



**THE TREFAEL STONE, NR NEVERN, PEMBROKESHIRE
ARCHAEOLOGICAL EXCAVATION AND RECORDING PROGRAMME**

DECEMBER 2010

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1.0 INTRODUCTION

The Trefael Stone is considered to be a capstone that once covered a burial chamber, possibly a Portal Dolmen, Wales' earliest Neolithic burial-ritual monuments. The site has been designated a Schedule Monument (Ref: PEM 313) and therefore Scheduled Monument Consent (SMC) was required prior to any intrusive investigations.

An application to excavate a small area of land around the Trefael Stone was made to Cadw by Dr George Nash in April 2010. In June 2010 permission was given by Cadw, subject to a number of conditions that included a geophysical survey followed by a targeted 4m x 4m excavation of the topsoil with exploratory slots (Cadw Ref: A-CAM001-02-QA849258/1). These amendments replace the original request to excavate a small slot directly in front of the upper surface of the stone in order to record any buried prehistoric rock-art. During the excavation Cadw undertook a monitoring visit on the 4th November 2010.

Prior to fieldwork a Project Design was produced and sent to Cadw. This document adhered to guidance set out within the IfA's *Standard and Guidance for Archaeological Excavation* (2008) and legislation within Welsh Circular 60/96. In addition, a risk assessment was prepared and co-signed by the project directors.

The results of the excavation programme are outlined and discussed in this report including all post-excavation analysis and specialist reports. The November 2010 field programme will be further supported by fieldwork undertaken in the summer of 2011 (subject to SMC).

The excavation programme was undertaken between November 3rd and 8th 2010.

2.0 GEOLOGY

Based on the soil survey of England & Wales (1983) the drift geology comprises a (Devensian till [TILLD] MANOD 611c, a well-drained fine loamy or fine silty soils overlying parent rock. The solid geology is a Nantmel Palaeozoic slate, mudstone and siltstone derivatives (NTM). Topographically, the site stands above the 125m contour with the land gradually rising to 160m to the east. The Pembrokeshire coastline is located c. 2km to the north-west.

3.0 ARCHAEOLOGICAL AND HISTORICAL DEVELOPMENT OF THE SITE

3.1 The Neolithic monuments of South-west Wales number around 48 with another 50 classified as possible, missing or lost monuments (Barker 1992, Children and Nash 1997, Nash 2006). All monuments appear to be within significant clusters but vary in architectural form (Children & Nash 1997).

3.2 The Trefael Stone, located within the Afon Nevern group stands on a flat parcel of land, north of the village of Nevern (NGR SN 1030 4030). The stone has been designated a

Scheduled Monument (Cadw Ref: PEM 32, HER Ref: 1120) and comprises a single flat monolith, possibly a capstone belonging to a burial monument and stands around 130m AOD. Surrounding the stone (prior to excavation) was an area of loose angular and sub-angular stone, much of which was abutting the lower western surface of the stone. Within this area, the ground had been eroded away, probably by livestock, using it as a means of shelter.

- 3.3 The site is located on land belonging to Coedfryn Farm and was first recorded by W.F. Grimes (1929, 31 & 277). Until recently and recorded on the upper surface of this stone were up to 45 shallow cupmarks, each with a mean diameter of c. 5cm (the largest is c. 10 cm in diameter). Following the 2010 excavation this number had been increased to 75.
- 3.4 According to Lynch (1972, 79), this now tilted stone may have once formed the capstone to a burial-ritual monument. The site lies within one of South-west Wales' core monument areas. Less than three kilometres to the north-west are the two standing monuments of Llech y Dribedd (PEM 1) and Trelyfaint (PEM 2), whilst to the south and east are a further four monuments including Pentre Ifan (3.3k). On one of the capstones of the double dolmen of Trelyffaint is carved with over 30 cupmarks.
- 3.5 The Trefael Stone in the recent past appears to have been severely damaged on the right hand side, probably the result of ploughing. A large stone flake measuring around 0.40 x 0.35m has been sheered and may have contained further rock-art. However, the excavation 2010 programme did not expose any evidence of this damage.

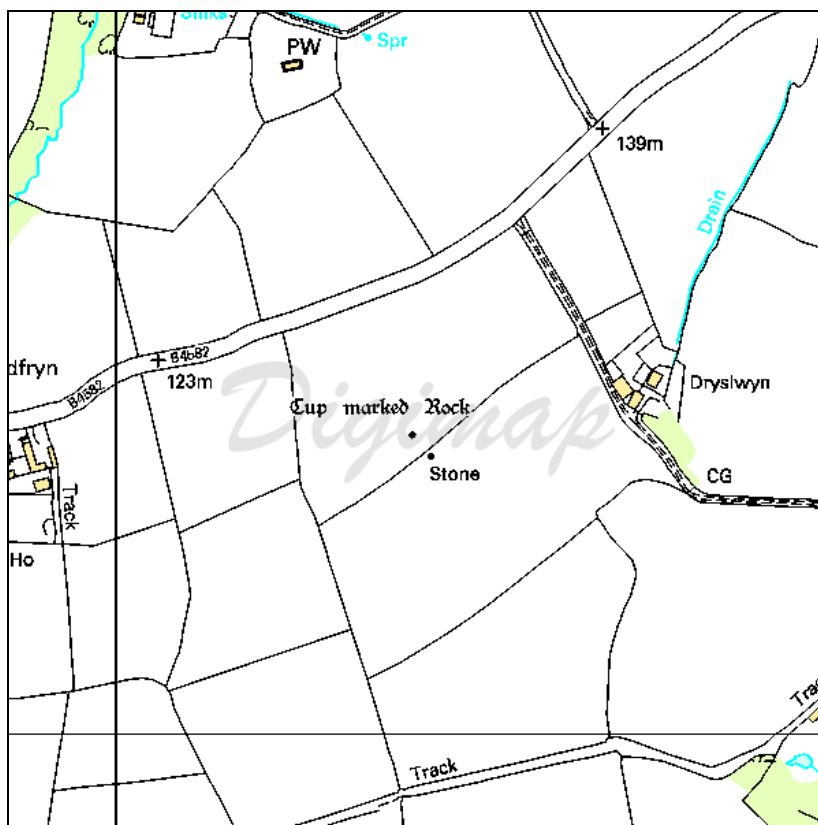


Figure 1. The Trefael Stone and neighbouring Standing Stone

- 3.6 Curiously and possibly associated with the Trefael Stone was a standing stone that was located within the adjacent field.¹ The provenance, age and use of this stone are unknown.

