandstone, and Siltstone (BGS, 2023).
- 1.3.5 The majority of the site has no recorded superficial deposits however clay, silt, sand, and gravel Head deposits are recorded within LP_003-005, LP_012-014 and LP_018-020 (BGS, 2023).
- 1.3.6 The soils underlying the majority of the site are likely to consist of brown rendzinas of the 343g (Newmarket 2) association. The soils in the south of LP_003 and LP_004 005 are likely to consist of humo-ferric podzols of the 631d (Shirrell Heath 2) association. The soils



of LP_014 – 020 are likely to be either brown calcareous earths of the 511g (Coombe 2) association or humo-ferric podzols of the 631d (Shirrell Heath 2) association as these fields run along the border between the two (SSEW SE Sheet 6 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 The archaeological and historical background was assessed in a prior desk-based assessment (DBA) (Shaikhley, 2022), which considered the existing archaeological information within a 500 m radius of the site boundary (as it was in August 2022). The DBA gathered information from the Historic Environment Record (HER) held by Surrey County Council, extensive practical knowledge of the archaeology of the area, maps from the Surrey History Centre, examination of secondary historical works as well as examination of aerial photographs and LiDAR for anomalies within the course of the pipeline corridor. The findings of the DBA, adjusted to 500 m from the site boundary as provided to Wessex in February 2023 (Figure 1), are presented below.

2.2 Summary of the archaeological resource

- 2.2.1 Within the 500 m radius around the proposed pipeline site, there are 25 designated assets which consist of various listed buildings, 4 scheduled monuments, and 1 park and garden.
- 2.2.2 The scheduled monuments include the site of a Bronze Age bowl barrow (NHLE 1009480) located 70m south of LP_005 close to Tyting Farm. It is located on a rise in the Lower Greensand. It measures 13 m in diameter and 0.7 m high, likely dating from the Late Neolithic period to the Late Bronze Age. There are three scheduled earth circles on St Martha's Hill (NHLE 1002976) located 440 m south of LP_007. They are considered likely to be plantation rings, associated with tree planting for Chilworth Manor to the south.
- 2.2.3 To the west of the site are various post-medieval listed buildings. On the south-east edge of Guildford, 400 m to the west of LP_001, are two Grade II listed buildings from the post-medieval period, Semaphore House (NHLE 1377890) and Chantry Dene (NHLE 1096031). A Grade II purpose built vagrants ward, an addition to the Guildford Workhouse (NHLE 1379815), is located 500 m to the north of LP_001.
- 2.2.4 To the south, 430 m from LP_007 and LP_008, is the Church of St Martha on the Hill (NHLE 1029553) that dates from around 1850 in its current form, but incorporates parts of an older structure and is close to the scheduled earthen circles mentioned above (NHLE 1002976). The Grade II listed post-medieval building, St Martha's Priory, with associated buildings and structures (NHLE 1393416) are located 320 m south of LP 005.
- 2.2.5 There are various post-medieval agricultural buildings located in the surrounds of the site, including Warren Farm House and associated barn (NHLE 1029197 & 1293969) 500 m north of LP_002, and White Lane Farmhouse (NHLE 1188246) and associated barn (NHLE 1029572) 50 m to the south of LP_012.
- 2.2.6 The listed Grade I park and garden Albury Park (NHLE 1000299) is located 20 m from LP_018 020 on the opposite side of the A25. The park consists of a mid-17th century terrace, bath house, and tunnel surviving from a garden designed by John Evelyn. Various listed buildings are located within the scheduled park area and 500 m of the site including the early medieval Grade I Church of St Peter and St Paul and associated Grade II vault (NHLE 1294958 & 1377724), a Grade II* post-medieval Catholic church and chapterhouse (NHLE 1029568), Grade II* bath house and terrace (NHLE 1029566), a Grade II 15th century hall house Cooks Place (NHLE 1294853), a Grade II former post-medieval inn



- Grange Cottages (NHLE 1187982), and a post-medieval model farm complex Home Farm west and east range (NHLE 1117007 & 1319675).
- 2.2.7 On the western edge of the village of Shere, 500 m to the east of LP_020, are various post-medieval dwellings including Denton (NHLE 1029466), Gareth The Old Cottage (NHLE 1377798), Lime Cottage (NHLE 1294203), and Knapps Cottage (NHLE 1377797).

