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The Results of an Archaeological Field Evaluation by Trial Trenching and Archaeological Excavation on the Forth Replacement Crossing at Dundas Castle Farms (Land Parcel 11)

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Report Status: Approved

Executive Summary

Headland Archaeology conducted an archaeological evaluation by trial trenching on the Forth Replacement Crossing at Dundas Castle Farms (Land Parcel 11), NGR: NT 12159 77315 (centred), to assess the presence/absence of archaeological features in an area identified as having good archaeological potential in the Forth Replacement Crossing Environmental Statement (Jacobs Arup, 2009a). The work was commissioned by Transport Scotland, managed and monitored by Jacobs Arup and undertaken in advance of the proposed commencement of construction works.

Five trenches with a total area of 472m^2 comprising a 5% sample of this parcel were excavated. Trenches were sited to ensure good spatial coverage. The trial trenching revealed a possible alignment of pits with an east-west orientation and an isolated pit to the western end of the site. No other features of archaeological significance were revealed.

Based on the results of the trial trenching an area measuring 10 m by 100 m centred on the possible pit alignment was excavated. Excavation of the features at the eastern end of the site demonstrated these to be natural hollows in the gravel, which had filled with natural clay. The features at the western end of the site were also revealed to be areas of variation in the natural clays and gravels. One of the features identified during the evaluation was found to be a geotechnical test pit. The excavation also revealed furrows running east to west and rubble drains crossed the site on the same alignment.

ARCHAEOLOGICAL EVALUATION
Forth Replacement Crossing: Land Parcel 11, Dundas Castle Farms

PROJECT SUMMARY SHEET (FRCE10)

Client	Transport Scotland
Consultant	Jacobs Arup
National Grid Reference	NT 12159 77315
Project Manager	Edward Bailey
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Schedule	
Evaluation	11th – 15th April 2011
Excavation	16th – 20th May 2011
Report	May 2011

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1 Introduction

1.1 *General*

1.1.1 This Data Structure Report is submitted as a report on a programme of archaeological trial trenching and excavation to Jacobs Arup and Transport Scotland in respect of the proposed Forth Replacement Crossing (hereinafter 'FRC'), and in accordance with the mitigation measures recommended in the FRC Environmental Statement Chapter 14 (Cultural Heritage; Jacobs Arup 2009a) wherein the requirement for a programme of trial trenching was identified.

1.1.2 Between the 11th and the 15th April 2011, Headland Archaeology (UK) Ltd. undertook a programme of archaeological evaluation by trial trenching on Land Parcel 11 on the southern side of the landfall for the FRC (Illus 1). The project was managed by Edward Bailey (Project Manager), the fieldwork and reporting was overseen by Ian Hill. Four additional staff members were involved throughout the evaluation.

1.1.3 Additional excavation works took place on Land Parcel 11 between the 16th and 20th May 2011 based on the results of the trial trenching. The project was managed by Edward Bailey (Project Manager), the fieldwork and reporting was undertaken by Elizabeth Jones. Three additional staff members were involved throughout the excavation.

1.2 Project Background

1.2.1 In December 2007, following the completion of the FRC Study as part of the Strategic Transport Project Review (hereinafter 'STPR'), the Scottish Government confirmed the intention to provide a new cable-stayed bridge to the west of the existing Forth Road Bridge. Jacobs Arup (as a joint venture) was commissioned in January 2008 to assist Transport Scotland to develop the FRC proposals, to undertake an Environmental Impact Assessment (hereinafter 'EIA') and to prepare an Environmental Statement (hereinafter 'ES') (Jacobs Arup 2009a).

1.2.2 The purpose of the cultural heritage component of the EIA was to identify the cultural heritage baseline, evaluate the likely significant impacts that the proposed development would have on this resource, and provide mitigation measures to ameliorate any impacts. .

1.2.3 The cultural heritage baseline data for the EIA was obtained via a desk-based assessment and walkover survey undertaken in 2008-2009 in accordance with the principles set out in DMRB Volume 11, Section 3 Part 2 'Cultural Heritage' (HA 208/07; Highways Agency 2007). Further information was also gathered during archaeological watching briefs on Ground Investigations for the proposed scheme carried out during 2008 and 2009 by variously Jacobs Arup, Glasgow University Archaeology Research Division and Headland Archaeology Ltd in accordance with the requirements of Historic Scotland to whom the results were reported (Transport Scotland 2010, 30).

