Whole Way Cottage, Harlton, Cambridgeshire. 1994 (HAR003):

The Roman Ceramic Building Materials

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Introduction

Cambridge Archaeology Field Group (CAFG)carried out a fieldwalking exercise in a field to the north of Whole Way Cottage, Harlton in 1994. The location is close to the present A603, a former Roman road (Akeman Street) which runs from the A1198 (known as Ermine Street, itself a major Roman road) at Arrington, to Cambridge, then onwards across East Anglia (Fig 1.).

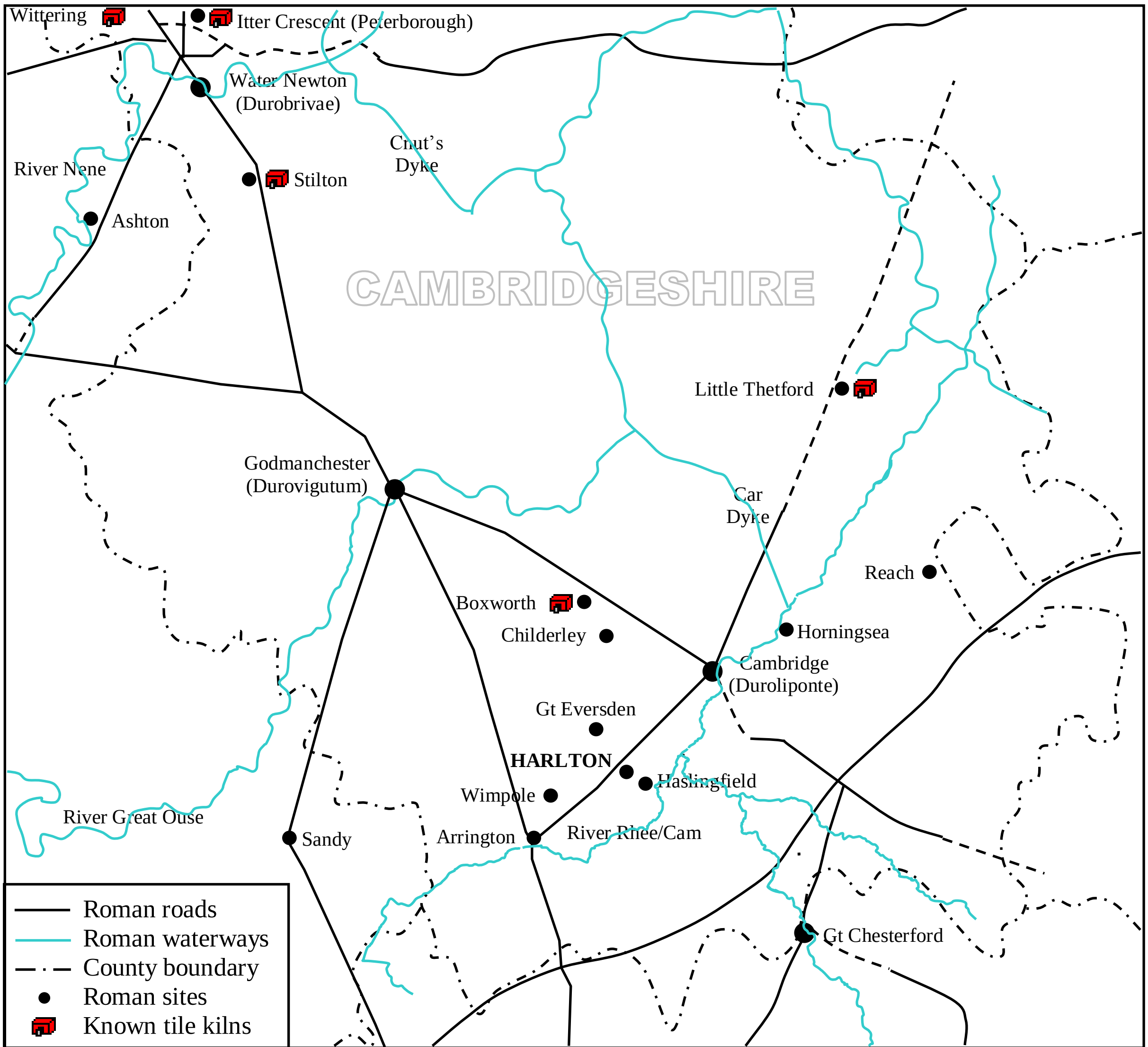

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Figure 1. Map of some of the Roman features in and around Cambridgeshire.

Methods

Surface collection was carried out by fieldwalkers following lines 10m apart. Finds were bagged at intervals along the lines; unique numbered labels were placed in each bag and National Grid references allocated. Fragments of Roman ceramic building materials (CBM) were recorded by weight and firing grade, inclusions were noted and colour of fabrics was determined in accordance with the Munsell Soil Color system. The data were recorded in a Microsoft Excel spreadsheet and analysed with the aid of a Pivot Table (Table 1).

The assemblage was examined by 10x magnification hand lens in order to aid the compilation of a catalogue of fabric types (Table 2). The forms of bricks and tiles were determined where possible and by reference to Brodribb (1987). Representative samples of forms and fabrics were retained, with the remainder and unidentifiable fragments being disposed of after recording.

Unusual features, such as marks made by humans and animals were recorded. The cross-sections of tegulae flanges were drawn, including in particular any cutaways identifiable and any evidence for how the flanges may have been formed was also recorded. Cutaways were categorised according to Warry (2006a).

The site codes referred to in this report, including that for the Whole Way Cottage investigation, are internal CAFG codes. Where individual CBM fragments have been referred to, they have been identified with a two letter site code (HW) plus two digit number, in line with the practice adopted in my wider study of Roman-British CBM in Cambridgeshire (Coates 2014).