4.0 ARCHAEOLOGICAL SUMMARY

- 4.1 The programme of archaeology was divided into three areas: a non-intrusive preliminary programme of work that included a geophysical survey, undertaken in September 2010. Coupled with this was a limited GPS survey which accurately tied-in a Temporary Bench Mark (TBM), located on a nearby gate post. The geophysical survey revealed the sub-surface remains of a probable cairn deposit. This feature appears to have been kidney-shaped and is not an uncommon shape for this particular monument type. As a result of the geophysical survey, various areas were targeted within the allocated trenching. A 4m x 4m trench was excavated immediately south-east of the stone where a strong-signalled anomaly was identified.
- 4.2 The excavation was organised into two phases. Phase 1 included the 4m x 4m trench with associated slots in order to gauge the stratigraphy and natural deposits. Up to four archaeological contexts were identified (including natural deposits). Finds from this excavation were poor but did include several sherds of medieval pottery and two pierced beads, possibly originating from a settlement on Nab Head where over 900 similar slate beads have been discovered. In addition to the large trench, several sondages were excavated next to the capstone and within the south-west corner of the site. Within the SW section of the slot abutting the capstone was a clear vertical cut which suggested that the stone may have been erected as a ornate standing stone following its use as a capstone.

5.0 MAP REGRESSION

For this section of the report six maps were consulted; the earliest dating to 1889 and the publication of the 1st Edition Ordnance Survey (Scale 1:2500). On this map the site is marked as 'Stone' (Figure 2). There appears to have been little change in size and shape to the field in which it stands, however, absent is a gated access to the field immediately south (Field No. 176). Within the field to the south is marked another stone, probably a standing stone. This has been displaced and allegedly deposited within the field boundary that divides both fields.²

¹ The landowner, Ms Gill Richards remarked that the standing stone within the adjacent field had been moved to a nearby field boundary.

² Ms Gill Richards (*pers. comm.*)

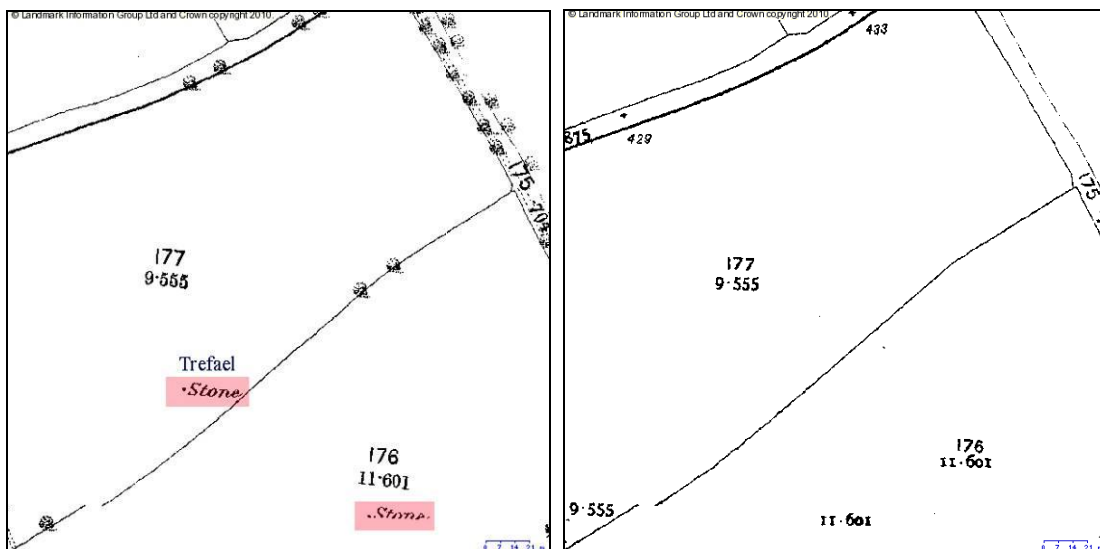


Figure 2. The Ordnance Survey plan of 1889 showing the location of the Trefael Stone (in red) and the standing stone in the southern field

Figure 3. The Ordnance Survey plan of 1907 with the Trefael Stone missing



Figure 4. Recent plan of the field and the re-emergence of the second stone, located in the southern field. Since the publication of this plan, the standing stone has been moved.

5.1 The Ordnance Survey map of 1907 (Scale 1:2500) shows little or no change to field boundaries (Figure 3). However, neither the Trefael Stone nor the standing stone in the southern field is marked; possibly an oversight made by the Ordnance Survey at this time. The National Grid series map of 1976 (Scale 1:100000) marks the Trefael Stone as 'Cup marked Rock' (Figure 4). The standing stone, once standing within the central section of the southern field appears to have been moved to a gated access, immediately south-east of the Trefael Stone, probably somewhere around the entrance area.

6.0 METHODOLOGY

6.1 Excavation requirements

6.2 This programme of archaeological excavation was developed in consultation with Cadw, the national archaeological heritage service for Wales. Following verbal consultation a project design was issued in April 2010. A single targeted trench measuring 4 x 4m was excavated following positive results from a geophysical survey undertaken in September 2010.

6.3 The geophysical survey element applied both magnetometry (fluxgate gradiometer) and resistivity methods within a 10m square grid around the Trefael monument (See Appendix 2). Whilst the geophysical survey was in progress several GPS readings were made include a value for the Temporary Bench Mark (TBM). The results of geophysical survey showed that a symmetrical kidney-shaped anomaly existed around the stone with an in-turn at the eastern end of the monument, measuring c. 8m (north-south) by 6.5m (east-west). Despite this positive anomaly showing clearly through the geophysics, no clear earthworks could be detected.

6.4 In accordance to the project design the trench was hand excavated and was laid east of the stone where clear anomalies from the geophysical survey were located. Due to adverse weather conditions, the number of archaeologist working at any one time was restricted to five. No intrusive investigations were undertaken to the west of the stone. All significant archaeological deposits, features and structures were excavated by hand. The depth of the trench did not exceed 0.45m and was excavated to natural deposits. All archaeological deposits were recorded stratigraphically using a fully cross-referenced single context pro-forma recording system. Within the trench area, several slots located within the south-eastern section were excavated in order to ascertain any Neolithic surface and to assess the depth of natural deposition (see Plate 2). A further trench measuring 2 x 0.5m was excavated immediately adjacent to the stone in order to expose any surviving rock-art below the soil line. The rationale for this trench was to fully expose the upper surface of the capstone, to assess and interpret the surrounding deposition and to expose natural deposits.

6.5 The trench location was tied into the site boundary and annotated onto Ordnance Survey mapping, using GPS and tape-and-offset methods.

6.6 The photographic record comprised high-resolution digital images with a supporting index in accordance with IfA guidelines. The drawn record comprised scaled plans and sections of the trench.

7.0 THE EXCAVATION

7.1 Recorded within the trench, measuring 4 x 4m were 10 contexts (Contexts 101 to 111) that included the excavation of two test pits (Test Pits 1 & 2). As part of the Cadw remit the excavation extended to the top of the first significant archaeological horizon (i.e. the top of the cairn deposit (102). The trench location was targeted following results of a geophysical survey, undertaken in September 2010. From this survey, a clear anomaly was indentified that was kidney-shaped (see Appendix 1).

