National Grid

River Eden Pipeline Diversion

Archaeological Trial Trenching Evaluation

JULY 2014

RSK GENERAL NOTES

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Summary

National Grid is replacing a short section of gas transmission pipeline crossing beneath River Eden, west of Low Crosby, Cumbria (National Grid Reference 343715, 559301).

This document describes the results of the archaeological evaluation of a working area in a field to the north of the River Eden, carried out between 6th – 9th May 2014.

In total, 8 trial trenches were excavated, measuring a total length of 261m (x 1.5m wide).

Archaeological remains were identified on the higher-ground to the north of the site only and comprised undated simple non-intersecting negative features. There is no evidence in the form or fill of the recorded cut features to suggest a specific historic land-use for the site. No artefactual material was recovered and there were no remains to indicate waste disposal into the features or deliberate back-filling. Overall, these features appear to have infilled naturally.

Trench 7, excavated through a meandering linear hollow exposed the full profile of a deep silted palaeochannel, a tributary of the River Eden. There were no remains to indicate waste disposal into the feature or deliberate back-filling and the palaeochannel appears to have infilled naturally, perhaps from the post-medieval period onwards.

If radiocarbon dating of the primary fill of palaeochannel is considered worthwhile then samples could be submitted for this purpose.

Options for archaeological mitigation comprise preservation in situ, or advance 'strip, map, and record', and thereby 'preservation by record' of any further archaeological remains within the proposed working area.

1 INTRODUCTION

National Grid is replacing a short section of gas transmission pipeline crossing beneath River Eden (**Figure 1**), west of Low Crosby, Cumbria. The development proposals include the establishment of a working area in a field to the north of the River Eden, centred on National Grid Reference 343715, 559301 (**Figure 2**).

No previous fieldwork has been carried out at this location to prove whether the projection of a Roman Road is correct, nor determine the state of preservation, archaeological significance, or extent of potential archaeological remains.

Through agreement with the statutory archaeological advisor to Cumbria County Council (CCC), a programme of pre-construction intrusive archaeological works by 'trial-trenching' was defined in a written scheme of investigation (WSI) (RSK, March 2014).

This document describes the results of the evaluation, carried out between 6th – 9th May 2014 and prepared by RSK Environment Ltd (RSK) on behalf of National Grid Gas Plc ("National Grid").

1.1 Standards

RSK is a Registered Organisation with the Institute for Archaeologists (IfA). RSK's work is undertaken to the highest professional standards: this document has been prepared with reference to the IfA's *Standard and Guidance for Archaeological Field Evaluation* (2013) and *Code of Conduct* (2014).

RSK operate a quality management system, which enables it to qualify for ISO 9001.

National Grid's commitments for all UK projects are set out in their Stakeholder, Community and Amenity Policy. These require National Grid to do what it reasonably can when formulating relevant proposals, to mitigate the potential environmental effects of its operations.

1.2 Monitoring

Method statements (RSK, March 2014) were approved by CCC in advance of works.

In accordance with the WSI notification of the start of site works was made to CCC by RSK to arrange opportunities to visit the works and CCC were suitably informed of progress throughout the evaluation.

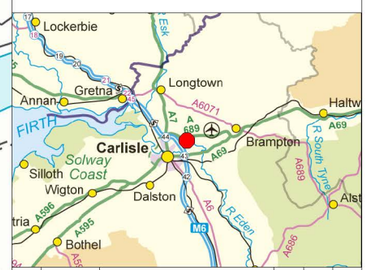
1.3 Acknowledgements

Fieldwork was carried out by Gerry Martin (Gerry Martin Associates) and Owen Raybould (RSK). Biological assessment by John Carrott (Palaeoecology Research Services Ltd. This report was prepared by Owen Raybould (RSK). Technical review was by Andy Towle (RSK). RSK would like to thank Mark Whittaker (National Grid) for Project Management, and Conrad Rees (National Grid) for supervision.

Fairholme Farm
Track
BIRKY LANE
22m
Issues
Playing Field
Low Crosby Bridge
East Lodge
Beck Farm
Cycle Path
West House
Willow Beck
Eden Grove
West Lodge
Hotel
21m
Ganavan
Brantwood
Fifestones
Park Broom
Eden View
Warwick
16m
Track

Legend :

- Proposed Temporary Working Area
- Existing 900NB Carlisle to Samlesbury HP Pipeline
- Proposed Diversion
- Trench Location



Rev	Date	Description	Drn	Chk	App
00	15-05-14	First Draft	AJ	SP	RD

River Eden

RSK

Title :

Figure 1:
Site Location/Trench Location Plan

0 0.1 0.2
Kilometres
Scale = 1:5,000 @ A3

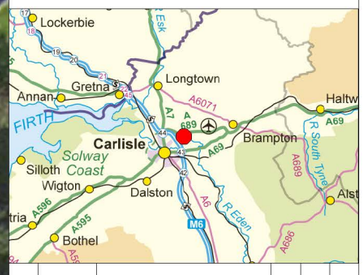
N W E S

REV 00

File Name : P660321 - River Eden\01-GIS\Trench Location Plan.wor

Legend :

- Proposed Temporary Working Area
- Area Not Used
- Archaeological Feature [20]
- Trench location
- Existing 900NB Carlisle to Samlesbury HP Pipeline
- Proposed Diversion
- 2 Trench Number



Rev	Date	Description	Drn	Chk	App
00	15-05-14	First Draft	AJ	SP	RD

River Eden

RSK

Title :

Figure 2:
Excavation Results

0 24 48
Metres
Scale = 1:1,200 @ A3

N W E S

REV 00

File Name : P660321 - River Eden\01-GIS\Excavation Results.wor

2 BACKGROUND

2.1 Project description

The 550m length of pipeline runs between NGR co-ordinates 343727, 559341 and 343926, 558901 (**Figure 1**). The diversion begins on the north bank of the river, where a Horizontal Directional Drill (HDD) will be made under the River Eden to a compound on the south side, and the replacement pipeline pulled through from the south side. From each end of the HDD a short section of pipeline will be constructed using an open cut technique to a tie-in pit located above the existing pipeline.

2.2 Archaeological background

An Environmental Report (RSK, March 2014) for the site identified the presence of a number of non-designated heritage assets recorded on the Cumbria Historic Environment Record in the vicinity; these include the projected line of a Roman road within the northern field.

2.3 Site description

The general topography of the site is 'shelf-like'; the northern portion of the site, adjacent to the current road (A689) overlooks the southern portion of the site, adjacent to the River Eden, with a relatively steep drop between the levels around halfway across the field (see **Figure 3**). This is considered to be a naturally-formed river terrace.

Figure 3. 'Shelf-like' site topography of site visible in background. (Extent of Trench 9 in foreground). Looking north east

Entering through the eastern site boundary, a large meandering linear hollow runs from the adjacent field and peters out in the direction of the river (see **Figure 4**).

Figure 4. Meandering linear hollow entering site eastern boundary. Looking east

The site lies at between 18.7m AOD (north of site) and 16.0m AOD (south of site).

Current land use is pasture.

2.4 Geology

The British Geological Survey website (http://www.bgs.ac.uk/) records the solid geology at the site as a combination of the Kirklinton Sandstone Formation and the St Bees Sandstone Formation, as detailed below:

- The Kirklinton Sandstone Formation forms part of the Sherwood Sandstone Group, has a thickness of up to 90 metres and comprises fine to medium grained red, locally white, strongly cross-bedded sandstone with abundant millet seed grains; and
- The St Bees Sandstone Formation forms part of the Sherwood Sandstone Group and has a recorded thickness of between 340 and 627 metres. It is described as red-brown, very fine to medium grained, commonly micaceous sandstones, generally cross bedded with some parallel lamination.

Drift geology at the site consists of alluvium fluvial deposits, which are normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel.

A recent stage of geotechnical site investigations confirmed the drift stratigraphy as light brown silty sand overlaying light brown grey gravelly sand (Jacobs a, b, 2014).

3 METHODOLOGY

3.1 Objectives

The objectives of the trial trenching evaluation were to:

- Establish the presence/absence, character and preservation state of any archaeological remains;
- Make a competent record of the location and character of any such remains;
- Recover any archaeologically significant artefacts;
- Recover biological samples of any material which has potential for the survival of palaeoenvironmental or dating evidence from secure archaeological context;
- Prepare a report on the findings and material recovered;
- Identify whether or not any further mitigation works are necessary;
- Deposit an archive with an appropriate repository.

3.2 Fieldwork methodology

All trenches were physically set out using a Leica Smartnet GPS unit.