Sum of WEIGHT(g)		FABRIC TYPES							KEPT	
TYPE	KEPT	F1	F2	F3	F4	F5	F6	Grand Total	Y	N
BRICK?	Y					78		78	78	
BRICK? Total						78		78		
IMBREX	N	220		133				353		353
	Y	462	73	83				618	618	
IMBREX Total		682	73	216				971		
INDET	N	272	51	95		8		426		426
	Y				19		26	45	45	
INDET Total		272	51	95	19	8	26	471		
TEGULA	N	317		183				500		500
	Y	4888	195	1529				6612	6612	
TEGULA Total		5205	195	1712				7112		
TILE	N	804		201				1005		1005
	Y	318	96	286		58		758	758	
TILE Total		1122	96	487		58		1763		
Grand Total		7281	415	2510	19	144	26	10395	8111	2284
% of Total		70.04	3.99	24.15	0.18	1.39	0.25	100.00	78.03	21.97

Table 1. CBM quantities recovered.

Results

Fabric	Description
F1	Predominantly uniformly fired, occasionally sandy fabric. Inclusions; ferrous (rare <0.5mm – abundant <4mm) present in all examples, calcite in 86.27% (rare <0.25mm – common <1mm), quartz in 49.02% (rare <0.5mm – occasional <4mm), silty pellets/streaks/patches, fine mica throughout. Surface: 2.5YR/5/4-7/6, 5YR/6/4-7/6, 7.5YR/7/6, 10R/5/4-6/8; core: 2.5YR/5/6–7/6, 5YR/6/4-7/6, 10R/5/6-6/8. (52 examples).
F2	Uniformly fired sandy fabric. Inclusions; quartz (occasional <1mm – common <2mm) present in all examples, calcite (rare <0.5mm – occasional <0.5mm) in 75%, ferrous (occasional <5mm – common <2mm), fine mica throughout. Surface: 10R/5/3-6/8; core: 10R/5/6-6/8. (4 examples).
F3	Uniformly well fired fine fabric. Inclusions; ferrous (rare <0.5mm – common <1mm) present in 80.77% of examples, calcite in 80.77% (rare <0.25mm – common <0.5mm), quartz in 73.08% (rare <0.5mm – occasional <2mm). Surface: 2.5YR/6/6-/6/8, 5YR/5/3-6/6, 10R/4/2-/6/8; core: 2.5YR/5/6–6/8, 5YR/5/4, 10R/5/6-6/8. (27 examples).
F4	Uniformly fired sandy fabric. Inclusions; ferrous (common <1mm). Surface: 2.5YR/6/8, core: 2.5YR/6/8. (1 example).
F5	Reduced/burnt? Fabric. Inclusions; calcite (rare <0.25mm – common <0.5mm) present in all examples, ferrous in 66.67% (rare <0.5mm), quartz in 33.33% (rare <0.5mm). Surface: 2.5YR/6/6, core: 2.5YR/6/1. (3 examples).
F6	Uniformly fired sandy fabric. Inclusions; ferrous (abundant <1mm), flint nodule (5mm). Surface: 2.5YR/6/6, core: 2.5YR/6/4. (1 example).

Table 2. Whole Way Cottage CBM fabric types.

The recovered CBM were very fragmented and often abraded. They were generally uniformly well fired and well made. They were composed of either fine silty or sandy clays, often with small quantities of ferruginous, quartz and/or calcitic inclusions. The dominant fabric type (F1) contains varying quantities of light, silty pellets, streaks and/or patches. Three of the fabrics (F2, F4 & F5) are represented by small numbers of examples and may be variants of the major fabric type F3. The single sherd in fabric type F6, with abundant fine ferrous inclusions, is redolent of a Horningsea fabric which was being produced in both pottery and CBM versions (Mills 2014, 450).

Tegulae

There appears to be as much variety in the tegula flange types amongst the Whole Way Cottage assemblage as is found on other sites in Cambridgeshire (Fig.2).