1.2.4 Based on the results of the EIA the ES recommended that a programme of invasive and non-invasive archaeological works be undertaken, to include resistivity survey and trial trenching (Jacobs Arup 2009a).

1.3 Aims and Objectives of the Archaeological Works

1.3.1 The general objectives of the programme of archaeological works (Transport Scotland 2010) were to:

- ensure that significant archaeological or palaeoenvironmental remains shall be neither needlessly destroyed, nor destroyed without record;
- identify any unknown archaeological remains that may be affected by the scheme;
- enable a more confident assessment of the impact of construction of the proposed scheme on archaeological remains;
- enable the identification and design of any measures that may be necessary to mitigate the impact of the proposed scheme on newly identified archaeological remains;
- enhance available information about known archaeological remains, where existing information is insufficient to enable a full assessment of impact or the design of mitigation measures.

1.3.2 Following the results of the evaluation the objectives of the excavations were to:

- Clarify the nature, character and extent of the features identified during the evaluation and obtain a plan of any additional features identified during the excavation.
- Identify any structures or activity areas and the date and duration of any settlement remains
- Obtain artefactual and environmental evidence for the purposes of dating and interpretation of the site

2 Site Background

2.1 Archaeological and Historical Background

2.1.1 Within a study area ranging in extent from 500m from the proposed route to 6km from the proposed main crossing a total of 356 cultural heritage sites were identified by the ES, whilst a desk-based assessment of a wider study area undertaken at route selection stage, identified a total of 1200 cultural heritage sites (Transport Scotland 2010, 30). The results from these studies show that the scheme is located in a landscape containing archaeological evidence dating from the Mesolithic period, through the prehistoric and medieval periods, up to post-medieval and modern times.

2.1.2 A number of archaeological sites were identified by the ES in and around South Queensferry. These include prehistoric, Roman and early historic activity, with the Royal Burgh of South Queensferry originating in the medieval period.

2.1.4 The land parcel contains one possible site. This is a pit alignment (Site 1146) identified from aerial photographs (Jacobs Arup 2009a).

2.1.5 The land parcel lies near Dundas Castle, the present keep of which dates to the 15th century, although the castle may originate as early as the 12th century (Jacobs Arup 2009a, 32).

2.2 Site Topography and Land Use

2.2.1 The site consisted of the southern end of an arable field that was under crop (Oilseed Rape) at the time of evaluation. The evaluation area was bounded by a hedgerow to the south and strips of protected woodland to the east and west (Echline strip). The site is under the ownership of the Trustees of S N M Bowlby.

2.3 Site Geology

2.3.1 The results of geotechnical investigations (Jacobs Arup 2009a) carried out demonstrate that the subsurface stratigraphy generally constitutes glacial till deposits of varying thickness; these are predominantly comprised firm to very stiff boulder clay deposits with occasional granular till deposits.

2.3.1 The solid geology of the site is typified by igneous alkali dolerite (British Geological Survey 2008). The alkaline nature of the bedrock geology has the effect of breaking up the structure of clays within the soil matrix which negatively affects its water holding capacity, similar to the effect agricultural lime has on arable soils.

3 Methodology

3.1 Evaluation

3.1.1 All works were undertaken in accordance with the specification in the contract documents (Transport Scotland 2010), which had been agreed with Historic Scotland and Transport Scotland. The total area of the Land Parcel measured 8,277m², of which a sample of at least 5% was investigated by trial trenching; the total area excavated was 472m². An indicative trench plan was agreed with the consultant archaeologists, Jacobs Arup. Trenches were sited to test blank areas and to provide good spatial coverage of the entire site. A BP pipeline was present on site and a 15 metre buffer zone for this was marked out, and the excavator remained outside of the marked area. It was also ensured that no trenches were placed close to overhead power lines running east-west across the site. As a result of the an 5 m increase in the stand off area required by the BP wayleaves team for the pipeline Trench 3 was moved slightly to the east. Trench 2 was also altered slightly due to the presence of protected woodland adjacent to the west of the site.