All trench locations were scanned using a Cable Avoidance Tool (CAT) by accredited RSK personnel, prior to, and throughout excavations.

Stripping of turf and topsoil was carried out by a 360° excavator equipped with a toothless ditching bucket, and under constant archaeological supervision by RSK archaeologists. Excavation was directed by the monitoring archaeologists and proceeded in spits to the depth of potential archaeological survival; i.e. all topsoil and subsoil was removed to the first archaeological horizon or underlying naturally deposited geological material, whichever was encountered first.

Where exposed, archaeological were recorded and excavated stratigraphically and all relationships investigated. Sufficient of any archaeological features or deposits were hand excavated in order to provide the information required.

Each context was recorded on a *pro-forma* context sheet by descriptive and measured description.

All archaeological deposits were recorded by drawn plans (scale 1:20 or 1:50 as appropriate) and sections (scale 1:10 or 1:20 as appropriate).

The Ordnance Datum height of all principal features and levels was calculated and plans and sections are annotated with Ordnance Datum heights.

A full photographic record (digital SLR) was maintained in order to record each feature, the site, and landscape context, including an appropriate scale measure.

The treatment of artefacts and biological samples was in accordance with the IfA's *Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* (IfA Finds Group 2008).

3.3 Biological remains

Assessment methodology for preserved biological remains is presented in the full assessment report which is included as Appendix 2.

4 RESULTS

The extent of excavated archaeological trench locations is depicted on **Figures 1 & 2**.

In total, 8 trial trenches were excavated, measuring a total length of 261m (see below). The trenches were excavated the width of a standard machine bucket (1.5m).

Trench	X	Y	X	Y	Notes
1	Not excavated				Area preserved from development impact at landowner request
2	343646	559436	343659	559421	20m
3	Not excavated				Area preserved from development impact at landowner request
4	Not excavated				Area preserved from development impact at landowner request
5	343663	559307	343678	559321	20m
6	343694	559267	343707	559252	20m
7	343761	559387	343773	559348	43m, lengthened to investigate landscape feature (see **Figure 4**)
8	343777	559311	343791	559325	20m
9	343640	559293	343708	559222	98m
10	343660	559387	343677	559398	20m, extended to 'T-shape' at western end in order to define identified archaeological remains
11	343660	559442	343672	559426	20m

Trench 9 (98m length) was placed to target a Roman road suspected to run through the site. The exact line not being known the length of the trench aimed to intercept with the road wherever it crossed through the site western boundary.

Trench 7 was placed across a substantial linear hollow entering the site's eastern boundary with the intention of clarifying whether the landscape feature was natural, or perhaps related to the suspected Roman road. Once opened across the base of the hollow, the decision was made to extend the trench to the south in order to investigate the 'shoulder' of the hollow, in case any road was located on the higher, drier ground.

The remainder of the trenches were randomly placed in order to investigate the prehistoric/general archaeological potential of the site.

The above trial trench locations were approved by CCC through submission of the WSI for the works. The extension of trenches 10 and 7 was carried out with telephone approval.

In addition, trench 11 which was added to the scope of works in order to investigate a prominent landscape feature identified once site works had begun.

4.1 General findings

No remains of a Roman road were identified during the course of the works.

Archaeological remains were identified on the higher-ground to the north of the site only (i.e. trenches 2, 10 & 11) and comprised simple non-intersecting negative features.

Trench 7, excavated through a meandering linear hollow exposed the full profile of a deep silted natural palaeochannel.

Trenches 1, 3 & 4 were not excavated and trenches 5, 6, 8 & 9 were empty of any archaeological remains other than an extensive network of land drains (described in Appendix 1 but not mapped on figures).

4.1.1 Artefacts

No dating evidence was retrieved from any of the archaeological features excavated and recorded.

4.2 Trenches

4.2.1 Trench 1

Not excavated.

4.2.2 Trench 2

A single gully [20] was exposed running into the eastern baulk, 5.8m from the south end of the 20m-long trench (**Figure 5**).

The gully measured 0.25m in width / 0.05m deep and was filled with sterile light grey sand (21). The upper interface was disturbed by bioturbation.

Figure 5. Trench 2 looking south east. Gully [20] (21)

4.2.3 Trench 3

Not excavated.

4.2.4 Trench 4

Not excavated.

4.2.5 Trench 5

No archaeological remains. See Appendix 1 for stratigraphy.

4.2.6 Trench 6

No archaeological remains. See Appendix 1 for stratigraphy.

4.2.7 Trench 7

At the lowest point of the meandering linear hollow a naturally silted palaeochannel was excavated by machine (**Figures 6 - 9**).

Figure 6. Trench 7 looking south. Full extent of palaeochannel pre-excavation in foreground. Scale 2m

The palaeochannel was 11m wide / 1.9m deep with the deepest point offset slightly to the north indicating the outside of a bend (evident on **Figure 2**). The sides of the feature were gently-sloping and slightly concave.

The palaeochannel contained three main fills. (More subtle laminations are no-doubt preserved but the depth of excavation prevented hand-cleaning for closer inspection.)

The primary fill (73) was 1.15m depth, very soft and rich with high levels of organic preservation, dark brown with a peaty texture, high water content and contained whole tree branches as well as other organic materials.

The secondary fill was 0.35m depth of a sterile pale-grey silt-sand, likely further natural silting following the water channel becoming defunct.

The final tertiary fill was 0.14m depth of light-yellow sand and likely redeposited natural that has migrated down the former watercourse slope (i.e. colluvium).

Figure 7. Trench 7 looking south. Palaeochannel [70] with succession of fills (73), (72) & (71). Scale 2m

Figure 8. Palaeochannel [70] mid-excavation. Detail of organic fill (73). Looking north

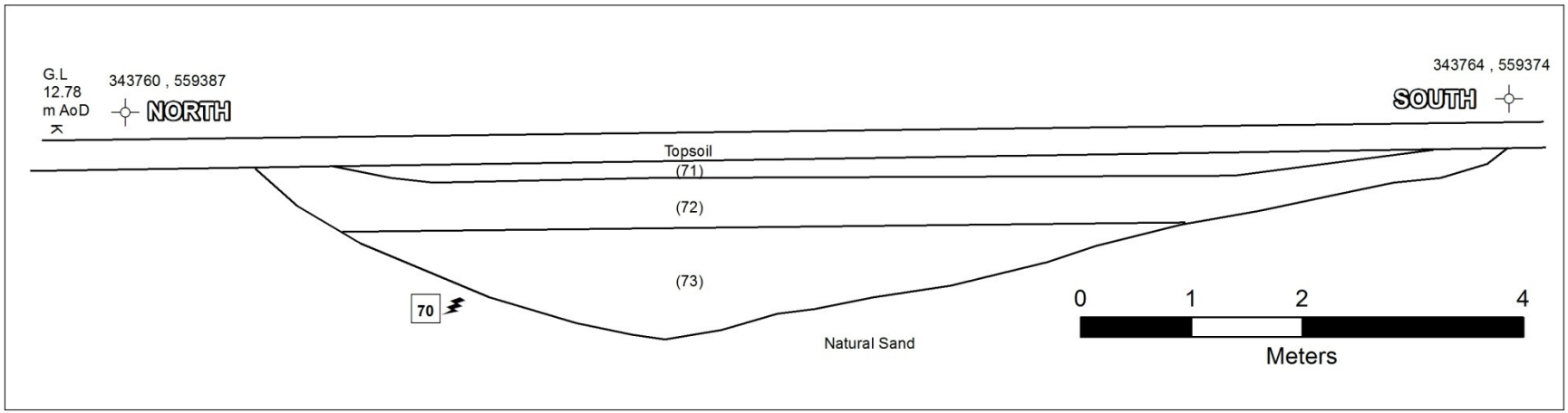


Figure 9. Trench 7, Palaeochannel [70] section

4.2.8 Trench 8

No archaeological remains. See Appendix 1 for stratigraphy.

4.2.9 Trench 9

No archaeological remains. See Appendix 1 for stratigraphy.

4.2.10 Trench 10

At the western end of 20m-long trench 10 a pit [101] was exposed, excavated into natural sands (**Figures 10 - 14**).

The oval shaped pit [101] measured 2.7m x 1.1m and the long-axis was orientated north north west - south south east. The profile was 0.23m deep, U-shaped, with steep-sloping sides and shallow sloping ends.

The feature was filled with grey-brown sand-clay (102) with some charcoal flecking which was more mottled with clean light yellow sand toward its northern end.

The trench was extended 6.6m to the south and 7.6m to the north, in alignment with the long-axis of the pit in order to identify any associated remains/potential pit alignment, however, no other archaeological remains or features were present.