Mesolithic

2.2.8 Upper Palaeolithic and Mesolithic material in the wider area is rare on chalklands, however Mesolithic material is much more frequent on Upper Greensand. Finds from the Mesolithic period have been discovered in the surrounding 500 m area including a dwelling site with hearth, microliths, ash pits, flints, and chipping floors (MSE2263) 285 m south of LP_017, and flints (MSE4361) 170 m south of LP_017.

Neolithic

2.2.9 Neolithic sites in the wider area were generally focused around river locations. Chalkland was used as a resource for flint and potentially pasture, however there is little Neolithic evidence from Lower Greensand areas. On the north-western edge of LP_012, a collection of six Neolithic flint flakes (MSE3126) was discovered. There are also a number of finds of Neolithic flintwork in the area surrounding the site. These include scrapers, small saws, boring tools, and rough arrowheads, as well as two pounding stones, cores, and upwards of 200 flakes (MSE290) discovered 480 m to the south, and a broken Neolithic polished flint axe (MSE282), 455 m to the west of LP_001 respectively. A collection of Neolithic flakes and one axe (MSE296), was found 200 m south of LP_003. Excavations in 1963 and 1966/67, revealed a broken polished greenstone axe and pottery sherds (MSE2264) 250 m to the south of LP_017. A Neolithic flint artifact (MSE3134) was recorded 60m south of LP_013.

Bronze Age

- 2.2.10 Bronze Age material has been recovered from the Chalk downs however it is limited to pottery, metalwork, and flint finds. However in many of the Lower Greensand areas agricultural activity intensified leading to widespread clearance.
- 2.2.11 A Bronze Age settlement site (MSE363) consisting of round houses, hearths/ovens, pits, post-hole clusters, and a levelled area was uncovered during excavations during 1961 63 250 m to the south of LP_017 at Weston Wood. A collection of Bronze Age flint implements (MSE2237) were found in and around St Martha's Hill, 430m to the south of LP_007 and LP_008. Around 120 m south of LP_018, a collection of possible Bronze Age struck flints (MSE6946) was discovered during fieldwalking.

Iron Age

Iron Age material in the form of clay pellets, likely used as shots, found in the wider area suggests the area was used as a hunting ground during this period. A kiln discovered 300 m south of LP_005 points to the area being regularly used, and potentially inhabited during the Iron Age. The Weston Wood settlement (MSE363) dating back to the Bronze Age was also used during the Early Iron Age. Located 250 m to the south of LP_017 Iron Age pottery sherds, a loom-weight, and a sandstone rubber were excavated in around 1960. A Late Iron Age quarter gold stater, in "British Remic" style with a triple-tailed horse design (MSE332) is recorded 80 m south of LP_001. A La Tene I fibula or brooch (MSE2793) was found in 1933, 380 m north of LP_005.



Romano-British

2.2.12 A concentration of villa sites have been found along the Greensand band which runs along the south of the Downs, which allowed access to chalk areas in the north used for pasture, and a cremation site at Merrow points to a, as yet undiscovered, settlement somewhere in the wider area. Evidence of Roman era activity in and around the site however is minimal, consisting of the possible route of the Farley Heath to Bagshot road passing through LP_013, Romano-British cremation burials found 70 m to the south of LP_005 (MSE2234), a pottery sherd (MSE2235) found 220m south of LP_003, and a human skull associated with a Roman spearhead found 340m north of LP_005 in 1901.

Saxon

2.2.13 Lower Greensand was used as grazing for the animals belonging to the permanent settlements in the North Downs. The early medieval Grade I Church of St Peter and St Paul and associated Grade II vault (NHLE 1294958 & 1377724) located 480 m to the south of LP_020 has its origins in the Saxon period. There is no direct evidence of settlement in the wider area, however some evidence from place names can be seen in the wider area. The manor of Shalford, 2 km to the south of LP_001, is first mentioned in Domesday Book as Scaldefor in 1086. The village of Shere, 800 m to the east of LP_020, is also first mentioned in Domesday Book as Essira, 1086.

Medieval

2.2.14 Tytings Farm, located 50 m from LP_006, is recorded in the Domesday Book in 1086. A private chapel from the 13th century was incorporated into the farmhouse. A collection of three 13th century Grey/Brown Sandy ware sherds including a rim, along with a thin scatter of post-medieval pottery and tile fragments (MSE6947) was recorded during field walking 100 m south of LP_018. An extant medieval boundary bank and ditch is located 250 m to the north of LP_014. To the south, 430 m from LP_007, is the Church of St Martha on the Hill (NHLE 1029553) that dates from around 1850 in its current form but incorporates parts of an older structure. It is likely to be associated with one of the three churches mentioned in the Domesday book as standing on the manor of Bramley.