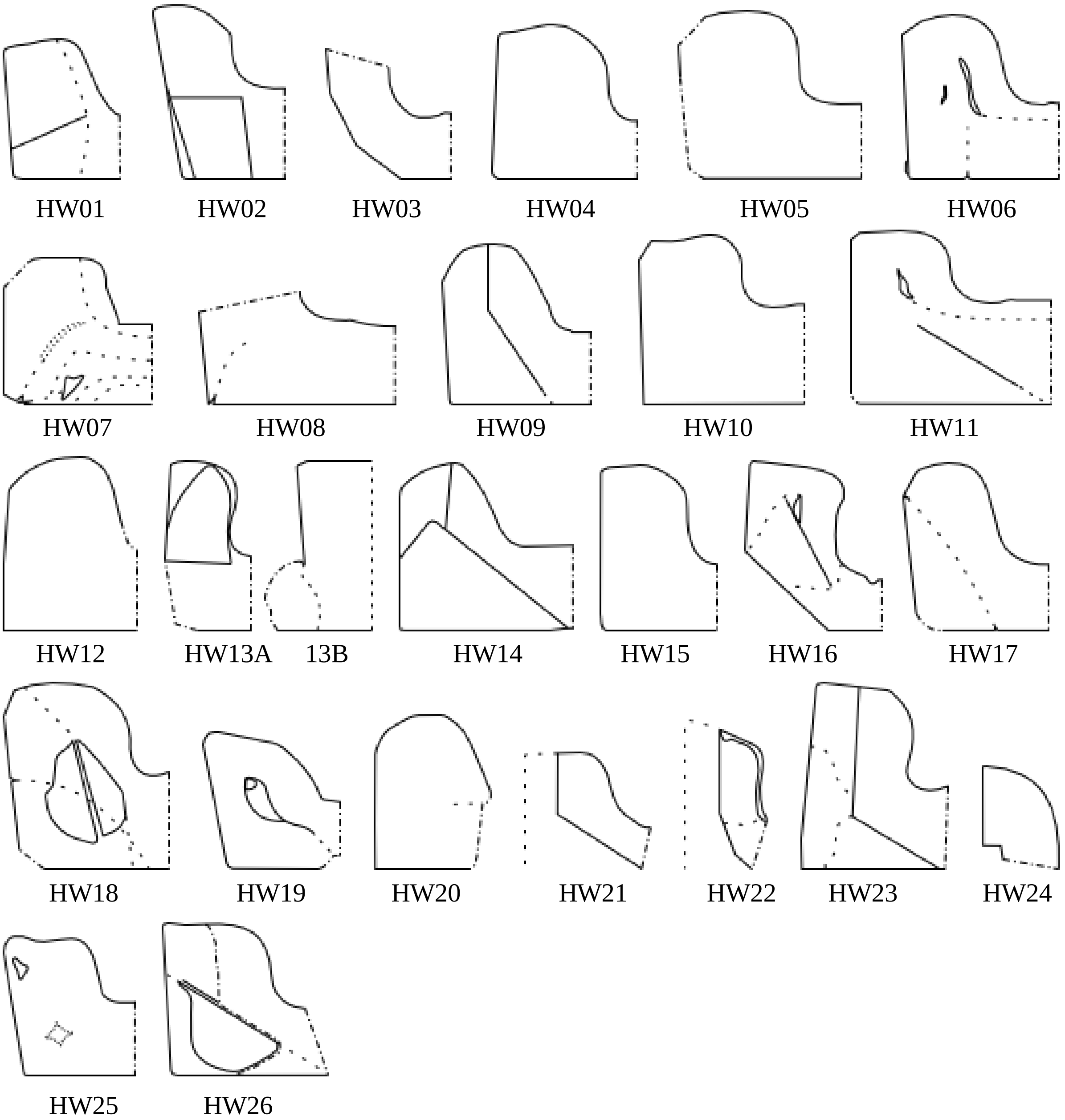

Figure 2. Whole Way Cottage tegulae flange profiles. (Scale 1:2)

All the illustrated flange profiles in Figure 2 above have been drawn as left handed to aid comparison.

A number of the Harlton tile flanges share some common characteristics. Single finger smoothing channels appear on many of the flanges, none however, exhibit the double finger smoothing channels seen on the inner flange faces of Great Eversden (CAFG forthcoming a) or Haslingfield (CAFG forthcoming b) tiles. Tools may have been used on five flanges (Fig.2: HW07, 10, 16, 18, 20). Voids are evident in several of the flanges, indicating where clay layers have been folded over, or applied and not completely amalgamated. Although the majority of the flange tops have been rounded over or flattened, four exhibit finger channels of varying depth (Fig.2: HW04, 10, 25, 26).

A variety of mould types appear to have been used, including those with vertical sides (Fig.2: HW06, 07, 10, 11, 12, 14, 15, 20), inclined inwards (Fig.2: HW04, 16, 23), inclined outwards (Fig.2: HW01, 02, 03, 05, 06, 08, 09, 17, 18, 19, 25, 26). A mould with inclined sides may have been more easily lifted away from a still wet tile. Although presumably, a mould with sides which are inclined outwards would have been used upside-down to produce an inverted tile, with an insert on the baseboard. Alternatively, a mould with detachable sides could have been employed (Warry 2006a).

One of the Whole Way Cottage tegula flanges (Fig.2: HW02), had a Warry type A26 lower cutaway, while one fragmentary sherd (Fig.2: HW24), may also have been part of an A type cutaway. One example (Fig.2: HW26), exhibited a Warry type B6 lower cutaway, whilst another (Fig.2: HW11) probably also had a type B. Type C5 upper cutaways were evident on three (Fig.2: HW09, 14, 21), while two (Fig.2: HW03, 22) had type C56. HW14 has an unusual type C5 variant, in that the lower cut was angled across the corner of the tile. Two fragments (Fig.2: HW21, 22), both appeared to be the weakened ends of flanges which had snapped off at the cutaways. Two probable type D1 cutaways are represented in the assemblage (Fig.2: HW16, 18), with one (Fig.2: HW23) possibly a type D5, although this could be a C5 variant.

Very few upper cutaways were observed in the assemblage. The only definite example (Fig.2: HW13A/B), was damaged. Two further fragments (Figs.3 & 4), which are clearly the corners of tiles, probably display the remains of upper cutaways. Their smoother, wiped surfaces have had a strip consistent with being the width of a flange trimmed away. The cuts are similar, both angled slightly downwards towards the outer edge of the tile. That from Bag 113 has an angle of 20° at the edge of the tile, reducing to 10° towards a damaged area probably representing the snapped off flange. The cut of the Bag 158 fragment is more uniformly angled at 20°. Another flange fragment (Fig.2: HW01), had an unusually angled cut mark in one of the broken ends. This is probably indicative of the fragment having come from the upper end of a tegula, where an upper cutaway had been formed in a manner similar to those from Bag 113 and Bag 158.