7.2 The two slots, one located within the SE corner of the trench (Test Pit 1) and the other immediately east of the Trefael Stone (Test Pit 2) were excavated with permission from Cadw's monitor. The rationale for Test Pit 1 was to expose the Neolithic land surface and any deposits/features and structures that might survive. This test pit was located away from any visible significant archaeological horizon within Contexts (102) and (103) – see Plate 2. A series of micromorphological 1 kg samples were taken from Contexts (104), (105) and (108). These samples will be analysed for the potential of pollen (Nash, Stanford & Wellicome *forthcoming*).

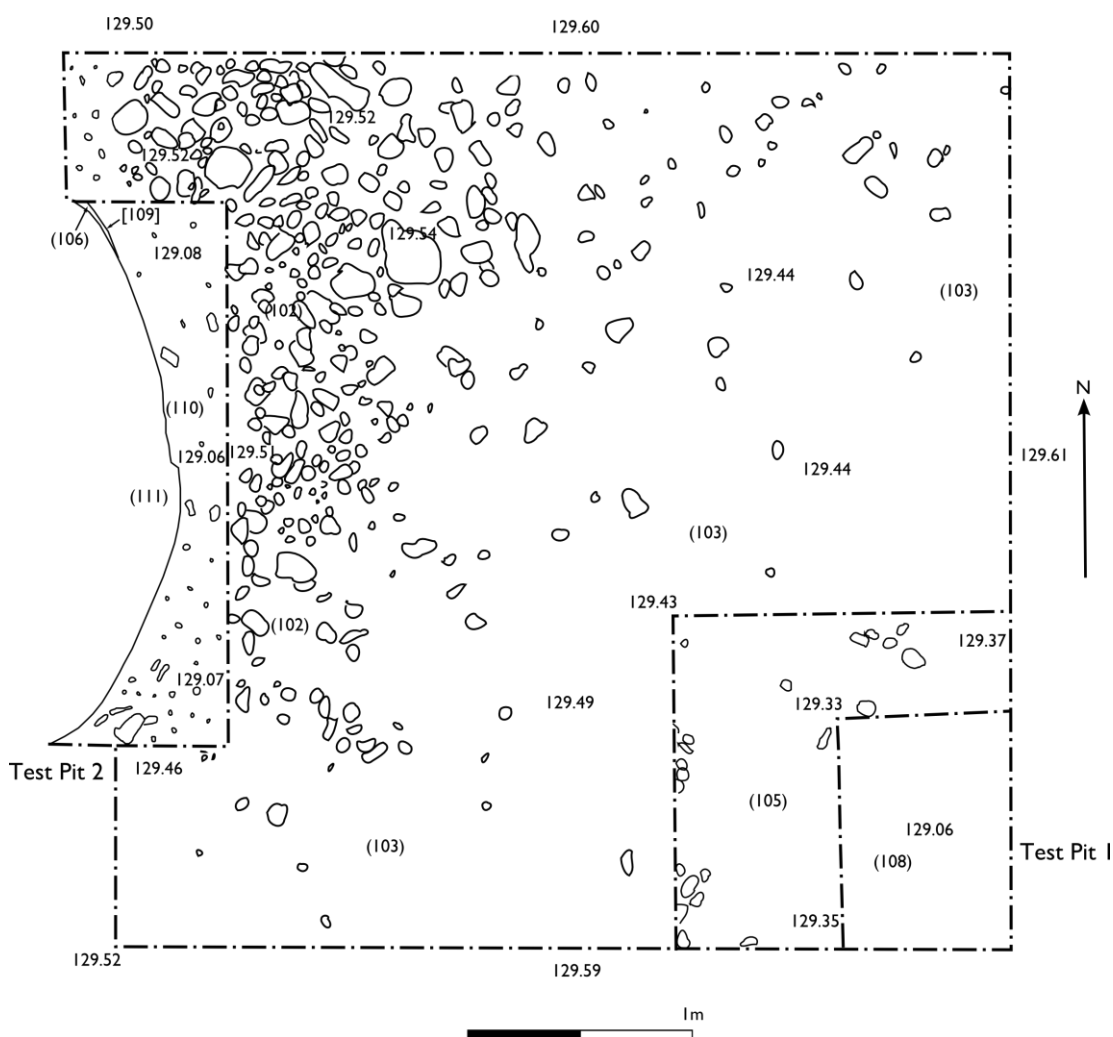


Figure 5. Plan of the site with final exposed contexts

- 7.3 Context (101) was interpreted as a cultivation soil. This loosely-compacted dark brown clay-rich soil contained small angular and sub-angular stones, many originating from the cairn (with occasional rounded stones – see Plate 3). Also recorded were c. 322 pieces of white quartz. The high quantity of dispersed quartz may represent an archaeological feature that has been subjected to plough damage. This soil directly overlies Contexts (102) and (103) and extends into all section of the trench.
- 7.4 Underlying Context (101) is a sub-angular and sub-rounded stone deposit (accounting for >80% of the context) that is within a well-compacted dark yellowish brown clay-rich soil (102). This deposit also contained occasional slate fragments and moderate quantities of white quartz (see Appendix 3). Recovered from around the base of the Trefael Stone (referred to as Context 111) was a lead green glazed neck-section belonging to a medieval flagon vessel. Its presence may be the result of moderate bio-turbation around this area of the site or an attempt to remove the Trefael Stone during the medieval period. Context (102) underlies (101) and overlies (103) and (106).
- 7.5 Located away from areas with a high concentration of stone (i.e. cairn material) is a loosely to moderately compacted brown soil with small sub-angular stones and occasional charcoal flecking, interpreted as an historic cultivation deposit (103). Also contained within the soil matrix are concentrations of pea gravel and rounded pebbles. This context underlies (102) and overlies (104) and (105).
- 7.6 Underlying Context (103) was a loosely-compacted dark yellowish brown clayey soil with occasional small angular stones and thin mudstone fragments; evidence of limited bioturbation (104). Dispersed throughout this probable Neolithic soil was occasional charcoal flecking. This deposit underlies (109) and overlies (108), and is the same as (107) which is recorded in the sections of Test Pit 1 (Figure 6).