As across the majority of the site, the pit was cut and overlain by later land drains.

Figure 10. Trench 10 looking north. Pit [110] pre-excavation. Scale 2m.

Figure 11. Trench 10 extended area looking north. Pit [101] (102). Scale 2m

Figure 12. Trench 10 looking south south west. Pit [101] (102) post-excavation detail. Scale 2m

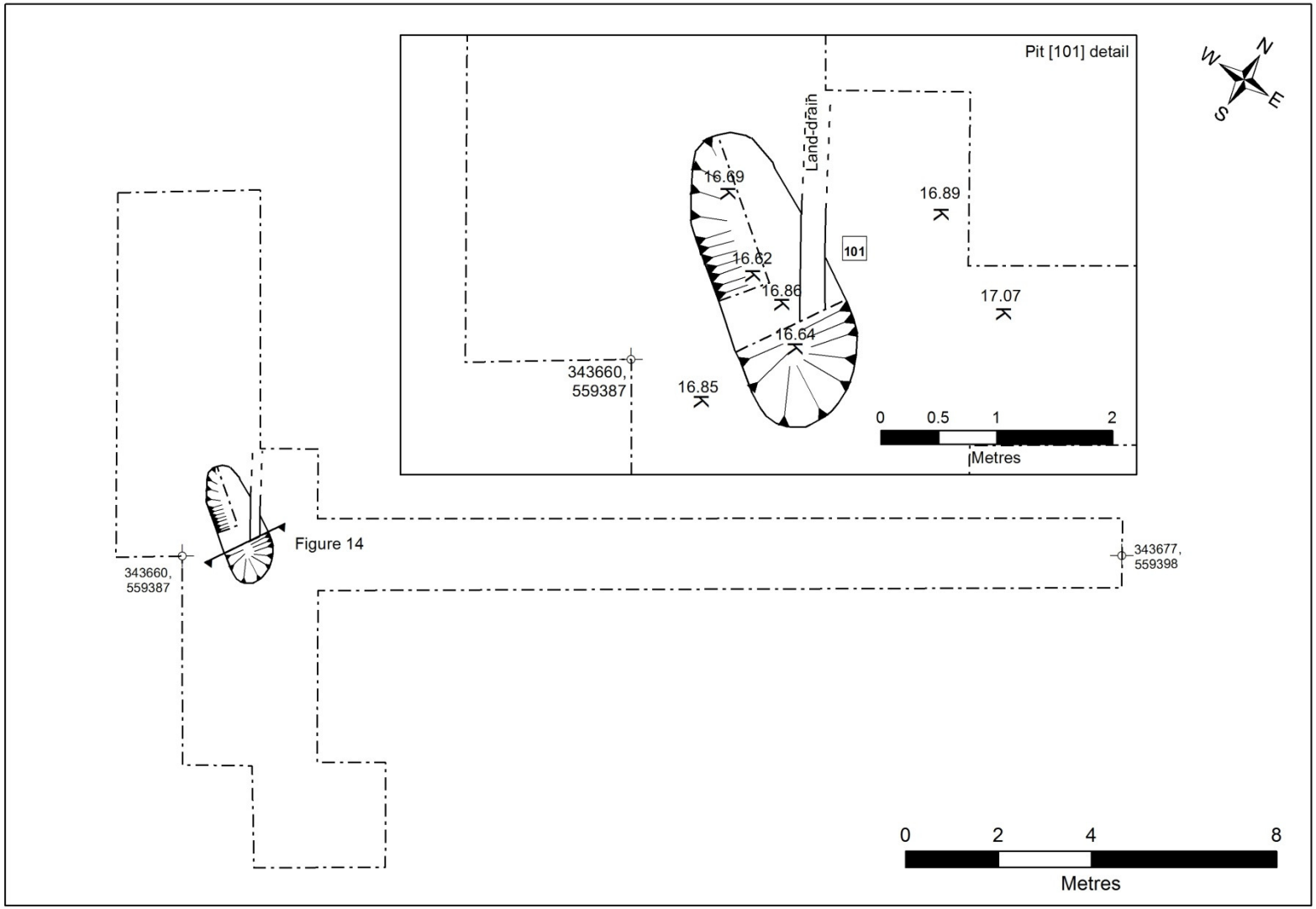


Figure 13. Trench 10 / Pit [101] plan

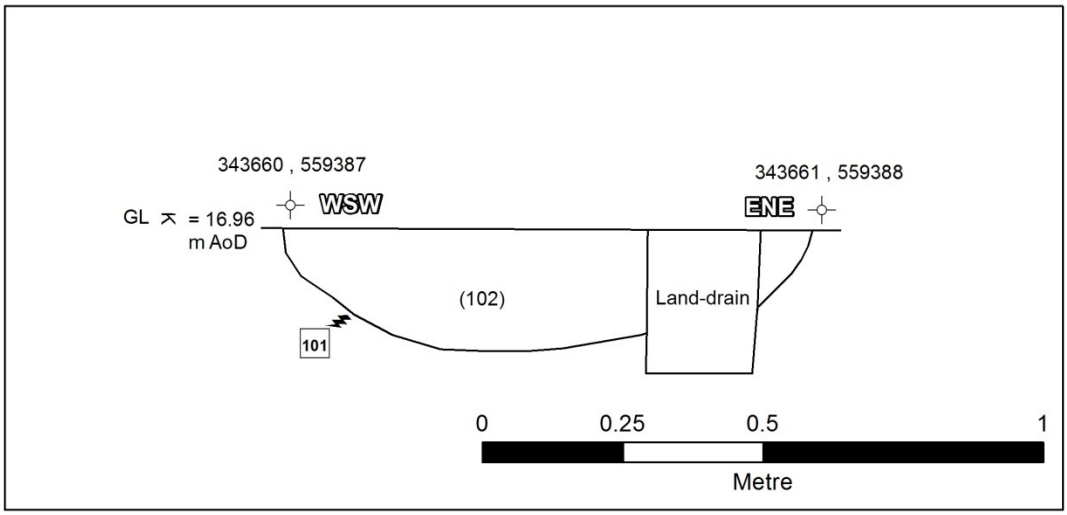


Figure 14. Trench 10. Pit [101] section

4.2.11 Trench 11

Trench 11 was investigated following the excavation of trenches 2 and 10, once it became apparent that the only archaeological remains within the site were located on the higher 'shelf'. Trench 11 was therefore excavated through the field's high-point, a slight mound (evident on **Figures 2 & 4**).

The natural horizon at the base of the trench was slightly stepped in two locations, in accordance with the slight mound visible on the ground surface (**Figures 15 & 16**).

Figure 15. Trench 11 pre-excavation. Ditch [110] in foreground. Stepped natural horizon visible in background. Looking south. Scale 2m

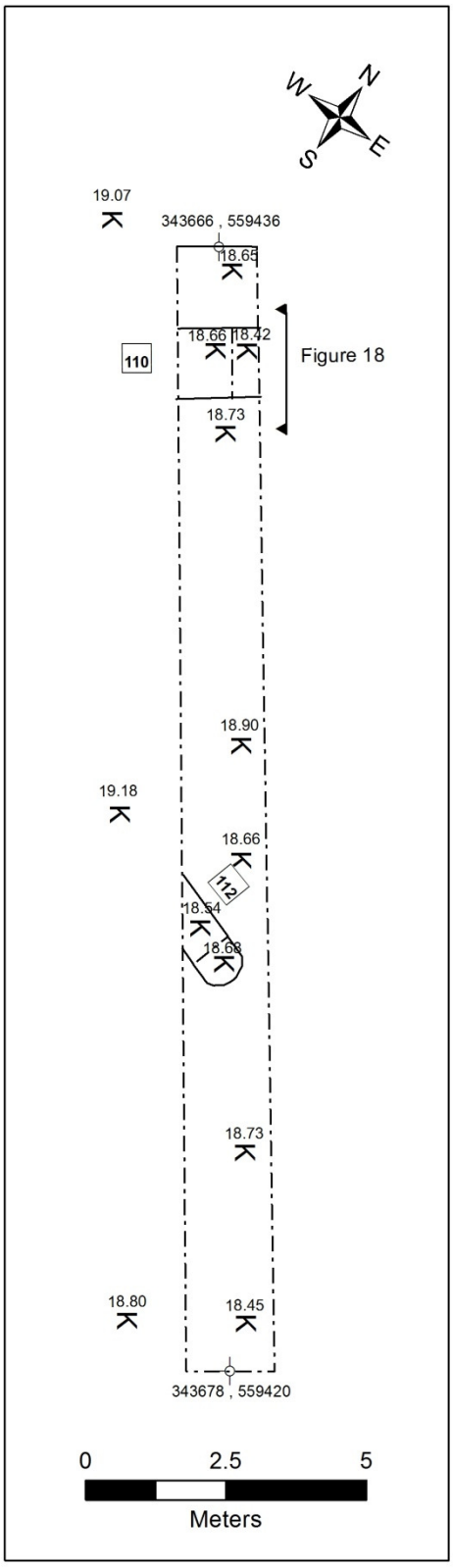


Figure 16. Trench 11 / Ditch [110], Gully [112] plan

Ditch

Two metres south of the northern end of the 20m-long trench was an east-west aligned ditch [110], 1.2m in width and 0.3m deep (**Figures 16 - 18**). The feature was U-shaped with a rounded base and contained a single, dark brown clay-silt homogenous fill (113). There was no evidence for re-cutting of the ditch.