Figure 3. Bag 113 - chamfered cutaway

Figure 4. Bag 158 - chamfered cutaway

Figure 5. Bag 89 - imbrex 'banjo' mark

Figure 6. Bag 65 - fragment of brick

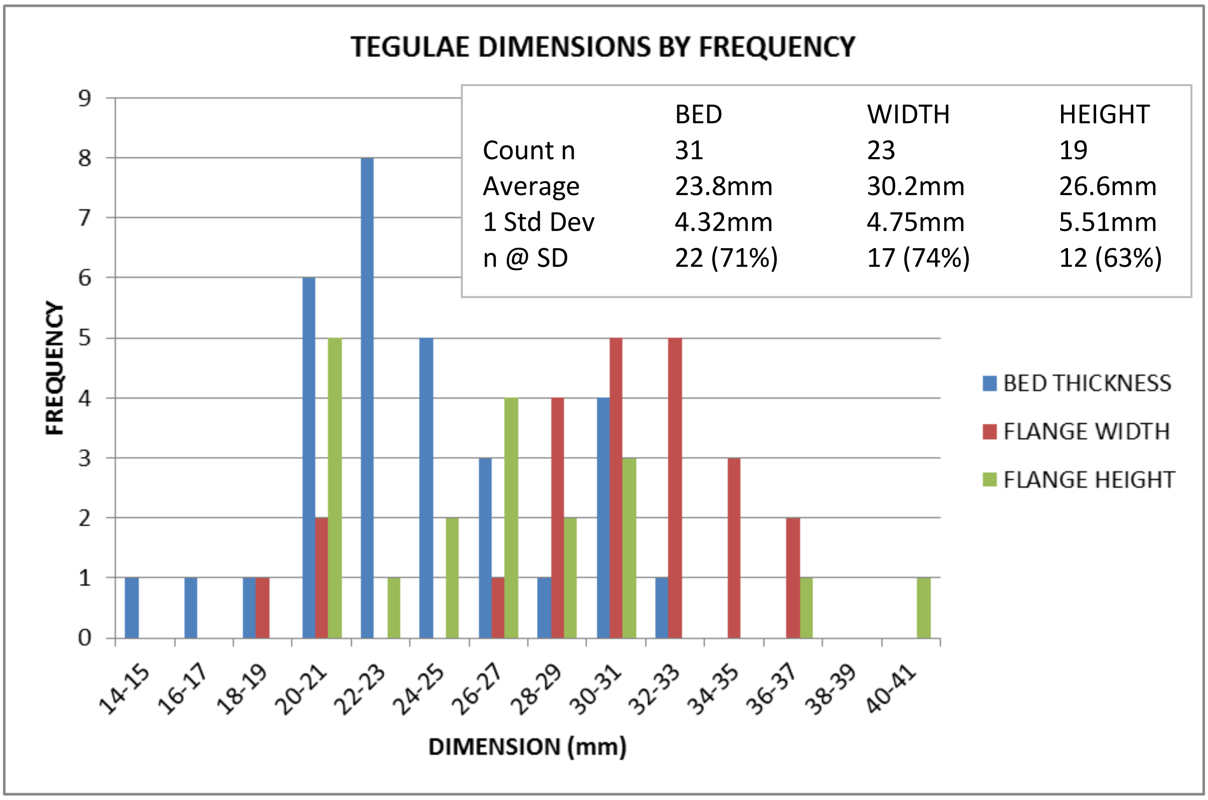

Figure 7. CBM category Tegula, dimensions by frequency.

Statistical analysis of such a small sample may not give very meaningful results, unless there are some very strong underlying factors. Nevertheless, some of the statistics derived from the Harlton tegulae fragments are worth noting.

The average flange width of the 23 measureable fragments is 30.2mm, with 17 (74%), falling within one Standard Deviation. If the group in the range 18-21mm are removed, the average increases to 31.7mm, with 20 of the flanges falling within one Standard Deviation. The smaller group appears to be a separate population

Bed thickness shows a strong peak between 20-27mm with an overall average of 23.8mm and 22 (71%) of the flanges falling within one Standard Deviation. There may be a second population in the range 30-33mm.

The height of flanges shows the widest spread of values, with only 12 (63%) of 19 tiles, falling within one Standard Deviation of the average value of 26.6mm. Once again, a small cluster of values in the range 36-41mm could be indicative of a second population.

Imbrices

There were 17 imbrex fragments identified amongst the Harlton CBM. Most were relatively small and usually much abraded. All had been produced on a sanded former and their outer surfaces had been smoothed longitudinally. Only one piece had any distinctive marks. This was noted on an example from Bag 89 (Fig. 5), in the rarer F2 fabric. The mark appeared to be 'banjo' shaped, perhaps applied with a tool or specific marking implement. By count, 12 fragments fell within one standard deviation of the average thickness of 15.75mm (Fig. 7).

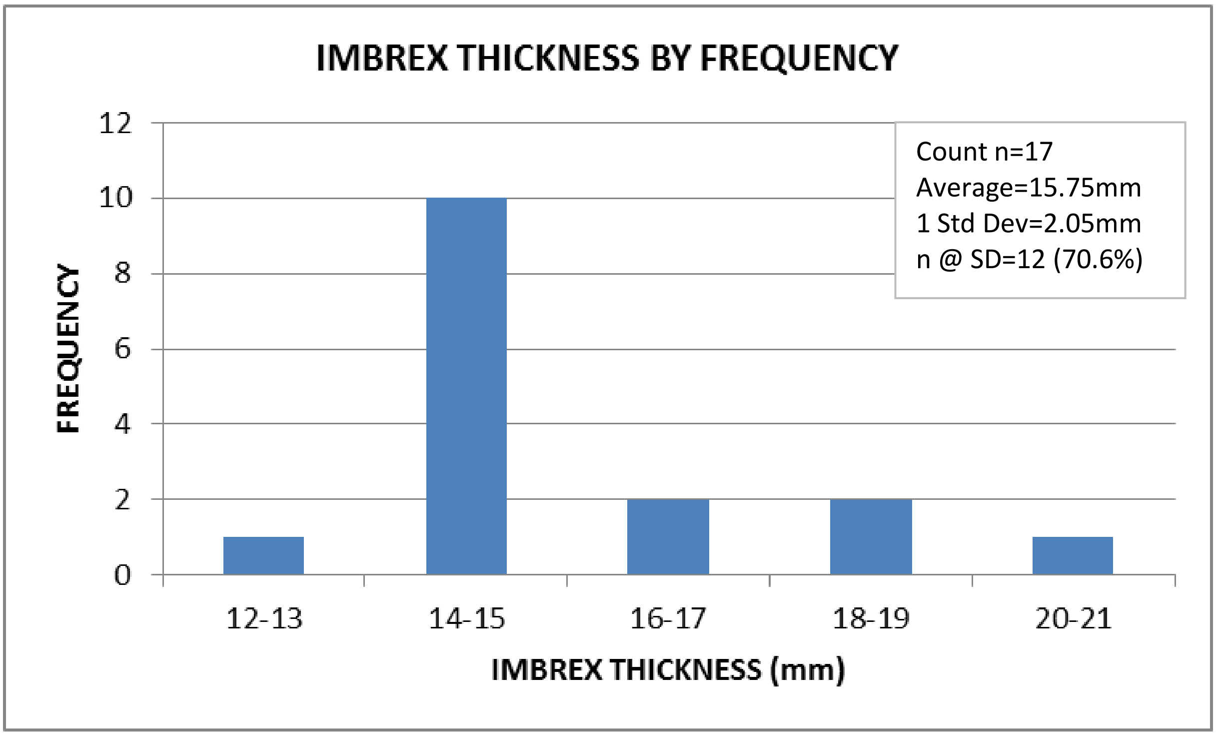

Figure 8. CBM category Imbrex, thickness by frequency.