Post-Medieval

2.2.15 Various farmsteads, dwellings, and churches are located in the vicinity of the site dating from the post-medieval period, including listed buildings. A trackway is labelled as 'supposed' Pilgrims Way on the 1870 OS map 70 m to the south of LP_014. Historical Ordnance Survey (OS) mapping also show various quarries in the surrounding area including one marked as 'Old Quarry' 20 m to the south of LP_001 in the 1870 OS mapping, one 470 m to the south of LP_001 and a quarry and kiln 550 m to the north of LP_001, suggesting that chalk was being quarried to convert into lime. Another kiln is recorded 120 m south of LP_017 on the 1870 OS mapping. The remains of Pewley Hill Mobilisation Centre or "Fort" erected circa 1890 AD as part of a London defence scheme (MSE331) lie 280 m to the west of LP_001. A hilltop building dating from 1905 and a garden dating from 1921 (MSE13529) are situated 100 m to the west of LP_001.

Modern

2.2.13 The area continued to develop into the modern period, and the presence of World War II structures is particularly noticeable. An anti-tank block (MSE6340) and an anti-tank pimple (MSE6426) are located 70 m north of LP_017. The site of an airplane crash from the war (MSE17035) lies 200 m south of LP_007. A pillbox (MSE6475) is sited 110 m south of LP_013.



2.2.16 A series of linear parch marks and shallow depressions, some potentially within LP_001, are recorded on Pewley Down. It is considered likely that these relate to plot division within a proposed earth 20th century residential development that was never built, or potentially to the quarry recorded 20 m to the south of LP 001.

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between the 06 10 March 2023. Field conditions at the time of the survey were dry at the start, and subsequently deteriorated to snow which caused waterlogged conditions. An overall coverage of 14.7 ha was achieved. Overgrown vegetation (LP_010 011) and waterlogged muddy conditions (LP_013 (partial), LP_015 017) made various fields unsurveyable.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:
 - To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
 - To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.
- 3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:
 - To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
 - To clarify the presence/absence of anomalies of archaeological potential; and
 - Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

- 3.3.1 The cart-based gradiometer system used a Carlson RTK GNSS instrument, which receives corrections from a network of reference stations operated by the OS. Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceeds European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).
- 3.3.2 The detailed gradiometer survey was undertaken using four Bartington Grad-01-1000L gradiometers spaced at 1 m intervals and mounted on a non-magnetic cart. Data were collected with an effective sensitivity of 0.03 nT at a rate of 10 Hz, producing intervals of 0.15 m along transects spaced 4 m apart.

3.4 Data processing

3.4.1 Data from the survey were subjected to minimal correction processes. These comprise a 'Destripe' function (±5 nT thresholds), applied to correct for any variation between the



- sensors, and an interpolation used to grid the data and discard overlaps where transects have been collected too close together.
- 3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

- 4.1.1 The detailed gradiometer survey has identified magnetic anomalies across the site. Results are presented as a series of greyscale plots (**Figs. 4, 6, 8, 10, 12, 14, 16 & 18**) and archaeological interpretations (**Figs. 5, 7, 9, 11, 13, 15, 17 & 19**) at a scale of 1:2000. The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image.
- 4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends (**Figs. 5, 7, 9, 11, 13, 15, 17 & 19**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.
- 4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.
- 4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.
- 4.1.5 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g., CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

4.2 Gradiometer survey results and interpretation

- 4.2.1 Various linear anomalies have been identified across LP_001 (**Figure 5**). Three parallel linear anomalies (**4000 4002**) have been identified in the west of LP_001. **4001** and **4002** are strongly positive, whilst **4000** is weakly negative. They are 30 m long by 1.7 m wide and transect the area on a north south orientation. They are spaced 32 m and 95 m apart respectively. A smaller sub-rectilinear positive anomaly (**4003**) has been identified 4.5 m to the west of **4000**. It has three sides and covers an area of 30 m x 1.7 m with its northern edge open. The anomalies exhibiting a positive signal (**4001 4003**) are typical of ditched features, whilst the negative (**4000**) is more typical of an embankment. They are considered likely to relate to previously identified cropmarks which are thought to relate to plot divisions within a proposed residential development that was never built, or infrastructure relating to the quarry recorded on historical mapping 20 m to the south of LP_001. It is also possible, given their regular morphology that they are drains, however further investigation would be needed to determine their origin.
- 4.2.2 Four weakly positive linear anomalies (**4004**) have been detected in the east of LP_001 (**Figure 5**). Three are straight and are between 10 11 m long by 0.6 1.5 m wide. The eastern-most anomaly is L-shaped and measures 20 m long by 1.5 m wide. They are typical of ditched features. The anomalies are located 7 m to the north-west of an old trackway (**4011**) and so may be related to this, or to general agricultural or modern use of the field.