3.1.2 All trenches were individually numbered and a pole-mounted Trimble G6 differential GPS programmed with the relevant coordinates was utilised to identify and mark out the locations of trenches. The trenches were excavated using one 13 ton 360˚ tracked mechanical excavator, fitted with a 2m wide flat-bladed ditching bucket. The machine operated under continuous archaeological supervision and topsoil and subsoil were removed down to the first archaeological horizon or clean geological deposits, whichever was met first. Topsoil and subsoil were stored separately. Any potential features identified were hand cleaned and investigated appropriately. Archaeological features and deposits were hand excavated and

recorded using standard archaeological methods and pro-forma record sheets. The excavated trenches and any archaeological contexts were recorded using a Trimble G6 differential GPS, as well as hand drawing where appropriate. Photographs were taken using colour slide film, black and white film, and digital.

3.1.3 Bulk soil samples were collected from secure archaeological contexts for processing and assessment. Where possible a minimum 30-litre sample was collected from each archaeological deposit and given a unique number (Transport Scotland 2010, 59). All finds were recorded by individual context and their cleaning, storage and conservation undertaken in accordance with the Institute for Archaeologists Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials (Transport Scotland 2010, 65-66).

3.2 Excavation

3.2.1 All works were undertaken in accordance with the specification in the contract documents (Transport Scotland 2010), which had been agreed with Historic Scotland and Transport Scotland. The total area excavated was 1000m², comprising a trench measuring 10m wide by 100m east to west, focussing on the possible pit alignment.

3.2.2 The area was excavated using a 13 ton 360° tracked mechanical excavator, fitted with a 2m wide flat-bladed ditching bucket. The machine operated under continuous archaeological supervision and topsoil and subsoil were removed down to the first archaeological horizon or clean geological deposits, whichever was met first. All potential features identified were hand cleaned and investigated appropriately. Archaeological features and deposits were hand excavated and recorded using standard archaeological methods and pro-forma record sheets. The excavation area and archaeological contexts were recorded using a Total Station EDM linked to a field computer running *TheoLT* software. Photographs were taken using colour slide film, black and white film and digital.

4 Results of Fieldwork

4.1 Trial Trenching (Illus 2 & 3)

4.1.1 Five trenches were excavated across Land Parcel 11 (Illus 2) with a combined total area of 472m². Full detailed descriptions of each trench and individual contexts can be found in Appendix 1 and Appendix 2. Results are summarised below.

4.1.2 The natural geology seen in the trenches was largely a mixed and mottled, dark, stony orange and grey clay [020]. Sondages were excavated at various points to test the natural and all deposits encountered appeared to be well-sorted, natural stony clays, turning into stony gravels at a depth of 1.70m. In general this was overlain by between 0.10m and 0.20m of subsoil or interface material – greyish-brown clayey silt [019]. Topsoil [018] was between 0.30m and 0.50m deep and contained little in the way of recent ceramic material.

4.1.3 Possible Archaeological features were found in two trenches (Trenches 2 & 4).

4.1.4 Within Trench 2, two possible pits were identified. Pit [008] was not fully exposed within the limits of the trench, but was at least 2.25m long by 0.75m wide and 0.16m deep. It had steep sloping sides and a regular, flat base. The pit was filled with mid brown silt [007] and had been subsequently cut by a rubble field drain. The second possible pit was not excavated.

4.1.5 Pits [003] and [006] were identified in Trench 4 along with five other pits [015, 016, 17, 021 and 022] that were not excavated during the evaluation works (Illus 4). The pits revealed formed an alignment roughly orientated east to west. The south-western quadrant was excavated from both [003] and [006] with each pit containing two fills. The upper fills of both the pits, [001] and [004] respectively, consisted of stiff dark grey clay with sub-rounded stones, likely representing a natural infilling. The primary fill of both the pits, [002] and [005] respectively, consisted of mixed, compact, orange and grey stony clay. The consistency was similar to the natural in the trench but contained more stones; a number of the stones also appeared to be 'pressed' into the cut of the pits. The stones are likely to be re-deposited natural and may represent a backfilling event carried out shortly after the cutting of the pits. Both pits excavated had steep sloping sides and a concave base and continued beneath the edges of the trench. Pit [003] was revealed to be 1.80m long and at least 0.90m wide and 0.45m deep. Pit [006] was 1.4m long and at least 0.75m wide and 0.30m deep.