The ditch was cut through by a later land-drain to the south.

Figure 17. Trench 11 looking east. Ditch [110] (113) section. Scale 2m

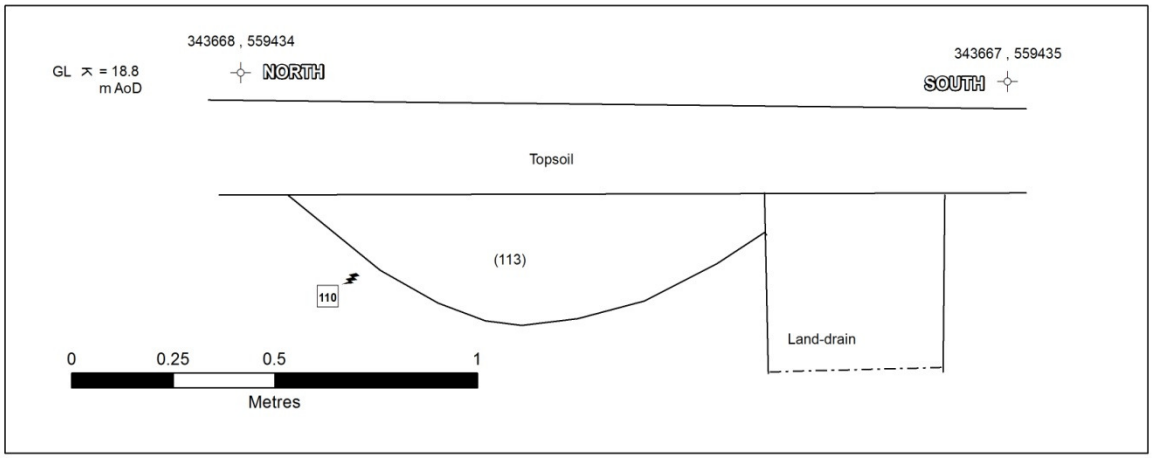


Figure 18. Trench 11. Ditch [110]

Gully

Seven metres north of the southern end of the trench, 1.5m of a shallow gully [112], similar to [20] exposed in trench 2 was exposed running into the trench western baulk. The gully [112] was 0.70m wide / 0.10m deep and filled with sterile grey sand (114) (**Figures 16 & 19**).

Figure 19. Trench 11 looking north west. Gully [112] (114). Scale 20cm

Tree-throw

In the precise centre of the trench a tree-throw [111] (**Figure 20**) was hand excavated.

Figure 20. Trench 11 looking north west. Tree throw [111]. Scale 20cm

4.3 Assessment of biological remains

Five bulk sediment samples ('GBA'/'BS' *sensu* Dobney *et al.* 1992) were submitted to Palaeoecology Research Services Limited, Kingston upon Hull, for assessment of their bioarchaeological potential from the following fills (contexts):

Trench 7

- Context 73 [primary fill of palaeochannel 70 – sample from base of deposit]
- Context 73 [primary fill of palaeochannel 70 – sample from upper part of deposit]

Trench 10

- Context 102 [fill of oval pit 101]

Trench 11

- Context 113 [fill of ditch 110]
- Context 114 [fill of shallow gully 112]

The full assessment report by John Carrott, Palaeoecology Research Services (PRS) Ltd is included as Appendix 2.

5 DISCUSSION AND POTENTIAL

5.1 Roman road

Following the archaeological evaluation across the extent of the site, the lack of evidence for a Roman road is unsurprising, given the soft and waterlogged natural deposits encountered. The lower 'shelf' of the site's topography is likely to have operated as a flood-plain.

The better-drained higher ground to the north of the site is a more likely location for any Roman road which may or may not have been present. (The source of the projected line annotated on the first edition OS mapping is unknown.) Indeed, the only archaeological remains identified throughout this phase of investigation were recorded on the higher ground, indicating a focus for previous activity.

It is possible that any Roman road is located beneath/in the vicinity of the current A689.

5.2 Historic land-use and date

Other than the conclusion that the focus of any previous activity was on higher ground within the site boundary, overlooking the River Eden and its tributaries, there is no evidence in the form or make-up of the recorded cut features to suggest a specific historic land-use for the site.

None of the archaeological features are dated through form or artefactual evidence.

The function and significance of the archaeological features is therefore speculative:

Ditch [110]

Possible former field boundary.

Although a boundary at this location is not evident on the historic map sequence, the 1868 first edition OS shows former east-west boundaries dividing the site into smaller land-parcels, and it is entirely likely that additional boundaries existed prior to the mapping event.

Gullies [20] & [112]

The shallow, sterile features may be animal burrows.

Pit [101]

The natural silting of the feature indicates that the removal of material may have been the primary function, and therefore may be the result of sand extraction.

5.2.1 Biological remains (by PRS Ltd.)

Ancient macrofossil remains recovered from the samples from the fills of archaeological features, pit [101], ditch [110] and gully [112], were restricted to traces of charred plant remains in the form of indeterminate charcoal (largely less than 2 mm) and of no interpretative value. Microfossil remains were also few, being confined to occasional

poorly preserved pollen grains and spores and, other than to indicate the presence of ferns (Polypodium), alder (Alnus) and ?hazel/birch (cf. Corylus/Betula) at the time of the formation of the fill of gully [112], similarly lacking in interpretative potential.

No artefactual material was recovered and there were no remains to indicate waste disposal into the features (e.g. bones of domestic animals) or deliberate back-filling (e.g. larger stones/rubble); cinder and coal from pit [101] were present at no more than 'background' levels.

Overall, these features appear to have infilled naturally, and gradually given the very fine-grained nature of the deposits, and were probably located at some remove from any contemporary human habitation; consistent with interpretations that pit [101] may simply have been created by the extraction of sand, ditch [110] may be a former field boundary, and shallow gully [112] may actually be the result of animal burrowing.

Although the trace levels of charcoal recovered from each of the deposits could provide sufficient charcoal for dating (via AMS) this material was poorly preserved and none was identifiable or of determinable age of wood growth. Charcoal of indeterminate species and wood age cannot be recommended for radiocarbon dating as the associated 'old wood' problems may result in a radiocarbon date significantly earlier (but by an unknown amount) than the charring event being returned. Concerns regarding the presence of intrusive/contaminant material (e.g. rootlet) within the deposits, and the likely consequent bioturbation and possible displacement of such small quantities of fine remains, also add considerable uncertainty to the validity of dating the deposits as a whole via radiocarbon dating of occasional charred plant remains.

5.3 Possible terracing

A slight mound within the site boundary was investigated through Trench 11 and revealed a high-point in the underlying natural deposit exhibiting a stepped/terraced profile. The 'mound' is therefore considered to be a natural feature, and there is every chance that the terraced profile is also formed naturally, however, given the presence in the vicinity of occasional archaeological features, the possibility that the profile of the ground-surface has been manipulated should not be discounted.

The reason/function for altering the profile of the natural low mound, if this was in fact anthropogenic in origin, is unknown.

5.4 Palaeochannel

The palaeochannel is clearly a tributary of the River Eden. As previously noted for the archaeological features (above), there were no remains to indicate waste disposal into the feature or deliberate back-filling and the palaeochannel appears to have infilled naturally.

The silting progression of the palaeochannel initially involved clogging with organic material, most likely as water flow reduced (for an unknown reason, possibly a human factor upstream, or possibly due to natural/climatic factors). The topography of the landscape as defined by the former watercourse is such that subterranean water flow is

channelled towards the palaeochannel, keeping the contained organic deposits waterlogged. This would explain the rather poor preservation as the regular influx of oxygenated surface water draining into the fills of the palaeochannel would prevent the formation of the anoxic conditions that result in a cessation of decay and the excellent waterlogged preservation seen at some archaeological sites.