Bricks

Only one piece of CBM, from Bag 65 (Fig 6), was identified as a possible fragment of Roman brick (pedalis?). This was largely due to its thickness (37mm). It was badly abraded, had a reduced core and was assigned to fabric type F5.

Tiles

Sixteen pieces of CBM weighing 1,763g (16.96% of the total), were assigned as tile. This was based on their having at least two intact surfaces, reliably measureable thickness but no other characteristics which could allow them to be placed in any other CBM category.

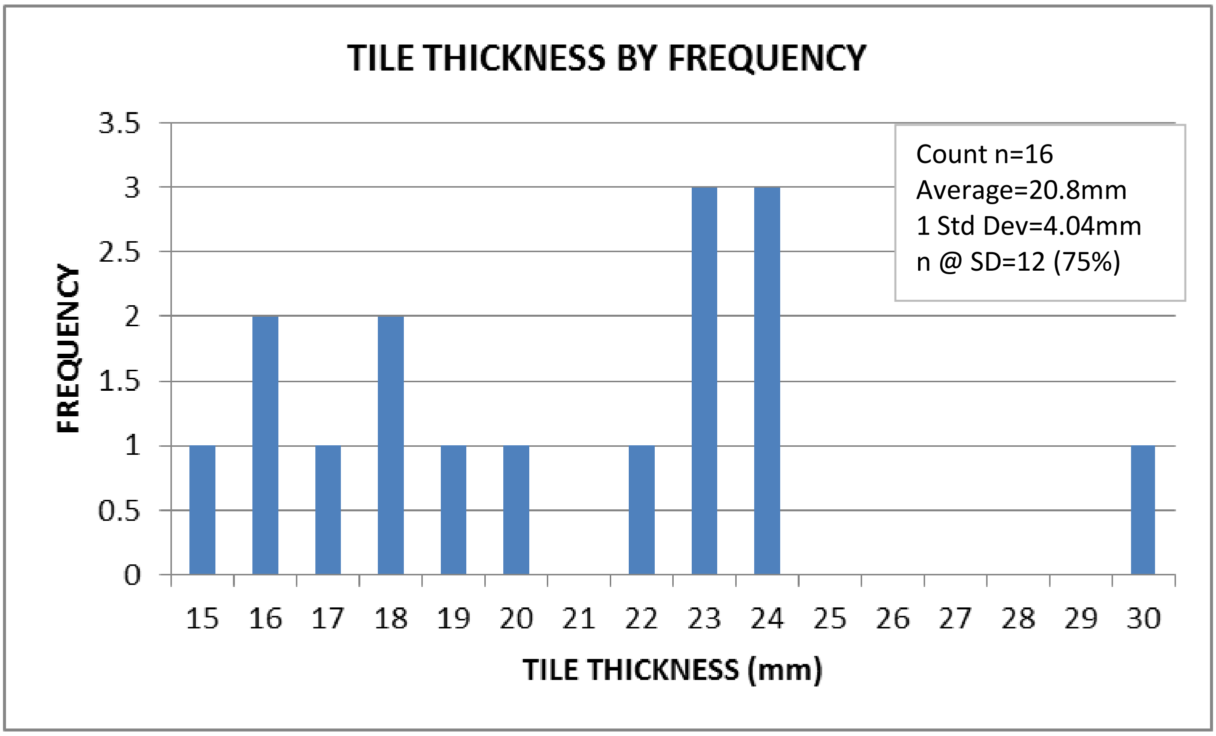

Figure 9. CBM category Tile, thickness by frequency.

The histogram of tile thickness by frequency (Fig 8) appears to show three groups of tiles by thickness. Although the thinner examples could be parts of box or flue tiles, none were combed and all fall within the range of tegulae bed thicknesses found at Harlton.

One example of this CBM category (Bag 70) had two narrow lines inscribed on its smoother surface, which appeared to be meeting at right-angles. This is reminiscent of the square mesh pattern noted on part of a half box tile from Shepreth (Z 22447, Box 371 A.5), in the collection at the Museum of Anthropology and Archaeology, Cambridge. Although incomplete, it was constructed in the form of a tegula without a cutaway at the existing end of the flange. However, part of the mid length section of flange had been cut out, no doubt to encourage the lateral dispersal of air/flue gasses.

Unidentified

Fifteen fragments of CBM weighing 471g (4.53% of the total), were too abraded or damaged to adequately determine their form and were recorded as indeterminate.

Discussion

There are some indications that the Whole Way CBM belong to an early phase of building. Tegula flange HW02 (Fig 2) has a Warry type A26 lower cutaway, while HW26 has a Warry type B6 lower cutaway. HW03 & 22 appears to have type C56 cutaways. Warry (2006b) defined four tegula type groups (A to D), arranged in broad chronological order, and based on the development of their lower cutaways. He gave a date range of 40-120CE for his A type lower cutaways and 100-200CE for B type cutaways. This dating has been challenged though by Phil Mills (2014) for instance, who argues for a much broader overlap between the four cutaway types (Table 3).

TYPE	WARRY DATE RANGE	MILLS DATE RANGE
A	40 -120	90 – 280
B	100 -180	71 – 410
C	160 -260	200 – 410
D	240 - 380	3rd - 4th C.
R	4th C.	4th C.

Table 3. Date ranges for lower cutaway types.