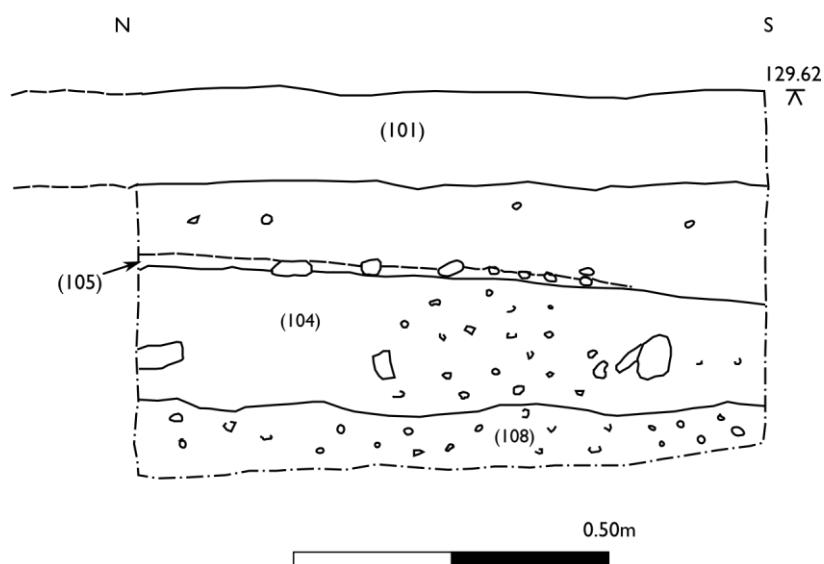


Figure 6. West-facing section within Test Pit 1

- 7.7 Recorded in plan and section within Test Pit 1 and underlying Context (104) was a moderately-compacted brown clayey soil with moderate quartz inclusions. This deposit may

represent the outer section of an archaeological horizon associated with a white quartz pavement (see Context 102) that may have stood within the facade area of the former Portal Dolmen. Underlying this deposit was Context (108). This natural [glacial] deposit, extending into all sections comprised a loosely-compacted dark yellowish brown gravelly-clayey soil (108). This deposit underlies (105) and is the same as Context (110) in the base of Test Pit 2.

7.8 Context (106), underlying (102) comprises a loosely-compacted brown clayey soil with frequent quantities of small angular stone fragments (Figure 6). This probable re-deposited cairn material fills a cut [109] and abuts the western surface of the Trefael Stone (111) (Plate 4). Recovered within this deposit was a pierced slate bead, similar to those recorded at nearby Nab Head, Pembrokeshire (Plate 5). Context [109] recorded within the south-facing section of Test Pit 1 comprises a vertical curvilinear cut that possibly represents a realignment of the capstone following the demise of the monument as a Portal Dolmen. The realignment (and the associated cut [109] may date to the Bronze Age when the former capstone appears to have been re-erected as a standing stone (Figure 7).

7.9 As part of the archaeological record, stone samples were taken from Context (102) for detailed petrological analysis (see Therriault, Appendix 3). Within the matrix of the cairn, up to eleven randomly-chosen samples were analysed including several samples that were considered exotic to the locality in which the monument stands. The cairn appears to have been constructed from mainly locally-gathered material and probably the exotic samples originated as a result of periglacial activity.

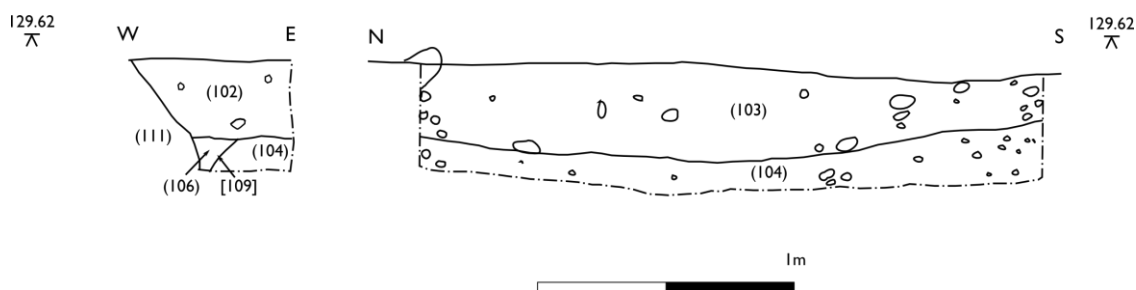


Figure 7. South and West facing sections within Test Pit 2

8.0 DISCUSSION

- 8.1 The Trefael Stone was considered to have originated from a Neolithic burial-ritual monument, probably forming a capstone that would have extended over a small chamber, possibly belonging to a Portal Dolmen (Lynch 1972; Nash 2006). Within the area are up to seven Neolithic burial-ritual monuments, three of which are classified Portal Dolmens (Daniel 1950; Barker 1992; Children & Nash 1997). Based on the results of the 2010 excavation many of the architectural traits associated with Portal Dolmens are found at Trefael including the size and shape of the (cap)stone and the cairn that forms a kidney-shaped mound (as partially revealed through the geophysical survey - see Appendix 2).

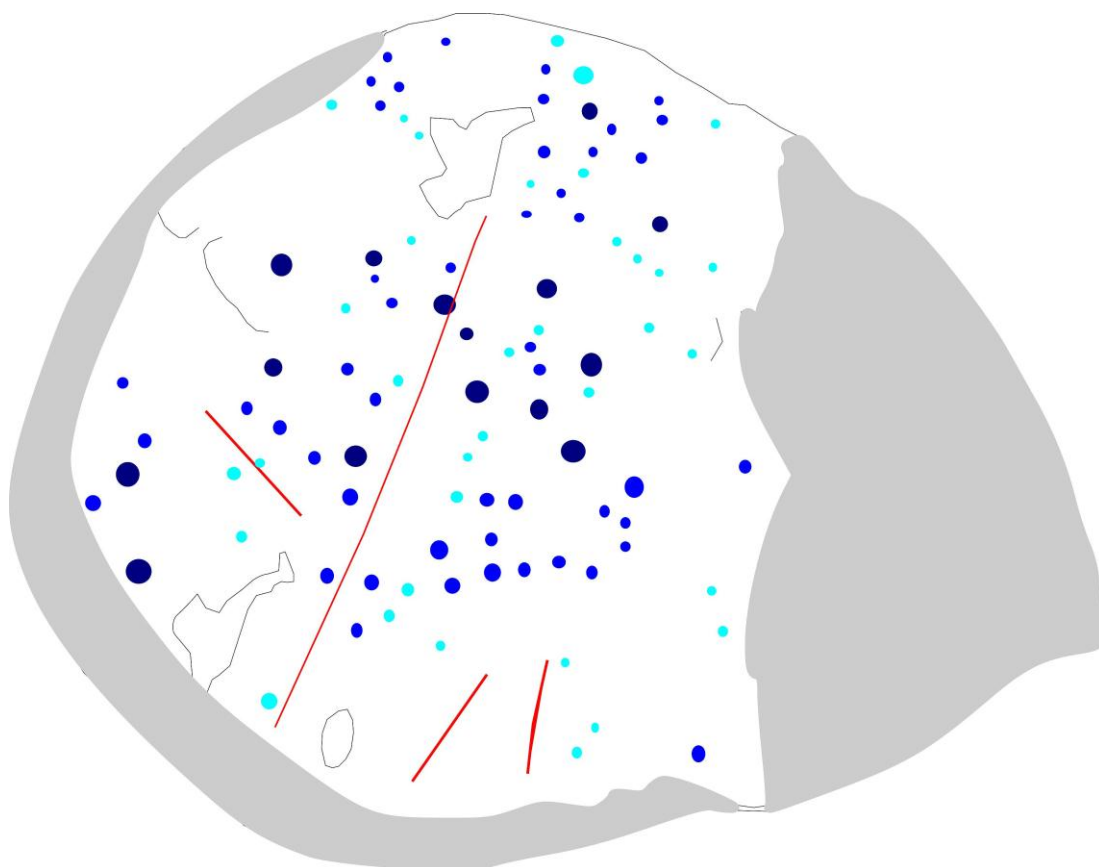


Figure 6. Distribution of varying sized cupmarks on the upper surface of the stone
(drawn by Thomas Wellicome)