The upper fluvial deposit is sterile and appears waterborne; possibly representing the final movement of muddy deposits along the channel.

An upper layer of redeposited natural represents natural migration of sand and clay deposits down the slope of the former river channel, to come to rest in the natural hollow low-point (colluvium).

The palaeochannel [70] (along with the archaeological features identified during the evaluation) appears to have silted naturally/fluvially.

5.4.1 Biological remains (by PRS Ltd.)

Given that anoxic waterlogged conditions do not appear to have developed within the deposit and yet quite large quantities of plant material still survive (albeit mostly robust 'woody' material and poorly preserved), it is most likely that the palaeochannel started to infill relatively recently, perhaps from the post-medieval period onwards.

The two samples from the upper and basal parts of the primary fill (Context 73) of palaeochannel [70] each yielded relatively large quantities of waterlogged plant remains, together with traces of indeterminate (or non-diagnostic) invertebrate remains and, from the basal sample, a little indeterminate charcoal. Preservation of the waterlogged plant material was, however, generally poor (particularly in the upper sample) and the only identifications possible were of a whole hazelnut (*Corylus*) and probable hazel roundwood twigs in the material from the basal sample (the largest piece of roundwood from this sample might also be identifiable to species given further study); the bulk of the remains from both samples being indeterminate 'woody' detritus.

Occasional pollen grains and spores were recorded in the microfossil subsamples from both samples. Ferns and alder were again indicated, together with grasses, and a few other taxa would probably be identifiable to further study but, overall, the remains were too few and too poorly preserved to be of any significant interpretative value.

Although of no real interpretative value, the hazelnut and roundwood twigs (those of only a few years growth even if this is not precisely determinable and species identifications cannot be achieved) would provide sufficient suitable material for radiocarbon dating (via AMS) should this be considered worthwhile.

If radiocarbon dating of the primary fill of palaeochannel [70] is considered worthwhile then the waterlogged hazelnut from the basal sample and twig fragments from both samples could be submitted for this purpose.

The absence of any associated archaeological features makes the dating of the palaeochannel less archaeologically useful than might otherwise be the case.

6 CONCLUSIONS / RECOMMENDATIONS

6.1 Conclusions

The archaeological evaluation method employed has been successful in meeting the specified aims.

There is no Roman road within the area of impact for the River Eden Pipeline Diversion, nor any other significant archaeological remains.

Several undated cut features of archaeological origin were identified on the higher ground, There is a potential for similar remains to be present outside of the boundary of the evaluation trenches. These are considered to be of low significance.

6.2 Recommendations for further work

No further study of the organic remains present in the deposits reported here is warranted.

If radiocarbon dating of the primary fill of palaeochannel [70] is considered worthwhile then the waterlogged hazelnut from the basal sample and twig fragments from both samples could be submitted for this purpose.

Options for archaeological mitigation comprise preservation in situ, or advance ‘strip, map, and record’ ahead of construction activities, and thereby ‘preservation by record’ of any archaeological remains.

Any further works will be carried out in consultation with, and with the approval of the Historic Environment Officer at Cumbria County Council.

7 STORAGE AND CURATION

7.1.1 Retention and disposal

The washovers from the processed subsamples are retained pending a decision regarding submission of material for radiocarbon dating but need not be kept for further analysis of the organic remains themselves. The residue fractions may be discarded. Unless required for purpose other than the study of biological remains, the remaining unprocessed sediment may also be discarded.

7.1.2 Archive

Digital copies of this report in PDF format will be deposited with the Client and CCC.

The project archive will consist of all relevant original records, artefacts, ecofacts/samples and documentation that relates to the archaeological works. Copies of the method statement and any relevant correspondence will be included.

The archive will be prepared according to the methodology set out in The Management of Archaeological Projects (MAP2, English Heritage 1991), as updated by MoRPHE (Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide, English Heritage 2008).

The archive will comply with the United Kingdom Institute for Conservation (Archaeology Section) Guidelines for the Preparation of Excavation Archives for Long-Term Storage (1990), and the Society of Museum Archaeologists Towards An Accessible Archive (1995) and to the reasonable requirements of the recipient museum (to be established).

The archive will be deposited within twelve months of the completion of the site works, with the agreement of the Client.

All biological material is currently stored by Palaeoecology Research Services (Unit 4, National Industrial Estate, Bontoft Avenue, Kingston upon Hull), pending return to the excavator or permission to discard, with paper and electronic records pertaining to the work described here.

7.1.3 Copyright

RSK will retain full copyright of any commissioned reports, tender documents or other project documents, under the Copyright, Designs and Patents Act of 1988 with all rights reserved; RSK will provide an exclusive licence to the Client for the use of such documents by the Client in all matters directly relating to the project.

8 REFERENCES

English Heritage, 1991, *Management of Archaeological Projects Revision II*

English Heritage, 2008, *MoRPHE (Management of Research Projects in the Historic Environment): Project Managers' Guide*

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APPENDIX 1
TRENCH DESCRIPTION TABLES

Trench 1 Not excavated. No impact at agreed location at request of landowner

Trench 2						
Dimensions		20m	1.5m	0.4m (N) - 0.5m (S)		
NGR	343646	559436	**NGR**	343658	559420	
Ground surface level		18.7m AOD				
Target	Prehistoric / general					
Context	**Category**	**Description**				**Depth**
	Topsoil					0.25m (N) - 0.3m (S)
	Natural	Mottled orange / light yellow sand				
20	Cut	0.25m wide gully				0.05m
21	Fill of 20	Light grey sand				0.05m
Notes						
Photos						
66 - 77						

Trench 3 Not excavated. No impact at agreed location at request of landowner

Trench 4 Not excavated. No impact at agreed location at request of landowner

Trench 5						
Dimensions		20m	1.5m	0.3m		
NGR	343663	559306	**NGR**	343677	559320	
Ground surface level		15.65m AOD				
Target	Prehistoric / general					
Context	**Category**	**Description**				**Depth**
	Topsoil					0.18m
	Natural	Blue green sand / blue clay bands				
Notes						
Metres from west end of trench: 5m – ceramic land drain. Flat top, round base, 8cm external diameter. 11m – plastic pipe / stone-filled land drain. 10cm wide, 20cm depth stone Land-drains 25cm bgl						
Photos						
37 - 43						

Trench 6					
Dimensions		20m	1.5m	0.4m	
NGR	343693	559267	**NGR**	343707	559252
Ground surface level		15.79m AOD			
Target	Prehistoric / general				
Context	**Category**	**Description**			**Depth**
	Topsoil				0.2m
	Subsoil				0.08m
	Natural	Banded light yellow/yellow sand and rounded (river) gravels, up to 18cm diam. / ave. 5cm			
Notes					
Occasional C19th ceramics in topsoil					
Photos					
32 - 36					

Trench 7					
Dimensions		43m	1.5m	0.3m	
NGR	343761	559387	**NGR**	343773	559348
Ground surface level		16.7m AOD			
Target	Meandering natural channel / Suspected Roman road				
Context	**Category**	**Description**			**Depth**
	Topsoil				0.2m (N, base of slope) - 0.3m (S, shoulder of slope)
	Natural	Orange sand with clay lenses (top of slope) Light red clay (upper slope) Orange sand (lower slope) Light orange sand (base of slope and up northern slope)			
70	Cut	Palaeochannel			1.9m
71	Fill (upper)	Light yellow sand (colluvium)			0.14m
72	Fill (2nd ary)	Light grey silt sand			0.35m
73	Fill (primary)	Dark brown, peaty			1.15m
Notes					
Occasional C19th ceramics in topsoil					
Photos					
83 - 130					

Trench 8					
Dimensions		20m	1.5m	0.3	
NGR	343776	559311	**NGR**	343791	559324
Ground surface level		16.92m AOD			
Target	Prehistoric / general				
Context	**Category**	**Description**			**Depth**
	Topsoil				0.25m
	Subsoil				0.05m
	Natural	Orange clay to E (includes slight manganese flecking) Yellow sand to W (change @ 12m from trench W-end)			
Notes					
Photos					
78 - 88					