- 4.2.3 A weakly positive linear anomaly (**4005**) (**Figure 7**) has been detected in LP_003. It is 35 m long by 3 m wide and is oriented north south. It does not correlate with any features seen on available historical OS mapping or satellite imagery. It may be a ditched archaeological feature however an origin relating to the agricultural use of the land is equally likely.
- 4.2.4 Two weakly negative curvilinear anomalies (**4006**) have been detected in LP_007 (**Figure 13**). LP_007 has an enhanced magnetic background caused by modern fencing and agricultural practices as well as natural variations in the underlying deposits. The anomalies detected are therefore difficult to interpret. The northern anomaly measures 20 m long by 1.5 m wide, and the southern 11 m long by 1 m wide. They are 7 m apart from each other at their western ends and together form a discontinuous circular shape with a diameter of 17.8 m. The negative magnetic signal is typical of an embankment or stone structure, however in certain conditions ditched features may also exhibit a negative signal. They may form part of a circular enclosure or possible ring ditch, however a more modern agricultural, or geological, origin cannot be ruled out.
- 4.2.5 A further weakly negative linear anomaly (4007) (Figure 13) measuring 10 m long by 0.8 m wide has been detected crossing into the centre of the two curvilinear anomalies (4006) on a south-west to north-east orientation. The relationship between the three anomalies is not clear, however their similar magnetic signals indicate they are similarly formed. Two positive curvilinear anomalies have also been detected in the vicinity of 4006 and 4007. They are less distinct and their form is difficult to determine, a more modern agricultural origin is therefore just as likely.
- 4.2.6 A fragmented positive linear anomaly (**4008**) (**Figure 13**) has been detected in LP_009. It is oriented north south measuring 20 m in length and 1 1.3 m wide with a 6 m gap fragmenting the anomaly at the centre. This may have formed one continuous ditched feature. Immediately to the north of LP_007 a field boundary on the same orientation as the ditch is visible on satellite imagery. Given this alignment plus the morphology of the ditch it is likely a former continuation of this field boundary.
- 4.2.7 Two weakly positive curvilinear anomalies (**4009**) (**Figure 13**) have been detected in LP_009, one with a pit-like anomaly immediately to its east. They measure between 13 14 m long and 0.7 1.5 m wide. They are typical of ditched features, however their morphology does not provide a clear understanding of their origin and whilst they could be archaeological, a geological origin, such as variation in the natural subsoil, is more likely.
- 4.2.8 A strong positive linear anomaly (**4010**) (**Figure 17**) has been detected in LP_014. It traverses the area on a north-west to south-east orientation and measures 107 m long by 2.5 m wide. It is on the same orientation as the 'supposed Pilgrim's Way' marked on the 1870 OS mapping which is still visible as a path 150 m to the south, within the same field. It is possible, given the similar orientation, that this is a footpath associated with this Pilgrim's Way, however the Pilgrim's Way is visible on satellite imagery (Google Earth, 2023) and expressed topographically in LiDAR data (Shaikhley, 2022), whilst **4010** is not. It is typical of a ditched feature and may be part of an old field system or trackway.
- 4.2.9 A weak negative linear anomaly (**4011**) (**Figure 19**) has been detected in LP_018. It is oriented east-south-east to west-north-west and measures 45 m long by 0.7 m wide. Analysis of features that have been expressed topographically in LiDAR data (Shaikhley, 2022) demonstrate that beyond LP_018 is an area of ridge and furrow. It is probable that this is either a remnant or ridge and furrow cultivation, or an unmapped field boundary.