- 8.2 The excavation of Test pit 2 revealed the upper surface of the Trefael Stone (capstone); Context (111). Exposed on this surface were 75 gouged weathered cupmarks - arranged in no recognised pattern (Plate 1). Also present are several grooved lines which are probably the result of recent plough damage. Missing on the right side of the surface is a large section of stone which is probable plough shear damage (Figure 6, see Plate 1). It is more than probable that further cupmarks existed on the missing section of the stone. Single and multiple cupmarked stones are relatively common throughout Western Britain. In terms of the relationship between cupmarks and chambered burial-ritual monuments, the preferred location is usually the upper surface of the capstone - e.g. Trellifant (Pembrokeshire); Mean Cattwg (Glamorgan) and Bachwan (Llyn Peninsula).

8.3 The rock-art recorded below the current ground level was limited to a few cupmarks. However the size and shape of the stone was ascertained, measuring 2m. In addition, the southern and western sections within Test Pit 2 revealed the survival and extent (depth) of the cairn deposit, measuring c. 0.40m. Within the western section was a clear vertical cut [109] through the lower section of the cairn [102] and the Neolithic land-surface on which the monument stood. The cut may represent a secondary use of the monument, when during the Bronze Age the capstone of the former Portal Dolmen was up-ended and utilised as a standing stone, possibly representing one of a number of landscape markers. Approximately 2.5 km east of the Trefael Stone is a complex of barrows/cairns, known as Crugiau Cemmaes (NGR SN 126 416). This complex stands on a small promontory that stands 196 m AOD. It is conceivable that an association may exist between the Trefael Stone and this Bronze Age burial-ritual complex (Nash, Stanford & Wellicome *forthcoming*).

9.0 RECOMMENDATIONS

9.1 The excavation and the subsequent geophysical survey revealed significant results including a probable tightly-compacted rubble cairn deposit on the northern side of the Trefael stone. The exposure of the cairn mirrored the anomaly present within the results of the geophysical survey. The base of the two slots, one within the south-eastern corner of the trench and the other immediately adjacent to the stone revealed a similar natural deposit – Contexts (108) and (110). Above this is the probable Neolithic land surface (although no finds have suggested this).

9.2 Based on the results of the excavation it is desirable to extend the geophysical survey, to hopefully reveal more features belonging to a potentially ritualised landscape. The geophysical survey could include the whole or part of the field. Following the geophysical survey targeted excavation could be undertaken, including over those anomalies revealed in the 2010 survey, immediately west of the stone and forming the probable rubble cairn (102). In addition, OSL dating could be applied to those contexts that form the possible Neolithic land surface (104); especially as no finds from this period have been recovered.

10.0 REFERENCES

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Silsoe 1983. *Soil Survey of England & Wales*.

11.0 ACKNOWLEDGMENTS

The directors of the project would like to thank the landowner Mr Hubert and Ms Gill Richards for allowing us to conduct archaeological investigations on their land. Sincere thanks to Polly Groom (Cadw) for assistance with the organisation of the project and her monitoring visit. Thanks also to Thomas Wellicome for supervising the team, producing the geophysical survey and establishing the GPS points. Finally, thanks to the field team: Carol James, Les Dodds, Bryan Moore, Una Tregaskis, Bill Chapman, Philip Langley, David Moyer, Megan Wright, Jeremy Farr and Isabelle Therriault.

12.0 CLOSURE

This report has been prepared by Co-directors Dr George Nash & Adam Stanford (and sub-consultants) with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the above; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from the authors.

We disclaim any responsibility to Cadw and others in respect of any matters outside the agreed scope of the work.

PLATES



Plate 1. The complete exposure of the upper surface of the Trefael Stone, looking west

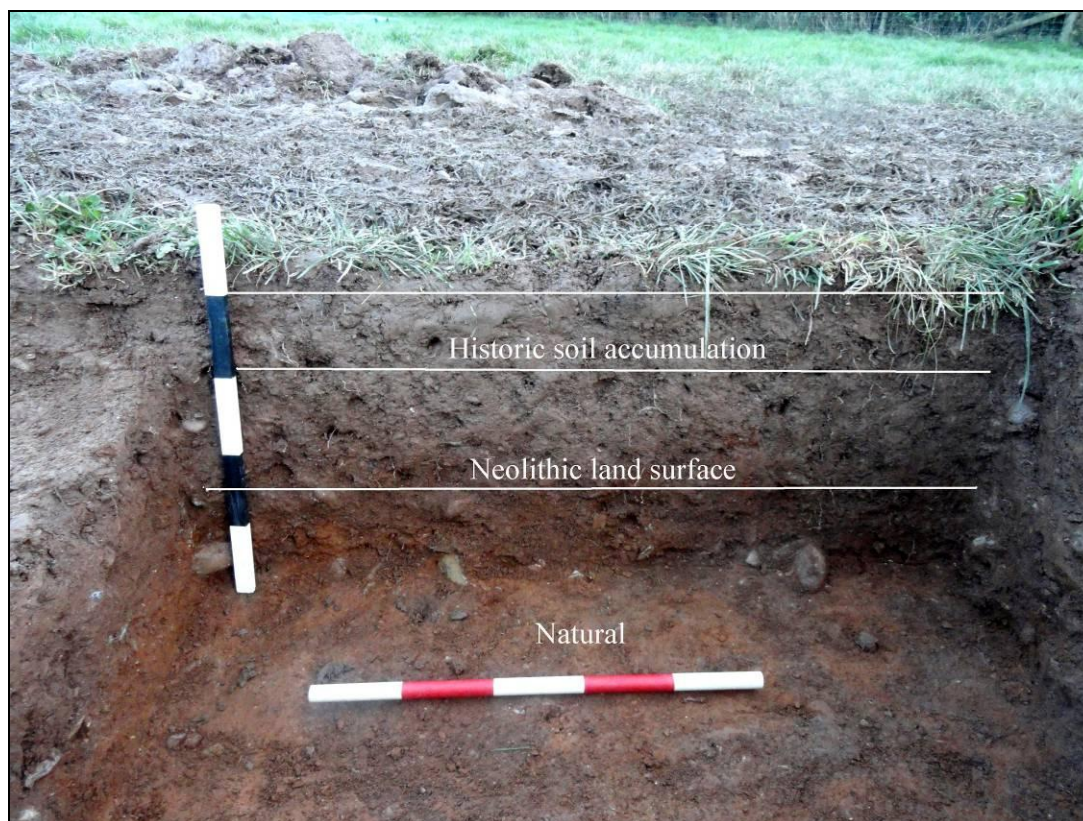


Plate 2. West-facing section within Test Pit 1



Plate 3. Exposing the lower section of the cairn of the Portal Dolmen, looking south