Trench 9					
Dimensions		98m	1.5m	0.2m (N) - 0.4m (S)	
NGR	343640	559292	**NGR**	343708	559222
Ground surface level		15.98m AOD			
Target	Suspected Roman road				
Context	**Category**	**Description**			**Depth**
	Topsoil				0.2m (N) - 0.12m (S)
	Subsoil				0.17m
	Natural	Orange sand with yellow/white fluvial mottles 0 – 86m Yellow blue clay (86 – 98m)			
Notes					
Measured from trench S-end: 56m – ceramic land-drain 58.5m – ceramic land-drain, excavated 25cm depth (below natural surface) 6” plastic pipe Grey silt fill 63.5m – tree throw, excavated 1.65m x 0.5m x 0.1m 71m – ceramic land-drain 79m – stone-filled plastic land-drain 80m – ceramic land-drain. Flat top, rounded base, 8cm external diam. 90m – ceramic land-drain. Flat top, rounded base, 8cm external diam.					
Photos					
1 - 31					

Trench 10					
Dimensions		20m	1.5m	0.46m	
NGR	343659	559387	**NGR**	343676	559397
Ground surface level		17.33m AOD			
Target	Prehistoric / general				
Context	**Category**	**Description**			**Depth**
	Topsoil				0.46m (E) - 0.42m (W)
	Natural	Orange sand. Red clay to S. White clay to N			
101	Cut	Oval pit. 2.7 x 1.1m			0.23m
102	Fill	Grey-brown clay-sand Fluvial mottles to N-end			0.23m
Notes					
Measured from trench W-end: 1.8m – ceramic land-drain 16m – ceramic land-drain 20m – 2 x land-drains Trench extended @ western end to N and S					
Photos					
44 – 65 / 131 - 152					

Trench 11					
Dimensions		20m	1.5m	0.3m	
NGR	343660	559442	**NGR**	343672	559426
Ground surface level		18.8m AOD			
Target	Site high-point / slight mound. Prehistoric / general				
Context	**Category**	**Description**			**Depth**
	Topsoil				0.25m (N) - 0.4m (S)
	Natural	Dark orange sand			
110	Cut	Ditch. 18m from trench S-end 1.2m wide, running into E & W baulks			0.3m
111		Tree-throw			
112	Cut	Gully. 8m from trench S-end 0.7m wide, running into W baulk			0.1m
113	Fill of 110	Dark brown clay-silt			0.3m
114	Fill of 112	Light grey sand			0.1m
Notes					
Measured from trench S-end: 4m – terraced natural (5cm) 10m – terraced natural (10cm) 18m – land-drain					
Photos					
153 - 174					

APPENDIX 2
BIOLOGICAL ASSESSMENT

Palaeoecology Research Services

Assessment of biological remains from sediment samples recovered during excavations associated with the River Eden Pipeline Diversion, west of Low Crosby, Cumbria (site code: COE14)

PRS2014/23

Palaeoecology Research Services ***PRS*2014/23**

Assessment of biological remains from sediment samples recovered during excavations associated with the River Eden Pipeline Diversion, west of Low Crosby, Cumbria (site code: COE14)

John Carrott

Summary

Five sediment samples from features encountered during excavations on land west of Low Crosby, Cumbria, were submitted for an assessment of their bioarchaeological potential. Eight trial trenches were excavated across the site; three additional trenches proposed were not excavated as the areas were to be preserved from development impact at the landowner's request. Features encountered included two gullies, a ditch, a pit and a palaeochannel. No dating evidence was recovered from the features and a Roman road projected to lie within the northern part of the site area was not encountered.

*Ancient macrofossil remains recovered from the samples from the fills of archaeological features, pit [101], ditch [110] and gully [112], were restricted to traces of charred plant remains in the form of indeterminate charcoal and of no interpretative value. Microfossil remains were also few, being confined to occasional poorly preserved pollen grains and spores and, other than to indicate the presence of ferns (*Polypodium*), alder (*Alnus*) and ?hazel/birch (cf.* Corylus*/*Betula*) at the time of the formation of the fill of gully [112], similarly lacking in interpretative potential. No artefactual material was recovered and there were no remains to indicate waste disposal into the features or deliberate back-filling.*

The two samples from the upper and basal parts of the primary fill of palaeochannel [70] each yielded relatively large quantities of waterlogged plant remains, together with traces of indeterminate (or non-diagnostic) invertebrate remains and, from the basal sample, a little indeterminate charcoal. Preservation of the waterlogged plant material was, however, generally poor and the only identifications possible were of a whole hazelnut and probable hazel roundwood twigs in the material from the basal sample; the bulk of the remains from both samples being indeterminate 'woody' detritus. Occasional pollen grains and spores were recorded in the microfossil subsamples from both samples with ferns and alder again indicated, together with grasses, but, overall, the remains were too few and too poorly preserved to be of any significant interpretative value. Again, there were no remains to indicate waste disposal into the feature or deliberate back-filling and the palaeochannel appears to have infilled naturally.

The hazelnut and roundwood twigs would provide sufficient suitable material for radiocarbon dating (via AMS) should this be considered worthwhile; no suitable charred remains were present.

No futher study of the organic remains from these deposits is warranted.

KEYWORDS: RIVER EDEN PIPELINE DIVERSION; LAND WEST OF LOW CROSBY; CUMBRIA; ASSESSMENT; UNDATED; PLANT REMAINS; HAZELNUT; ROUNDWOOD; CHARRED PLANT REMAINS; CHARCOAL (TRACE); INVERTEBRATE REMAINS (TRACE); MICROFOSSILS; POLLEN GRAINS; SPORES

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27 June 2014

Assessment of biological remains from sediment samples recovered during excavations associated with the River Eden Pipeline Diversion, west of Low Crosby, Cumbria (site code: COE14)

Introduction

An archaeological evaluation associated with the River Eden Pipeline Diversion was undertaken by RSK Environment Ltd (RSK) on land west of Low Crosby, Cumbria (centred on NGR NY 437 593), in the first half of 2014. The works were necessitated by National Grid's replacement of a short section of gas transmission pipeline crossing beneath the River Eden.

Eight trial trenches were excavated across the site area each 1.5 metres in width and varying in length between 20 and 98 metres (total length 261 metres); three additional trenches proposed (Trenches 1, 3 and 4) were not excavated as the areas were to be preserved from development impact at the landowner's request. Features encountered included two gullies (Trenches 2 and 11), a ditch (Trench 11), a pit (Trench 10) and a palaeochannel (Trench 7); no archaeological features were present within Trenches 2, 5, 6, 8 and 9. No dating evidence was recovered from the features and a Roman road projected to lie within the northern part of the site area (and targeted by Trench 9) was not encountered.

Five bulk sediment samples ('GBA'/'BS' *sensu* Dobney *et al*. 1992) were submitted to Palaeoecology Research Services Limited, Kingston upon Hull, for an assessment of their bioarchaeological potential.

Methods

The lithologies of the samples were recorded, using a standard *pro forma*. A small subsample (~5 ml) was extracted from each for examination for microfossils (see below) prior to the processing of subsamples (or, in one case, the entirety of the remaining sediment) for the recovery of plant and invertebrate macrofossils, broadly following the techniques of Kenward *et al*. (1980). Before processing for macrofossil recovery the sediments were disaggregated in water for 24 hours or more and the sample volumes recorded in a waterlogged state.

The residues were primarily mineral in nature and were dried and weighed prior to the recording of their components. To facilitate recording, the residues were separated into three fractions using 1 and 4 mm sieves. Sorting for all remains, including artefacts, was undertaken to 4 mm. Residue less than 1 mm was retained unsorted. The residue fractions (including those less than 1 mm) were scanned for magnetic material.

Each of the washovers contained at least some organic material that was not charred and all were examined wet; in three cases this material proved to be exclusively of modern origin, however.

The processed sample fractions were examined for plant, invertebrate and vertebrate remains using a low-power binocular microscope (x7 to x 45). All of the components of the washovers and residues were recorded using a five-point semi-quantitative scale; fractions were generally scanned until no new remains were observed and a sense of the abundance of each taxon or component was achieved. The abundance scale employed was: 1 – few/rare, up to 3 individuals/items or a trace level component of the whole; 2 – some/present, 4 to 20 items or a minor component; 3 – many/common, 21 to 50 or a significant component; 4 – very many/abundant, 51 to 200 or a major component; and 5 – super-abundant, over 200 items/individuals or a dominant component of the whole. The abundance of recovered

organic and other remains within the sediments as a whole may be judged by comparing the washover volumes and the quantity of remains recovered from the residues with the size of the processed sediment subsamples.

Plant macrofossil remains were identified to the lowest taxon necessary to achieve the aims of the project by comparison with modern reference material (where possible) and the use of published works (e.g. Cappers *et al*. 2006). Nomenclature for plant taxa follows Stace (1997).