A second line of evidence pointing to an early building phase at Harlton lies in the dimensions of some of the tegula flanges. It can be difficult to draw conclusions from randomly broken sections of tegula flanges unless the ends of the tiles are present. Nevertheless, the flanges of several of the Harlton tegula fragments are amongst the widest of those found in Cambridgeshire in a recent survey of Roman roofing tiles by the author (Coates 2014).

Peter Warry (2006b) has argued that tegulae reduced in size over time, with all dimensions reducing in concert with this trend. It should be noted that 3 tegulae from the Itter Crescent villa having Warry C5 type lower cutaways, also display a similar range of flange widths to those from Harlton. However, five of the Whole Way flanges also have C type lower cutaways and this might be indicative of a much earlier starting date for the use of this type of cutaway in Cambridgeshire.

A third, albeit more tenuous piece of evidence, is found in the pottery recovered from Harlton. Amongst the fieldwalked assemblage, were two sherds of Samian ware. Samian occurs in Britain in contexts from at least the conquest of 44 C.E., through to the 3rd century (Willis 2005). The Harlton examples however, are perhaps too few to draw adequate conclusions from.

From these strands of evidence then, we might infer an early date for the commencement of activity at Whole Way in the Roman period, which continued on into the 3rd, or perhaps 4th centuries. The building, if that is what it was, does not appear to be have been of very high status; perhaps a rural farmhouse rather than grand villa. Assuming that ploughing had penetrated deeply enough, no tesserae were identified in the assemblage not even coarse ones made from recycled tile as at Great Eversden (CAFG forthcoming a). Neither was there much evidence for box flue or cavity wall tiles.

Distribution of finds

The distribution plot (Fig. 7) of fabric types F1 and F3 shows that they are broadly coincident, with F1 perhaps, being slightly more dispersed. This could indicate that the F1 fabric is sitting higher in the ploughsoil and is perhaps from a slightly later phase of activity to that of the F3 fabric.

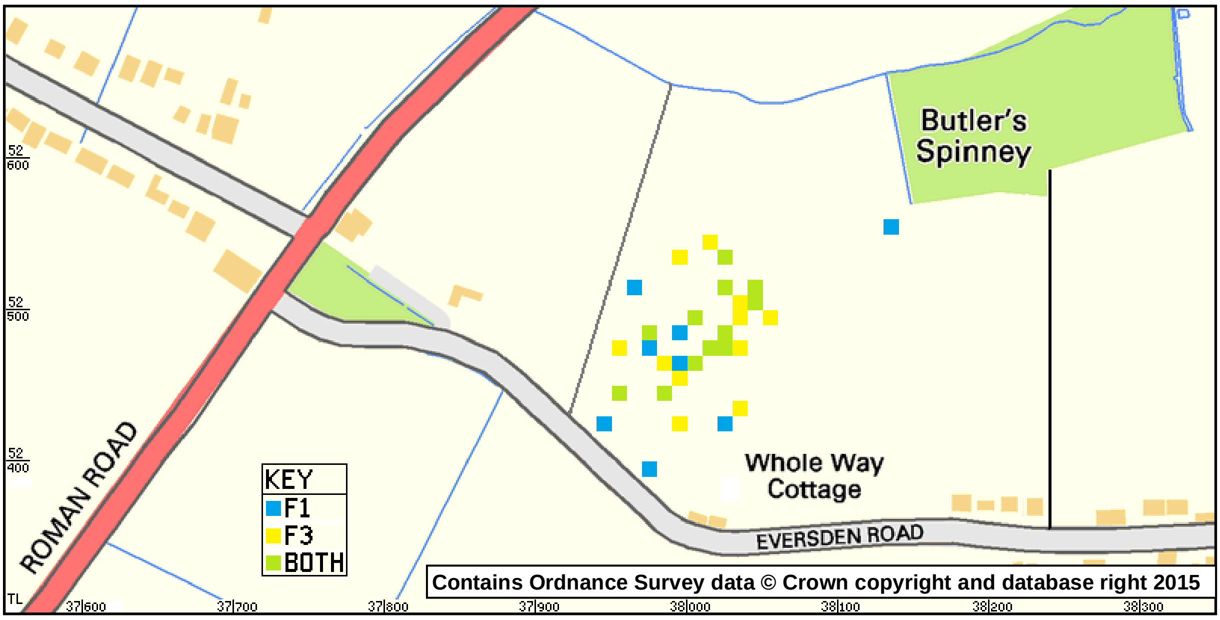

Figure 10. Plot of CBM fabrics F1 and F3 distribution by 10m squares.

As tegulae and imbrices have markedly different forms and dimensions, comparing them by weight may produce a more satisfactory analysis. A ratio of 2-3.5:1 between tegulae and imbrices by weight has been suggested for Roman style roofs depending on the area covered (Brodribb 1987, 11-12; Ramos Sáinz 2003). The ratio among the Harlton assemblage is 7:1, which is somewhat unusual. If the sub-assemblage of tiles discussed above is added to the identified tegulae fragments, the discrepancy becomes even more extreme.

One explanation which has been proposed for such disparity is the reuse of tegulae in later building phases. Some of the Harlton CBM fragments do have traces of mortar on broken edges, but this is not conclusive. Phil Mills (*pers*. *comm*.) has suggested that it may have been the result of the CBM being used as hardcore (and perhaps not necessarily in the Romano-British period).

The etymology of the name Whole Way, suggests a sunken or boggy route, perhaps from the Germanic *hohlweg* (hollow way). Topologically this is appropriate, as the surrounding area can be quite wet. A convenient source of hardcore could have been utilised to firm up a boggy corner, as I have observed in the Post Medieval period during fieldwalking on a number of other sites in Cambridgeshire.

That a significant quantity of Roman potsherds were also recovered from the Harlton site (CAFG 2000), perhaps suggests a settlement site; however, it has been noted that pot has also been employed in repairs to Roman roads (Gibson and Knight 2002, 40). I would suggest that the line of the Cambridge road seen today may originally have run further to the east and was moved to accommodate expansion of the manorial estate known as Butler's. The original Roman road would then have run close to the Whole Way cottage site, with the Whole Way track remaining as a relic of it (Fig. 11). Of course, the imbrices may have been preferentially removed for alternative uses; as drainage conduits or perhaps ridge tiles for buildings of later periods. It is clear that much more work will be required to satisfactorily resolve these questions.