Plate 4. Excavation of Test Pit 2, looking east

APPENDIX 1

Context Summary

Context Number	DESCRIPTION
101	Loosely-compacted dark brown clayey soil with small angular stone inclusions. Dimensions: >4.00 x >4.00 x <0.20m. Overlies: (102), (103).
Interpretation	<i>Modern topsoil/ cultivation soil. The quartz inclusions may represent the remains of quartz paving.</i>
102	Sub-angular and sub-rounded stones with occasional slate fragments. Moderate quartz inclusions. Moderate bio-turbation. Dimensions: c. 1.90 x c. 1.80 x c. 0.10m. Underlies (101). Overlies (103) and (106).
Interpretation	<i>This deposit appears to be cairn material.</i>
103	Loosely to moderately-compacted brown clayey soil with small sub-angular stones and occasional charcoal flecking and small gravel/pebbles. Dimensions: >4.00 x >3.00 x 0.20m. Underlies (102). Overlies (105).
Interpretation	<i>Sub-soil, appears undisturbed by modern cultivation within the field.</i>
104	Loosely-compacted dark yellowish brown clayey soil with occasional small angular stones and thin mudstones. Occasional charcoal flecking. Some bio-turbation. Dimensions: 1.00 x 0.80 x >0.08m. Underlies (109). Overlies (108). Same as (107).
Interpretation	<i>Clayey soil that is probably contemporary with Trefael stone.</i>
105	Moderately-compacted brown clayey soil with moderate quartz inclusions. Dimensions: >1.50 x >1.50 x <0.08m. Underlies: 103. Overlies (104).
Interpretation	<i>Deposit represents possible quartz pavement.</i>
106	Loosely-compacted brown coarse clay soil with frequent small angular stones. Dimensions: >2.50 x >0.15 x 0.10m. Fills [109]. Underlies (102). Finds include three probable slate beads.
Interpretation	<i>Stony backfill of cut [109], possible cairn material.</i>
107	Loosely-compacted dark yellowish brown coarse clayey soil with occasional small angular stones. Occasional charcoal flecking. Dimensions: >2.50 x >0.30 x 0.10m. Cut by [109]. Overlies (110). Same as (104).
Interpretation	<i>Clayey soil that is probably contemporary with Trefael stone.</i>
108	Loosely-compacted dark yellowish brown coarse clayey soil and gravels. Dimensions: 1.50 x 1.00 x >0.05m. Underlies (104). Same as (110).
Interpretation	<i>Natural gravels; probable periglacial deposition.</i>
109	Cut, recorded in section, linear cut. Corners: Appear rounded. Dimensions: >2.50 x >0.15 x 0.10m. Break of slope top: Sharp. Sides: Steeply sloping to vertical. Break of slope base: Sharp. Base: Not fully excavated. Cuts (107). Filled by (106).
Interpretation	<i>Cut for the realignment of the Trefael stone.</i>
110	Loosely-compacted dark yellowish brown coarse clayey soil and gravels. Dimensions: >1.50 x >0.72 x >0.05m. Underlies (107). Same as (108).
Interpretation	<i>Natural gravels. Probably periglacial deposition.</i>
111	Trefael Stone.
Interpretation	<i>Capstone belonging to former Portal Dolmen.</i>

APPENDIX 2

Geophysical Synopsis for Trefael Stone, Newport, Pembrokeshire, Wales (Grid Ref: SN 103 403)

Thomas Wellicome BSc MA AIFA

Introduction

The following report details the results of resistivity and gradiometer geophysical surveys at the Trefael Stone Scheduled Monument (SM), Newport, Pembrokeshire, Wales. The surveys were undertaken in September 2010. Final interpretation and discussion of the geophysical results is included in the main report and only a brief statement of the results is included here.

Methodology

At all points the surveys were carried out in accordance with English Heritage guidelines and standards for *Geophysical Survey in Archaeological Field Evaluation* (Jones 2008).

After examining the nature of the archaeology on the site and the area to be covered, it was decided to use two methods of geophysical survey, resistivity and gradiometer.

Firstly a resistivity survey, using an RM15 resistivity meter was conducted over two 10 x 10m grid squares. Due to time constraints only two rows were surveyed in Grid 2, while the entirety of Grid 1 was surveyed. This meant the total survey area measurement of 20m E – W x 10m N - S. The grids were walked on an approximate N – S orientation using the ‘zigzag’ method. Following the resistivity survey a gradiometer survey using a FM256 gradiometer, was carried out using the resistivity survey as a guide. The gradiometer survey measured 20m N – S and 10m E - W. Grids were walked on an approximate N – S orientation using the ‘zigzag’ method. Survey grids were located using a Leica GPS system.

Survey Conditions and Constraints

The conditions for the survey were good, with dry weather combined and slightly damp ground conditions. The ground around the standing stone was very stony in places, which limited the penetration of the resistivity probes into the ground.

Archiving

All geophysics results will be presented in a suitable format to be archived as detailed in *Geophysical Survey in Archaeological Field Evaluation* (Jones 2008) and *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2001).

SURVEY RESULTS

Resistivity Survey

The resistivity survey located a large anomaly apparently orientated on a NE – SW alignment. This anomaly appears to be on a slightly different orientation to the faces of the standing stone which face approximately E –W. Although detail is lacking in the resistivity survey results appear to a sub-rectangular shape with low resistivity surrounding the stone. This could be interpreted as background geology interfering with the readings; however the concentration and shape seem to rule against this not being a feature. As the survey moves away from the stone there is a marked increase in the reading, although there are possible hints of a further feature to the west of the stone, possibly a weak linear response. These results tally partially with the results of the gradiometer survey detailed below.