Wood and charcoal identifications were attempted for a small number of larger fragments (all over 4 mm). The fragments were broken to give clean cross-sectional surfaces and the anatomical structures were initially examined using a low-power binocular microscope (x7 to x45) and subsequently (where necessary) at higher magnifications (x60 to x600). Identifications were made by comparison with modern reference material, where possible, and with reference to published works (principally Hather 2000 and Schoch *et al*. 2004).

Where present in any processed subsample fraction, bone and artefactual material was noted and recorded or removed to be returned to the excavator.

The microfossil subsamples were examined using the 'squash' technique of Dainton (1992), originally designed specifically to assess the content of eggs of intestinal parasitic nematodes; however, this method routinely reveals the presence of other microfossils, such as pollen and diatoms, which were the primary focus of the examinations here. The assessment slides were scanned at x150 magnification and at x600 where necessary. Provisional identifications for pollen grains and spores were made by comparison with modern reference material and the use of published works (principally Moore *et al*. 1991).

During recording consideration was given to the suitability of macrofossil remains for submission for radiocarbon dating by standard radiometric technique or accelerator mass spectrometry (AMS).

Results

The results of the investigations of the samples are presented below in context number order by trench (and stratigraphically, lowermost first, where applicable). Archaeological information, provided by the excavator, is given in square brackets. A brief summary of the processing method and an estimate of the remaining volume of unprocessed sediment follows (in round brackets) after the sample numbers.

TRENCH 7

Context 73 [primary fill of palaeochannel 70 – sample from base of deposit]
Sample 2/T (6 kg/4.5 litres sieved to 300 microns with washover and microfossil 'squash'; approximately 4 litres of unprocessed sediment remain)

Moist, varicoloured (jumble of browns, greys and grey-browns from light to very dark but mostly mid and mid to dark shades), crumbly (working soft), moderately humic, silt, with wood and twig fragments present.

The large washover (approximately 1.5 litres) was almost entirely of waterlogged plant material (abundance score 5), including wood fragments (to 120 mm by ~40 mm diameter; score 5), numerous smaller roundwood twigs with bark (to ~4 mm diameter; score 3) and a single whole hazelnut (*Corylus*). The finest part of the washover (including the material that floated) was almost all of plant detritus, with some very poorly preserved and unidentified (but all appeared to be of the same form) 'seeds' (score 2) and some 'scraps' of invertebrate cuticle (all indeterminate but including heavily fragmented and eroded pieces of beetle sclerite – score 2 – and an occasional better preserved but non-diagnostic element, e.g. a single leg sclerite). The vast majority of the material was 'woody' detritus (score 5), with additional invertebrate cuticle (score 3; again, predominantly indeterminate 'scraps' but including beetle remains (score 2) which, in turn, included indeterminate elytron fragments and non-diagnostic abdominal sclerites) and a moderate component (score 3) of less robust, 'filmy', plant detritus. Identification of the largest roundwood fragment and three of the smaller

twigs was attempted. The first was rather soft and clean cross-sections difficult to obtain but probably of a diffuse-porous species (additional study *might* allow a species level identification) and the twigs were all of a diffuse-porous species (probably hazel, cf. *Corylus*) representing between three and six years of wood growth.

The tiny residue (dry weight 165.5 g) was mostly ?indurated mid grey/grey-brown and orange sediment concretions (to 29 mm; score 5) and sand; the latter predominant in the finest (less than 1 mm; dry weight 48.8 g) fraction and the former in the two larger fractions (1-4 mm and over 4 mm; dry weights 39.4 g and 79.3 g, respectively). Each fraction also contained a little indeterminate charcoal (to 8 mm but mostly less than 4 mm; score 2) and there were traces of uncharred 'woody' detritus in the two finer fractions (to 11 mm but mostly less than 6 mm; score 2). No remains were sorted from the residue and there was no magnetic or artefactual material present.

The 'squash' subsample was mostly organic detritus (~75%), with some inorganic (~25%). Some plant tissue fragments and fungal hyphae were noted (both score 2) and there were a few very poorly preserved (broken and eroded) possible pollen grains/spores (including one ?fern, cf. *Polypodium*, spore) present.

Context 73 [primary fill of palaeochannel 70 – sample from upper part of deposit]
Sample 3/T (3 kg/2.75 litres sieved to 300 microns with washover and microfossil 'squash'; approximately 10 litres of unprocessed sediment remain)

Moist, very dark grey-brown to very dark grey to black, crumbly (working soft), very humic, silt, with wood and twig fragments common and modern rootlet present.

The very large washover (approximately 2 litres) was almost entirely of waterlogged plant material (abundance score 5), including wood fragments (to 47 mm, with roundwood to 42 mm by ~11 mm diameter – score 2). The finest part of the washover (including the material that floated) was almost all 'wispy' plant detritus (score 5), with occasional 'scraps' of indeterminate invertebrate cuticle (score 2). The bulk of the washover consisted of more substantial 'woody' detritus (score 5), with small roundwood twigs (of 1 to 5 mm in diameter; score 3) and some larger twigs (to 12 mm diameter; score 2). Small 'crumbs' of undisaggregated sediment (to 1 mm) were common (score 3) and occasional 'scraps' of indeterminate invertebrate cuticle, soil-dwelling fungus (cf. *Cenococcum geophilum* Fr.) fruiting bodies (sclerotia) and a little fine sand were all present (all score 2). Six wood species identifications were attempted on roundwood twigs but all of the remains were very soft and no clean cross-sections could be obtained; nor could the number of years of wood growth represented be determined although these could only be relatively few (certainly less than 10 years in many cases).

There was no separate mineral residue fraction from this sample – the only mineral material remaining after processing being the small amount of fine sand in the washover (see above).

The 'squash' subsample was mostly organic detritus (~85%), with a little inorganic (~15%). Plant tissue fragments were abundant (score 4), fungal hyphae were common (score 3) and fungal spores (of at least three forms) were present (score 2). Pollen grains/spores were also recorded (score 3), with at least six different taxa present. Preservation was variable but generally rather poor with all of the grains/spores eroded and often also crumpled; fern (*Polypodium*) spores and pollen grains of alder (*Alnus*) and grasses (Poaceae) were all present (score 1), however (additional taxa *may* be identifiable to further study).

TRENCH 10

Context 102 [fill of oval pit 101]
Sample 1/T (12.5 kg/10 litres sieved to 300 microns with washover and microfossil 'squash'; approximately 12 litres of unprocessed sediment remain)

Moist, mid grey-brown (occasionally light to mid brown and grey-brown), crumbly to unconsolidated (working slightly soft), ?slightly clay, silty sand, with small patches of light yellow-brown sand. Stones (6 to 20 mm) and modern rootlet were present.

The vast majority of the tiny washover (~100 ml) consisted of fine sand (abundance score 5; 95%+). Lesser components were cinder (score 3; one piece to 16 mm, the rest less than 3 mm), modern rootlet (score 2) and fine indeterminate charcoal (score 3; mostly less than 2 mm and all less than 4 mm), undisaggregated sediment 'crumb' (to 2 mm; score 2), a trace of fine ?coal (to 2 mm; score 1) and a few very pootly preserved unidentified 'seeds' (score 1; perhaps modern).

The relatively small residue (dry weight 1394.6 g) was predominantly of fine sand (score 5) which, together with some slightly coarser sand (score 3), formed almost all of the finest (less than 1 mm) fraction (dry weight 1322.6 g). The only other material noted within the finest fraction was occasional small (to 1 mm) 'crumbs' of orange (presumably rich in iron oxide(s)) mineral concretion (score 2). Similar concretions (to 4 mm; score 5) and small rounded stones (to 4 mm; score 5) formed the entirety of the tiny middle (1-4 mm) fraction (dry weight 65.5 g) and the minute over 4 mm fraction

(dry weight 6.5 g); the latter containing stones to 18 mm (score 2) and concretions to 8 mm (score 2). No remains were sorted from the residue and there was no magnetic or artefactual material present.

The 'squash' subsample was mostly inorganic (80% or more), with a little organic detritus (10-20%). The only microfossil remains seen were two ?fern (cf. *Polypodium*) spores – very poorly preserved and only tentatively identified.

TRENCH 11

Context 113 [fill of ditch 110]
Sample 5/T (12.25 kg/10 litres sieved to 300 microns with washover and microfossil 'squash'; approximately 2 litres of unprocessed sediment remain)

Moist, very dark brown to very dark grey-brown, unconsolidated, slightly ?humic, silty sand (to sandy silt), with occasional patches of light to mid brown sand and modern rootlet present.