4.2 Excavation

4.2.1 The excavation did not reveal any features further to those revealed in the trial trenching. The base of the evaluation trench 4 was cleaned in order to fully expose the features. Three clay patches, unexcavated during the evaluation were half-sectioned in order to determine their nature ([015], [016], [017]; Illus 5 and 6). The features were interpreted as natural depressions or hollows in the gravels. The gravels in this area of the site are overlain by a thin (<0.05 m) band of clay, which filled these hollows. The variation in the site geology between grey clays, lighter gravels and mixed clayey gravels is shown in Illus 7. Further inspection of features [003] and [006] excavated during the trial trenching showed that these were also natural hollows/depressions.

4.2.2 Excavation at the western end of site revealed that the feature identified in Trench 2 [008] was the edge of a change in the natural from stiff clay to a more silty deposit. The silty clay extended westwards from the edge of the feature and covered an area approximately 8m by 7m in a shallow depression. The unexcavated feature in Trench 2 was found to be a test pit.

4.2.3 Three furrows were found running from west to east across the western part of the excavation area [009, 011 and 013]. A section was excavated through each of them. They varied in width between 0.70m and 1m and were on average 0.07m in depth and 8m apart (centre to centre). The fills were dark brown clayey silt with occasional to frequent stones [010, 012 and 014] respectively. The furrows became very narrow and then became indistinct towards the eastern side of the site. Three rubble drains also crossed the site from west to east, parallel with the furrows.

5 Conclusions

5.1 The evaluation identified a concentration of undated features towards the centre of the Land Parcel, which were thought to represent a pit alignment identified from aerial photographs (Site 1146). The pits were described as of a constant size and evenly spread (Kirkdale Archaeology 1994). Interpretation of the pit alignment suggested it may represent an old tree line (Jacobs Arup 2009c). Further excavation of the features identified during the evaluation has demonstrated that the features are natural in origin. However, the variation in the size and depth of the features and the uniform, clean fills suggest they are natural depressions or hollows in the natural gravels rather than the remains of a tree line as previously suggested.

5.2 A further, unrelated feature [008] was revealed towards the western part of the site; however this was shown during the excavation to be the edge of a variation in natural deposits.

5.3 The spacing of the furrows found during the excavation is consistent with systems medieval rig and furrow; however no finds were recovered from any of the furrows to date them. The alignment of the furrows and rubble drains respected the existing southern field boundary, as shown on 19th-century maps (Ordnance Survey 1856a & b).

5.4 Based on the results of the fieldwork and the post excavation assessment the archaeological archive is considered as having no potential and therefore no further works are recommended. It is recommended that the single sample recovered during the archaeological works be discarded.

6 References

6.1 Bibliographic References

Highways Agency *et al* 2007 *DMRB Volume 11 Cultural Heritage, Section 3, Part 2, Revision HA 208/07*. The Highways Agency, Transport Scotland, Welsh Assembly Government and the Department for Regional Development Northern Ireland, August 2007.

Jacobs Arup 2009a *Forth Replacement Crossing: Environmental Statement*. November 2009.

Jacobs Arup 2009b *Transport Scotland Forth Replacement Crossing: Network Connections – South Ground Investigations Report*. Jacobs Arup November 2009.

Jacobs Arup 2009c *New Forth Crossing Cultural Heritage Interactive PDF*. Jacobs Arup 2009

Kirkdale Archaeology 1994 *Setting Forth, Stage 2a.* Unpublished report.

Parry, M L 1976 A typology of cultivation ridges in Southern Scotland. *Tools and Tillage* 3.1: 3-19.

Transport Scotland 2010 *Forth Replacement Crossing*. 'Competition for the Land Based Invasive and Non-Invasive Archaeological Survey and Evaluation Contract Volume 2: Tender Document'.

6.2 Cartographic References

British Geological Survey 2008 *Linlithgow*, S032W, (version B&Sup), 1: 50 000.

Ordnance Survey 1856a *Linlithgowshire*, 2, (surveyed 1854-5), 6 inch to 1 mile.