- 4.2.10 A strong positive L-shaped linear anomaly (**4012**) (**Figure 5**) has been detected in LP_001. It measures 84 m in length and is 1 3.4 m wide. It traverses the field on a north-east to south-west orientation. It is visible in the 1840 parish tithe mapping as a former path (Shaikhley, 2022).
- 4.2.11 A strong positive and negative linear anomaly (**4013**) (**Figure 7**) has been detected in LP_003. It is 16 m long by 2.5 m wide and traverses the field on a south-west to north-east orientation. It correlates with a modern field boundary seen on satellite imagery between 1999 2004 (Google Earth, 2023).
- 4.2.12 A strong positive and negative discontinuous linear anomaly (**4014**) (**Figure 15**) has been detected in LP_013. It is 43 m in length and 3.4 11 m wide. It correlates with a field boundary (or at least a boundary of a change in usage between two sections of the field) seen in the OS 1:10,560 Air Photos (1948 51/04 N.W), and lines up with a field boundary in the field immediately to the south.
- 4.2.13 Various areas of magnetic disturbance have been detected across the site. Most of these are considered to be modern and/or agricultural in origin. In LP_001 at **4015** (**Figure 5**) a linear anomaly oriented north-west to south-east measuring 6.4 m x 60 m has been detected. From satellite imagery (Google Earth, 2023) it can bee seen that this is where people routinely walk, and therefore has potentially been surfaced at some point. Similarly **4016** (**Figure 17**), a strong linear feature measuring 17 m long by 6.5 m wide detected in LP_013, is also a path as seen on satellite imagery (Google Earth, 2023) and in OS mapping back to 1870 (25 inch map series).
- 4.2.14 Various areas of enhanced magnetic signal have been detected across the site in LP_003, 009, 012, and 019 (Figs. 7, 13, 15 & 19) which are considered typical of variations on the underlying deposits. At 4017 (Figure 15) a strong positive band, with surrounding negative signal is seen crossing LP_012 east west. This is in the same location as a steep north south slope and is considered likely to be related to the natural processes associated with this slope and its underlying deposits. The magnetic background of the site is relatively homogenous in LP_001 003 (Figure 5). From the very south of LP_003 and all subsequent fields there is a magnetically enhanced mottling effect in the data. This reflects the change in underlying geology from chalk to bands of mudstone, sandstone, and siltstone.
- 4.2.15 Various narrow positive and negative anomalies have been detected across the site. These are likely representative of the sites agricultural past in the form of cultivation and modern drainage.
- 4.2.16 Strong magnetic linear anomalies on various orientations have been detected within LP_002 004, 006, 012, 018 020 (**Figs. 5, 9, 11, 15 & 19**). These are interpreted as modern services.

5 DISCUSSION

5.1.1 The detailed gradiometer survey has not identified any anomalies that can confidently be interpreted as archaeology. There are however anomalies of possible archaeological origin and several features related to the historical use of the site for agriculture. The majority of the anomalies identified are most likely to be representative of medieval to post-medieval land management and cultivation, reflecting the continuing rural nature of the site as recorded in historical mapping OS and parish tithe mapping. No anomalies have been identified from the early medieval, prehistoric, or Romano-British periods, however for



- several anomalies no confident origin has been able to be determined from the geophysical data alone. In addition to these, anomalies interpreted as natural and modern have been identified.
- 5.1.2 Ditch features in the north-west of the site likely relate to either boundaries created for a proposed early 20th century housing scheme that was never built, or infrastructure relating to the use of a post-medieval quarry immediately beyond the site boundary.
- 5.1.3 Various other ditch-like anomalies were detected across the site. Some of the linear anomalies are likely to be former, unmapped field boundaries or related to previous cultivation. One linear anomaly however may relate to an old trackway or ditch forming part of a previous field system. It is within the same field and on the same orientation (although not the same location) as a 'supposed Pilgrims Way' marked on historical OS mapping and may be associated with this pathway, such as an older or alternative route. Several curvilinear anomalies are more uncertain in origin, however one forms a circular shape and could reflect an enclosure or ring ditch.
- 5.1.4 Several other features that indicate the historical use of the landscape were identified, pertaining to mapped field boundaries, paths, and trackways.
- 5.1.5 Variations in the underlying deposits have been detected across the site, with a clear difference in the magnetic background between the chalk to the north, and the bands of mudstone, sandstone, and siltstone that the majority of the site contains.
- 5.1.6 The remaining identified features were agricultural and likely modern in origin including drains, ploughing trends, and magnetic disturbance.