The vast majority of the tiny washover (~100 ml) consisted of fine sand (abundance score 5; 90%+). Lesser components were fine coal (to 3 mm; score 3), modern rootlet (score 3), indeterminate charcoal (score 5; but almost all less than 2 mm – four larger pieces, to 7 mm, were examined but all crumbled and no identifications were possible), undisaggregated sediment 'crumb' (to 2 mm; score 2) and a few modern beetle sclerites (score 1).

The relatively small residue (dry weight 1570.9 g) was very similar to that from the sample from Context 102 (above) being predominantly of fine sand (score 5) which, together with some slightly coarser sand (score 3), formed almost all of the finest (less than 1 mm) fraction (dry weight 1540.9 g). The only other material noted within the finest fraction were small (to 1 mm) 'crumbs' of grey (?ashy) mineral concretion (score 3). Similar concretions (to 4 mm; score 4) and small stones (to 4 mm; score 4) formed the entirety of the tiny middle (1-4 mm) fraction (dry weight 28.4 g) and the minute over 4 mm fraction (dry weight 1.6 g); the latter containing stones to 12 mm (score 2) and concretions to 9 mm (score 2). No remains were sorted from the residue and there was no magnetic or artefactual material present.

The 'squash' subsample was mostly inorganic (80%+), with a little organic detritus (10-20%). The only microfossil remains seen were some very poorly preserved (all crumpled/broken and eroded) pollen grains/spores (none of which could be identified) and a few fungal hyphae.

Context 114 [fill of shallow gully 112]
Sample 4/T (16 kg/14 litres sieved to 300 microns with washover and microfossil 'squash'; only the ~5 ml 'squash' subsample remains unprocessed)

Just moist, mid to dark brown and grey-brown (with some areas of mid grey and light to mid grey-brown), crumbly to unconsolidated, ?slightly humic, silty fine sand to sandy silt. There were no obvious inclusions.

The very small washover (~250 ml) was approximately 80% sand (score 5) and small (to 2 mm) 'crumbs' of undisaggregated sediment (score 5), and 20% fine charcoal (score 5) of which most was less than 2 mm (score 5), with a moderate quantity 2-4 mm (score 3) and only occasional fragments over 4 mm (largest to 17 mm; score 2). The four largest charcoal fragments were examined more closely but only one could be partially identified as of a diffuse-porous species (the others failing to provide clean cross-sections); none of the charcoal was of roundwood. Other components were all probable or certain modern intrusions/contaminants and comprised rootlet (score 3; and a little other plant detritus – score 2), orache/goosefoot (*Atriplex*/*Chenopodium*) seeds (score 3) and abundant (score 5) sclerotia (fruiting bodies) of a soil-dwelling fungus (cf. *Cenococcum geophilum* Fr.).

As previously recorded for the samples from Contexts 102 and 113 (above), the relatively small residue (dry weight 1759.0 g) was predominantly of fine sand (score 5) which, together with a little slightly coarser sand (score 2), formed almost all of the finest (less than 1 mm) fraction (dry weight 1610.0 g). The only other material noted within the finest fraction were some small (to 1 mm) 'crumbs' of mid/dark orange (?iron-rich) mineral concretion (score 3) and few black flecks of charcoal (to 1 mm; score 1). Similar orange concretions (to 6 mm; score 5), smaller mid/dark grey concretions (to 4 mm; score 3), small stones (to 4 mm; score 3) and a little indeterminate charcoal (to 5 mm; score 2) formed the tiny middle (1-4 mm) fraction (dry weight 82.0 g). The over 4 mm fraction was also tiny (dry weight 67.0 g) and composed entirely of larger concretions, mostly of the orange variety (to 22 mm; score 4) with rather less of the grey (to 11 mm; score 2). No remains were sorted from the residue and there was no magnetic or artefactual material present.

The 'squash' subsample was approximately equal parts organic detritus and inorganic. A few fungal hyphae were noted and there were at least 16 fern (*Polypodium*) spores present which exhibited variable preservation. The few (score 1) other pollen grains/spores noted were all poorly preserved (broken/crumpled and eroded) but included single representatives of alder (*Alnus*) and ?hazel/birch (cf. *Corylus*/*Betula*).

Discussion and statement of potential

Ancient macrofossil remains recovered from the samples from the fills of archaeological features, pit [101], ditch [110] and gully [112], were restricted to traces of charred plant remains in the form of indeterminate charcoal (largely less than 2 mm) and of no interpretative value. Microfossil remains were also few, being confined to occasional poorly preserved pollen grains and spores and, other than to indicate the presence of ferns (*Polypodium*), alder (*Alnus*) and ?hazel/birch (cf. *Corylus*/*Betula*) at the time of the formation of the fill of gully [112], similarly lacking in interpretative potential. No artefactual material was recovered and there were no remains to indicate waste disposal into the features (e.g. bones of domestic animals) or deliberate back-filling (e.g. larger stones/rubble); cinder and ?coal from pit [101] were present at no more than 'background' levels. Overall, these features appear to have infilled naturally, and gradually given the very fine-grained nature of the deposits, and were probably located at some remove from any contemporary human habitation; entirely consistent with the excavator's interpretations that "…the focus of any previous activity was on higher ground…", and that pit [101] may simply have been created by the extraction of sand, ditch [110] may be a former field boundary, and shallow gully [112] may actually be the result of animal burrowing. Although the trace levels of charcoal recovered from each of the deposits could provide sufficient charcoal for dating (via AMS) this material was poorly preserved and none was identifiable or of determinable age of wood growth. Charcoal of indeterminate species and wood age cannot be recommended for radiocarbon dating as the associated 'old wood' problems may result in a radiocarbon date significantly earlier (but by an unknown amount) than the charring event being returned. Concerns regarding the presence of intrusive/contaminant material (e.g. rootlet) within the deposits, and the likely consequent bioturbation and possible displacement of such small quantities of fine remains, also add considerable uncertainty to the validity of dating the deposits as a whole via radiocarbon dating of occasional charred plant remains.

In contrast, the two samples from the upper and basal parts of the primary fill (Context 73) of palaeochannel [70] each yielded relatively large quantities of waterlogged plant remains, together with traces of indeterminate (or non-diagnostic) invertebrate remains and, from the basal sample, a little indeterminate charcoal. Preservation of the waterlogged plant material was, however, generally poor (particularly in the upper sample) and the only identifications possible were of a whole hazelnut (*Corylus*) and probable hazel roundwood twigs in the material from the basal sample (the largest piece of roundwood from this sample might also be identifiable to species given further study); the bulk of the remains from both samples being indeterminate 'woody' detritus. Occasional pollen grains and spores were recorded in the microfossil subsamples from both samples. Ferns and alder were again indicated, together with grasses, and a few other taxa would probably be identifiable to further study but, overall, the remains were too few and too poorly preserved to be of any significant interpretative value. As previously noted for the archaeological features (above), there were no remains to indicate waste disposal into the feature or deliberate back-filling and the palaeochannel appears to have infilled naturally. The excavator noted that "The topography of the landscape as defined by the former watercourse is such that subterranean water flow is channelled towards the palaeochannel, keeping the contained organic deposits waterlogged". This would explain the rather poor preservation as the regular influx of oxygenated surface water draining into the fills of the palaeochannel would prevent the formation of the anoxic conditions that result in a cessation of decay and the excellent waterlogged preservation seen at some archaeological sites (Anglo-Scandinavian deposits at Coppergate in York, for example; see Kenward and Hall 1995).

Although of no real interpretative value, the hazelnut and roundwood twigs (those of only a few years growth even if this is not precisely determinable and species identifications cannot be achieved) would provide sufficient suitable material for radiocarbon dating (via AMS) should this be considered worthwhile. Given that anoxic waterlogged conditions do not appear to have developed within the deposit and yet quite large quantities of plant material still survive (albeit mostly robust 'woody' material and poorly preserved), it is most likely that the palaeochannel started to infill relatively recently, perhaps from the post-medieval period onwards.

Recommendations

No further study of the organic remains present in the deposits reported here is warranted.

If radiocarbon dating of the primary fill of palaeochannel [70] is considered worthwhile then the waterlogged hazelnut from the basal sample and twig fragments from both samples could be submitted for this purpose.

Retention and disposal

The washovers from the processed subsamples should be retained for the present pending a decision regarding submission of material for radiocarbon dating but need not be kept for further analysis of the organic remains themselves. The residue fractions may be discarded.

Unless required for purpose other than the study of biological remains, the remaining unprocessed sediment may also be discarded.

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Archive

All material is currently stored by Palaeoecology Research Services (Unit 4, National Industrial Estate, Bontoft Avenue, Kingston upon Hull), pending return to the excavator or permission to discard, with paper and electronic records pertaining to the work described here.

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