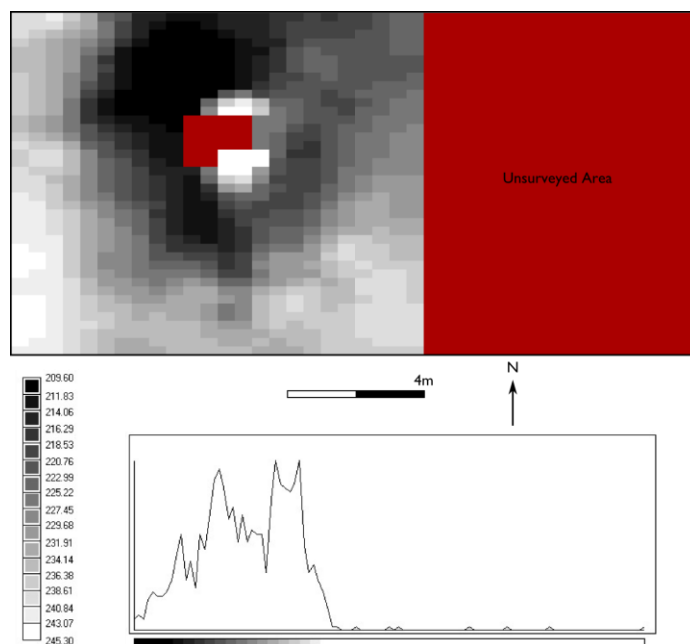


Figure 1: Interpolated resistivity results and histogram. Red areas zeroed readings.

Gradiometer Survey

The gradiometer survey portrays a similar image to the resistivity survey where they overlap, with a sub-circular/ovoid response at the southern end of the survey grid. Additionally the gradiometer survey has picked out some ephemeral features that were not present on the resistivity survey. These include a large negative response, possibly a pit, located to the north of the stone and several smaller possible small pits or post holes to the southwest. The results may suggest a NE – SW linear alignment to these responses. A weak response of a curvilinear feature is just about observable to the south of the stone and a slightly stronger linear and a weak curvilinear response can just be made out to the northwest. The location of the stone itself is not obvious on the survey, but it is located to the immediate southwest of the large ‘pit’ response.