Ordnance Survey 1856b *Linlithgowshire*, 6, (surveyed 1854-5), 6 inch to 1 mile.

7 Appendices

Appendix 1: Trench Register

Trench No	Length (m)	Depth (m)	Description
1	45	0.55	E-W running. No features.
2	50	0.55	NE-SW running. Contains pit [008] and one un-excavated pit.
3	50	0.3	E-W running. No features.
4	40	0.4	E-W running. Contains pits [003], [006] and five un-excavated pits.
5	51	0.4	NW-SE running. No features.

Appendix 2: Context Register

Context No.	Area	Description
001	Tr 4	Upper fill of hollow [003]. Comprised stiff dark grey clay.
002	Tr 4	Lower fill of hollow [003]. Mixed compact orange and grey stony clay.
003	Tr 4	Natural hollow/depression in stony gravel.
004	Tr 4	Clay upper fill of natural hollow [006]. Comprised stiff dark grey clay.
005	Tr 4	Mixed basal fill natural hollow [006]. Mixed compact orange and grey stony clay.
006	Tr 4	Natural hollow/depression in stony gravel.
007	Tr 2	Voided number
008	Tr 2	Change in natural deposits
009	Exc	Cut of furrow runs NW-SE, gradual sloping sides, rounded base. W: 0.72m, D: 0.08m.
010	Exc	Fill of [009], dark brown clayey silt with occasional small stones.
011	Exc	Cut of furrow, runs NW-SE, gradual sloping sides and slightly rounded base. W: 0.93m, D: 0.07m.
012	Exc	Fill of [011], dark brown clayey silt with occasional small stones.
013	Exc	Cut of furrow, runs NW-SE, gradual sloping sides and flat base. W: 1.02m, D: 0.06m.
014	Exc	Fill of [013], dark brown clayey silt with frequent small stones.
015	Exc	Natural hollow/depression in stony gravel filled with clean bluish grey clay.
016	Exc	As [015]
017	Exc	As [015]
018	Exc	Topsoil. Dark greyish brown clayey silt loam, 0.3 – 0.5m.
019	Exc	Subsoil. Greyish brown clayey silt, 0.1 – 0.2m.
020	Exc	Natural. Mixed dark orange and grey stony clay.
021	Exc	As [015]
022	Exc	As [015]

Appendix 3: Trench Matrices

Trench 2

Topsoil
018

Subsoil
019

007

008

Natural
020

Trench 4

Topsoil
018

001 004

002 005

003 006

Natural
020

Topsoil
018

Open area

010 012 014

009 011 013

Natural
020

All Other Trenches

Topsoil
018

Subsoil

019

Natural
020

Appendix 4: Photographic Register

Photo No.	Direction facing	Description
evaluation		
625	NW	General shot of Trench 3
626	E	General shot of Trench 4
627	SE	General shot of Trench 5
628	E	Post-ex shot of SW quadrant of possible pit [003] Trench 4
642	SW	Post-ex shot of SW quadrant of possible pit [006] Trench 4
643	NW	NE and SE facing sections of quadrant through [008] Trench 2
647	W	Possible Pit [008] Trench 2
648	N	Possible Pit [003] Trench 4
649	N	Possible Pit [006] Trench 4
excavation		
300		ID shot
301	SW	Pre-ex shot of excavation trench
302	E	Pre-ex shot of excavation trench
303	SE	NW facing section through furrow [009]
304	W	E facing section through furrow [011]
305	NW	SE facing section through furrow [013]
306	NE	Working shot of east end of site
307	SE	General shot of clay patches
308	S	General post-ex shot of [015]
309	SE	General post-ex shot of [016]
310	S	General post-ex shot of [017]
311	SE	General shot of changing naturals around possible pits
312	NW	General shot of changing naturals around possible pits

Appendix 5: Drawing Register

Drawing No.	Plan	Section	Description
1		1:10	W facing section of SW quad through possible pit [003]
2		1:10	S facing section of SW quad through possible pit [003]
3		1:10	S facing section of SW quad through possible pit [006]
4		1:10	W facing section of SW quad through possible pit [006]

Appendix 6: Sample Register

Sample No.	Context No.	Description
001	004	Stiff dark grey clay, upper fill of possible pit [006]