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Google Earth website http://earth.google.com (accessed March 2023)

Historic England (HE) https://historicengland.org.uk (accessed March 2023)

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APPENDICES

Appendix 1 Survey equipment and data processing

Survey methods and equipment

The magnetic data for this project were acquired using a non-magnetic cart fitted with four SenSys FGM650/3 magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 0.6 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of $\pm 8~\mu T$ over $\pm 1000~nT$ range. All of the data were then relayed to a CS35 tablet, running the MONMX program, which is used to record the survey data from the array of FMG650/3 probes at a rate of 20 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Carlson BRX7 system. This receives corrections from a network of reference stations operated by the Ordnance Survey, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Post-processing

The magnetic data collected during the survey is downloaded from the system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

Typical data and image processing steps may include:

- GPS DeStripe Determines the median of each transect and then subtracts that value from
 each datapoint in the transect within the defined window. May be used to remove the striping
 effect seen within a survey caused by directional effects, drift, etc.
- Discard Overlaps Intended to eliminate a track(s) that have been collected too close to one
 another. Without this, the results of the interpolation process can be distorted as it tries to
 accommodate very close points with potentially differing values.
- GPS Base Interpolation Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).

Typical displays of the data used during processing and analysis:

Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength
of the signal at each measurement point. These plots can be produced in colour to highlight
certain features but generally greyscale plots are used during analysis of the data.





Appendix 2 Geophysical interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further subdivided into three groups, implying a decreasing level of confidence:

- Archaeology used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from nonmagnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend used for low amplitude or indistinct linear anomalies.
- Superficial geology used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



Appendix 3 OASIS form

Project Details:

Project Details	s:							
Project name		Guildford Pipeline, Pewley to Netley Mill, Surrey						
Type of project		Detailed gradiometer survey (Field evaluation)						
Project description		The detailed gradiometer survey has not identified any anomalies that can confidently be interpreted as archaeology. There are however anomalies of possible archaeological origin and several features related to the historical use of the site for agriculture. The majority of the anomalies identified are most likely to be representative of medieval to post-medieval land management and cultivation, and reflect the continuing rural nature of the site as recorded in historical mapping OS and parish tithe mapping No anomalies have been identified from the early medieval, prehistoric or Romano-British periods, however for several anomalies no confident origin has been able to be determined from the geophysical data alone. In addition to these, anomalies interpreted as natural and modern have been identified. Ditch features in the north-west of the site likely relate to either boundaries created for a proposed						
Project dates		early 20th century housing scheme that was never built, or infrastructure relating to the use of a post-medieval quarry immediately beyond the site boundary. Various other ditch-like anomalies were detected across the site. Some of the linear anomalies are likely to be former, unmapped field boundaries or related to previous cultivation. One linear anomaly however may relate to an old trackway or ditch forming part of a previous field system. It is within the same field and on the same orientation (although not the same location) as a 'supposed Pilgrims Way' marked on historical OS mapping and may be associated with this pathway, such as an older or alternative route. Several curvilinear anomalies are more uncertain in origin, however one forms a circular shape and could reflect an enclosure or ring ditch. Several other features that indicate the historical use of the landscape were identified, pertaining to mapped field boundaries, paths, and trackways. Variations in the underlying deposits have been detected across the site, with a clear difference in the magnetic background between the chalk to the north, and the bands of mudstone, sandstone, and siltstone that the majority of the site contains. The remaining identified features were agricultural and likely modern in origin including drains, ploughing trends, and magnetic disturbance. Start: 06-03-2023 End: 10-03-2023						
Previous work		DBA						
Future work								
Project Code:	PN274770	HER event no.		If relevant	OASIS form	wessexar1-514389		
-		NMR no.		N/A ID:				
		SM no.		N/A				
Planning Application	Ref.							
Site Status		None						
Land use		Agricultural						
Monument type		N/A Period N/A						
Project Location:								
Site Address Pewley Down, Pewle		ey Hill, Charlotteville, Guildford		Postcode		GU1 3SN		
County	unty Surrey District Guildford			Parish		St Martha, Albury, Shere		
Study Area	58 ha	Height OD	82 – 120 m aOD		NGR		500562, 149017	
Project Creators:								
Name of Organisatio	n	Wessex Archaeology						
Project brief originat	or	GHD Ltd. Project design		n originator		GHD Ltd.		



Project Manager		Patricia Edwards		Project Supervisor			Lydia Jones		
Sponsor or funding	body	GHD Ltd.		Type of Sponsor			Private		
Project Archive and Bibliography:									
Physical archive	Physical archive N/A		Geophysical survey and report		Paper Archive		N/A		
Report title	Guildford Pipeline Pe	uildford Pipeline Pewley to Netley Mill, Surrey, Terrestrial Geophysics Report Date					2023		
Author	Nor Wessex Archaeology Description Unpublished report			Report ref.	PN274770.02				





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