The silty inclusions in the clay used to manufacture some of the Harlton CBM assemblage most likely indicate that the clay came from riverine deposits. These may have been obtained locally, as the site lies within around 3.5km of the current course of the river Cam to the east and the Bourn brook, 2km to the north. There was a significant clay extraction operation on-going in the post medieval period at the nearby Claypit Hill site at Great Eversden, with associated brickworks. Two clay pits were located in the parish of Harlton itself and were in use from the medieval period. The last one was infilled by 1971 (BHO) and is probably the one shown on early Ordnance Survey maps, approximately 300m to the south of the Whole Way site.

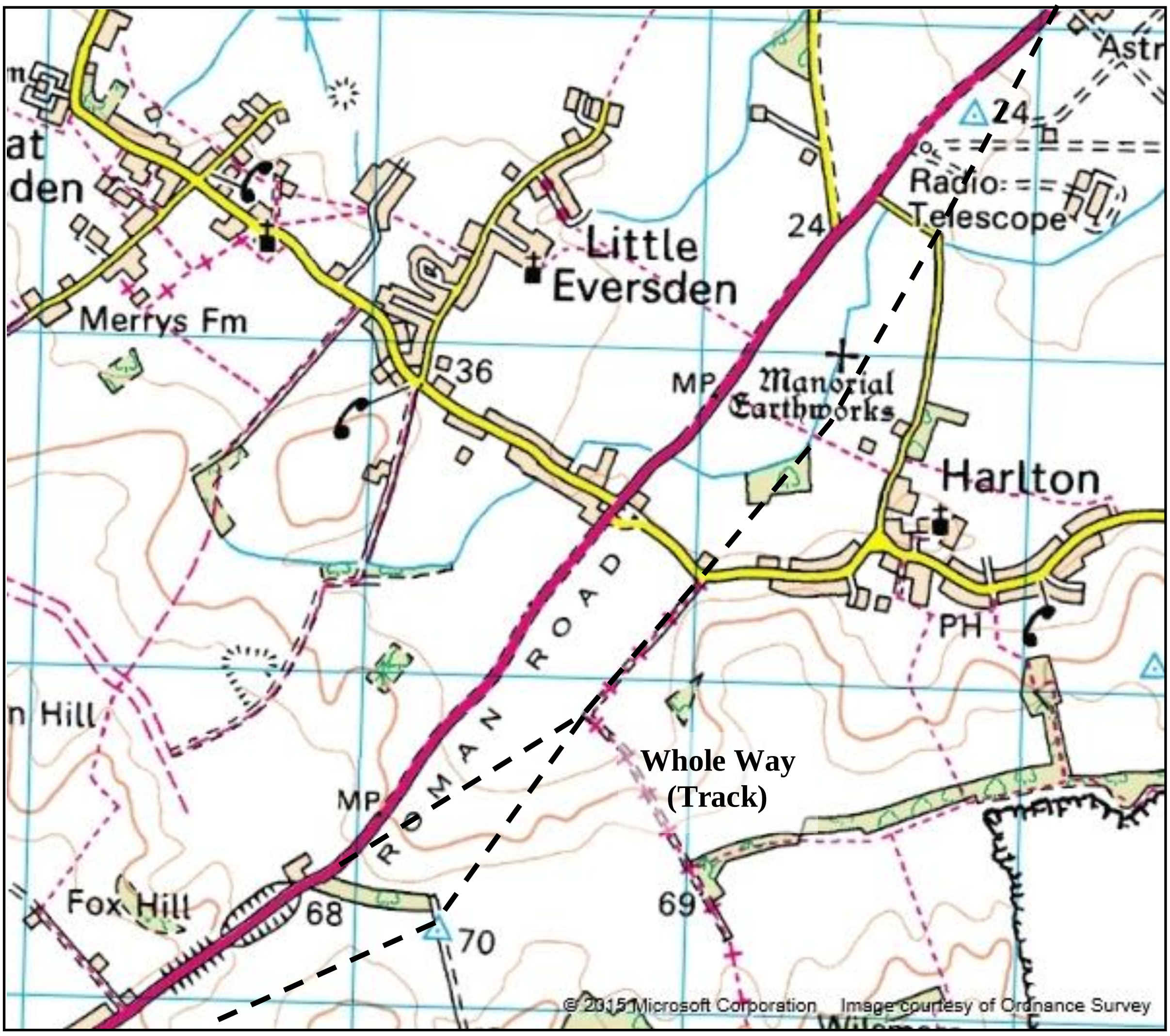

Figure 11. Possible alternative routes for Akeman Street.

Future work

A further programme of investigation at Whole Way Cottage is recommended in order to better understand the nature of activity there in the Roman period. The original fieldwalking programme appeared to show that finds were concentrated near to the western field boundary; most likely would extend into the adjacent field/paddock. Intensive fieldwalking by 10m squares may produce evidence which could be more confidently considered to be a representative sample. The use status of the fields is presently uncertain, but perhaps geophysical survey might be employed if they were to remain uncultivated.

Attention might also be given to the land to the south of Eversden Road. The early Ordnance Survey maps indicate a Roman Villa site at approximately TL379523 (CHER N°: 03439), although this may just indicate the southwest corner of the containing 100yd/m grid square.

Archiving

The physical finds from the Whole Way Cottage site, both pottery and CBM, are currently stored in a single cardboard archiving box (CAFG Box 7), in the general storage shelving area of Oxford Archaeology East, Trafalgar Way, Bar Hill, Cambridgeshire. Ultimately, they may be moved to Cambridgeshire County Council's 'Deep Store' facility in Cheshire.