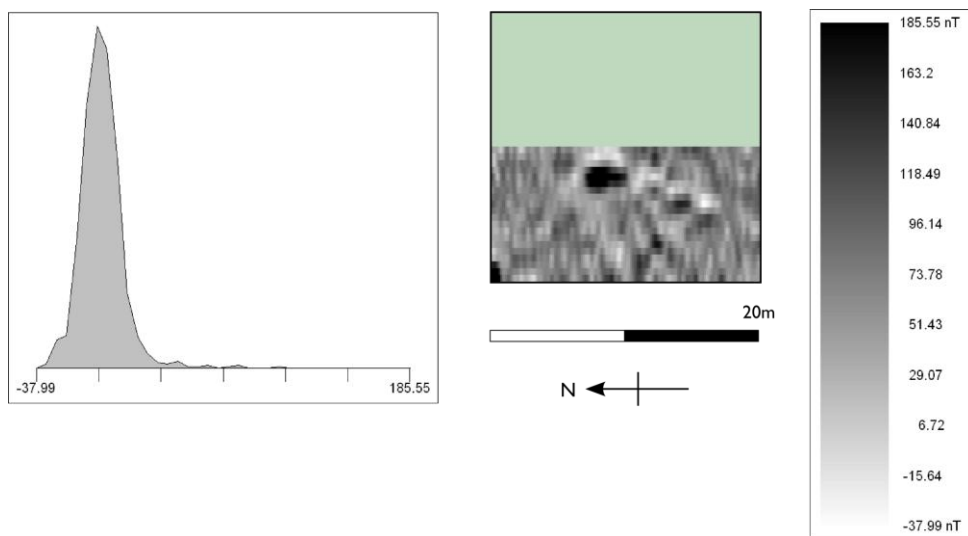


Figure 2: Wallis Contrast Enhanced, De-striped, Interpolated Gradiometer Results

RAW DATA PLOTS

Raw Resistivity Plot

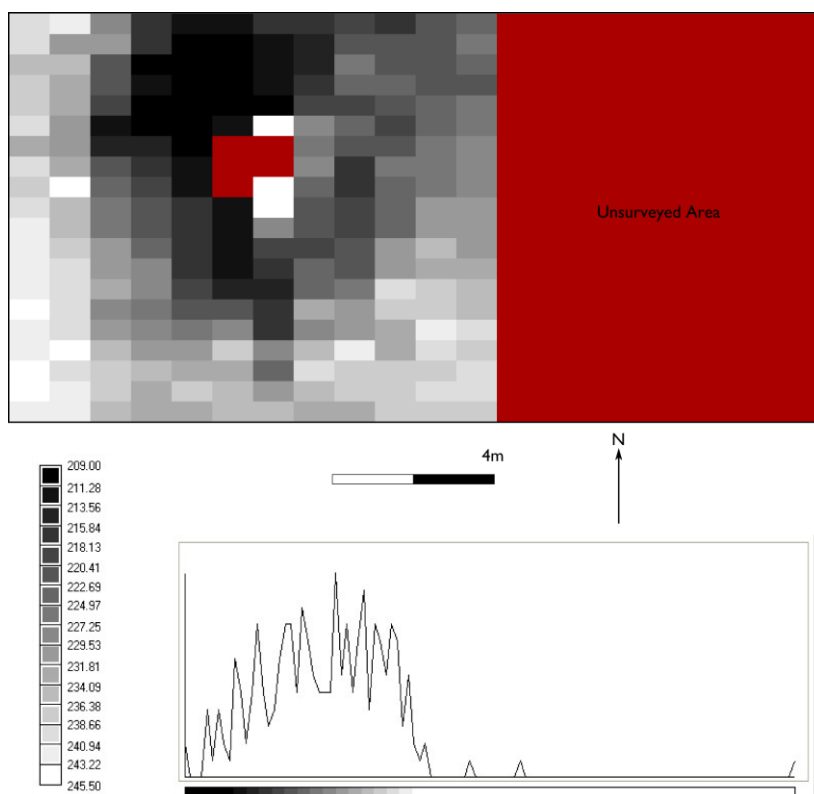


Figure 3: Raw Resistivity Survey with Histogram

Raw Gradiometer Plot

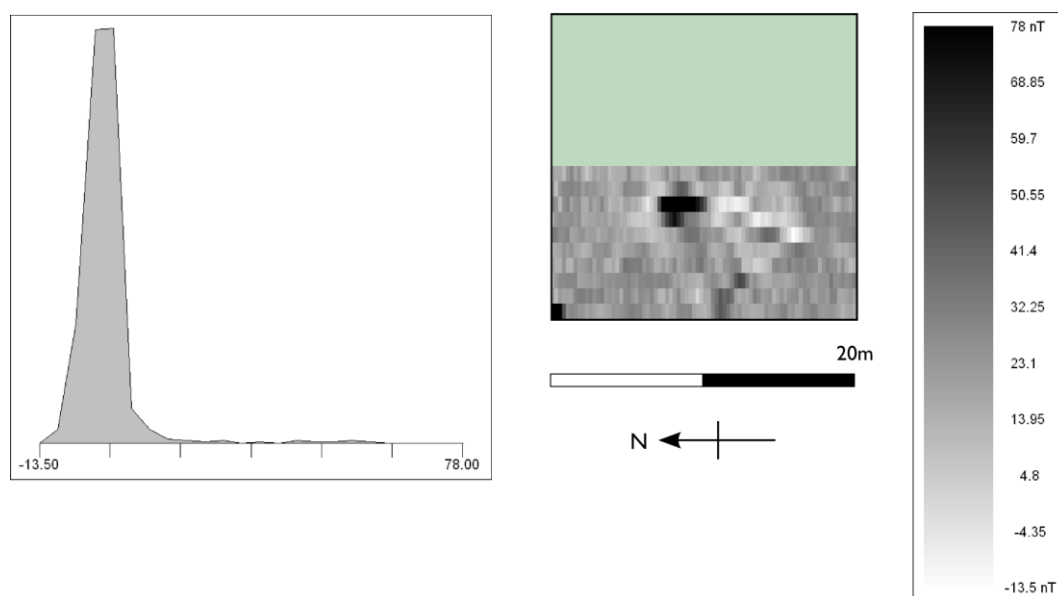


Figure 4: Unprocessed Gradiometer Results

APPENDIX 3

PETROLOGICAL REPORT

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As part of the programme of excavation a total of fourteen stones and stone fragments were analysed in order to understand the petrological make-up of the cairn and assess the origins of the Trefael Stone. This involved the collection of an exotic stone as well as twelve other randomly selected ones from the cairn material in addition to a potential fragment of the Trefael Stone, recovered from the present-day surface. Weathered and freshly hammered surfaces of hand samples were studied using a 16X Ruper hand lens. Thin sections of (number) stones were also made and examined under a transmitted light (microscope type). Shape, size, colour, mineral content and association as well as alteration, mineralisation and features such as fracturing and weathering patterns were recorded. Based on the samples taken, it is clear most stones derive from glacial deposition and one stone was shaped by human agency. The following is a brief description of the various stones collected.

Trefael Stone

This stone has an oval shape and is sub-rounded to sub-angular, about 20 x 11 cm in size. It was recovered from the present-day surface, from underneath the western portion of the capstone and was most likely part of the capstone in the recent past, as its fracture and weathering patterns indicate. Indeed, one half of the stone is sub-rounded to sub-angular, light brown in colour and appears weathered. This half also shows a triangular aspect, with one side being covered in dark green moss, another side being consistent with a fracture along a quartz vein and the third side showing only weathering with no particular feature. The other half of the stone is medium bluish grey in colour, slightly more angular and fresh looking than its counterpart, suggesting a fairly recent break. In addition, it is also possible to see the surface weathering crust on the edges of the stone on this side of the stone. The cracked opened surface is light bluish grey, fine grained and silica-flooded. (exact mineral content to be determined with thin section) It is traversed by two generations of quartz veins; one set consists in several white, millimetre-scale quartz veinlets with a parallel orientation and the other is represented by a 5 mm large oxidised quartz vein showing a growth pattern perpendicular to its orientation. The stone also contains trace, very fine grained disseminated pyrite.

TRE2010-106: Exotic stone, likely ultramafic (exact name to be determined with thin section)

This stone sub-angular to sub-rounded, about 15 x 12 x 5 cm in size and has a much higher specific gravity than all the other stones recovered. It is brownish green on its weathered surface and greyish green on its fresh surface. It is fine to medium grained with a predominance of mafic minerals (to be determined with a thin section) showing strong chlorite alteration. This stone is massive and weakly to moderately magnetic, and this is possibly due to magnetite present with serpentine as an alteration product of olivine (to be confirmed with a thin section). It also contains trace fine grained pyrite in small clusters that are randomly distributed, with some showing an oxidation halo.

Possible whetstone (sandstone)

This stone is about 7 x 7 x 3 cm large and has a square shape, with two sides being rough and nearly straight and the two others being more polished and angled at respectively 75° and 50° from the vertical; this shape suggests a possible whetstone. The weathered surface of the stone is light brown. It appears fine grained, massive and equi-granular, containing mostly quartz and possible lithics, forming a clast-dominated sandstone. There are small patches of oxidation on the surface. However, in order to preserve the integrity of the whetstone, it was not broken open, so no data is available on its fresh surface.

Sandstone

This stone is very similar in composition and appearance to the whetstone. Its weathered surface is light brown and fresh surface is pinkish brown. It is sub-angular, fine-grained, composed mostly of quartz and very little matrix. In addition, it is massive contains millimetre-scale quartz veins and shows some oxidation at the surface.

Quartz vein in host rock

This stone possibly represents parts of a quartz vein in sharp contact with its host rock. The quartz portion is white with some hematite-staining and displays locally a growth pattern perpendicular to the contact/orientation of the vein. The host rock is aphanitic to fine-grained, light to medium brown, contains mostly quartz grains and is also hematite-stained near the contact with the quartz. It has a similar composition and appearance to the whetstone although this one contains a higher proportion of matrix versus clasts.

Rounded to sub-rounded pebble

A brownish grey-blue (weathered surface) pebble was also collected from the context. It is about 8 x 7 cm in size and aphanitic to fine-grained. It has not been broken opened, so there is no data available on its fresh surface.

Mudstone

The weathered surface of this stone is light brown and its fresh surface is dark grey. It is aphanitic and massive.

Shale (two stones)

Two of the recovered stones could be called shales. One stone is brownish grey on its weathered surface and shows aphanitic light and dark grey portions on its fresh surface. It displays a weak planar fabric, with millimetre-scale oxidised horizons parallel to that fabric. The other piece of shale is about 12 x 14 x 1 cm in size, bluish grey, aphanitic and displays a weak to moderate planar fabric.

Name to be determined

This stone is sub-angular to sub-rounded, 8 x 7 x 2 cm in size. It is light greyish brown on its weathered surface and medium to dark grey on its fresh surface. It is aphanitic to fine-grained, silica-flooded and shows weak oxidation on the surface and possibly along a fracture plane. It is too fine-grained and silicified to classify it in hand sample.

Tonalite? (three stones)

Three stones with similar composition were recovered from the context. They are sub-angular to sub-rounded, light brown in colour on their weathered surface and medium grey on their fresh surface. They are fine-grained, massive, weakly oxidised throughout and silicified and appear to contain feldspar and primary quartz, hence their possible classification as tonalites.

Name to be determined

This stone is similar to the tonalites, but is slightly more angular, finer grained and only shows oxidation at the surface. In addition, one side was most likely fractured from a quartz vein, as it is entirely made up of quartz.