A copy of this report will be deposited with the Cambridgeshire Historic Environment Record and may also be available on the CAFG website, along with the original fieldwalking report (CAFG 2000), with which this report should be integrated. The full data recording Excel spreadsheet may also be available from the website, or by application to the group.

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Version [1.0]

[C.C.]

Appendix 1. CBM assessment data (abridged)

BAG	WEIGHT(g)	ID	X(mm)	Y(mm)	T(mm)	W(mm)	H(mm)	TYPE	FIRING	GRADE	SILTY	SANDY	FTYPE	FERROUS	CALCITE	QUARTZ	SURFACE	CORE	INNER	KEPT
0	354	HW26			20	33	26	TEGULA	UNIFORM	COARSE			F1	RARE<1mm	RARE<1mm		10R/5/4	10R/5/8		Y
40	118		86	64	18			TILE	UNIFORM		Y	Y	F1	COM<2mm	COM<0.5mm	OCC<2mm	5YR/6/6	5YR/6/6		N
44	201	HW01	102	35	19	31	23	TEGULA	UNIFORM		Y	Y	F1	COM<3mm	OCC<3mm	RARE<0.5mm	5YR/6/6	5YR/6/6 - 2.5YR/6/6		Y
50	195	HW02	136	40	27	21	25	TEGULA	UNIFORM			Y	F2	COM<2mm	OCC<0.5mm	OCC<1mm	10R/5/3	10R/5/6 - 6/8		Y
51	220	HW03	90	81	20	19	20?	TEGULA	UNIFORM	FINE			F3	OCC<3mm	RARE<4mm		2.5YR/6/8	10R/6/8		Y
54	164		85	84	23			TILE	UNIFORM	FINE			F3	RARE<0.5mm	COM<0.5mm	RARE<1.5mm	10R/6/4	10R/6/8	1/4/N	Y
63	21		59	29	15			IMBREX	UNIFORM	FINE	Y		F1	OCC<2mm	OCC<1mm		5YR/6/8	5YR/6/8		N
63	38		61	40	15			IMBREX	UNIFORM	FINE			F3	OCC<0.5mm	OCC<0.5mm		2.5YR/6/8	2.5YR/6/8		Y
63	13		36	25	15			IMBREX	UNIFORM	FINE			F3	OCC<0.5mm		RARE<1mm	2.5YR/6/8	2.5YR/6/8		N
63	193	HW08	82	75	25	29	?	TEGULA	UNIFORM	COARSE	Y	Y	F1	OCC<8mm			2.5YR/6/8	2.5YR/6/6		Y
63	162	HW07	70	52	24	34	20	TEGULA	UNIFORM	FINE			F3	COM<0.25mm	OCC<0.5mm		10R/5/8	10R/5/8		Y
64	27		50	36	15			IMBREX	UNIFORM	FINE	Y	Y	F1	RARE<1.5mm	COM<0.5mm	RARE 1mm	5YR/6/6	5YR/6/6		Y
64	59		62	58	15			IMBREX	UNIFORM	COARSE	Y	Y	F1	OCC<1mm	RARE<1mm		5YR/6/6	5YR/6/8		Y
64	164	HW05	86	59	22	35	28	TEGULA	WELL	COARSE	Y	Y	F1	OCC<2mm	RARE<2mm	RARE 2*3mm	5YR/6/6	2.5YR/6/6		Y
64	163	HW04	69	52	17	34	29	TEGULA	WELL	COARSE	Y	Y	F1	COM<1mm	RARE<0.5mm		5YR/6/8	5YR/6/4		Y
64	346	HW06	108	97	23	33	26	TEGULA	WELL	COARSE	Y	Y	F1	COM<1mm	RARE<1mm	RARE 2*2mm	7.5YR/4/4	5YR/6/6		Y
64	90		87	36	24			TILE		COARSE	Y	Y	F1	RARE<1mm	RARE<1mm		10R/5/6	10R/5/6		N
64	76		88	47	17			TILE	UNIFORM	FINE	Y	Y	F1	OCC<1mm	COM<1mm		5YR/6/6	5YR/6/4		N
64	73		56	50	24			TILE	UNIFORM		Y		F1	ABUND<2mm	RARE1mm		5YR/6/6	5YR/6/6		N
65	78		66	28	37			BRICK?		RED'D			F5	RARE<0.5mm	OCC<2mm		2.5YR/6/6	2.5YR/6/1		Y
65	82		74	54	15			IMBREX	UNIFORM	FINE	Y	Y	F1	COM<1mm	OCC<0.5mm	OCC<1mm	2.5YR/6/8	2.5YR/6/8		Y
65	70		82	43	24			INDET	UNIFORM	FINE	Y		F1	RARE<1.5mm	RARE<0.5mm		2.5YR/5/6	2.5YR/5/6		N
65	17		41	28	19			INDET	UNIFORM	FINE	Y	Y	F1	COM<2mm			2.5YR/7/6	2.5YR/7/6		N
65	19		45	31	14			INDET	UNIFORM	FINE	Y		F1	COM<2mm			5YR/7/6	5YR/7/6		N
65	11		46	26	10			INDET	UNIFORM	FINE			F3			RARE<0.5mm	2.5YR/6/8	2.5YR/6/8		N
65	19		46	32	12			INDET	UNIFORM	FINE		Y	F4	COM<1mm			2.5YR/6/8	2.5YR/6/8		Y
65	129		102	38	33			TEGULA	UNIFORM	FINE	Y	Y	F1	OCC<2mm		OCC<4mm	2.5YR/6/6	2.5YR/6/8		N
65	28		53	29	18			TILE	UNIFORM	FINE	Y		F1	COM<1.5mm	RARE<0.5mm		5YR/6/6	5YR/6/6		N
65	25		51	31	16			TILE	UNIFORM	FINE	Y		F1	OCC<1mm	RARE<2mm		5YR/6/6	5YR/6/6		N
67	113		74	41	30			TEGULA	UNIFORM	FINE		Y	F3		RARE<0.5mm	RARE<0.5mm	2.5YR/6/6	2.5YR/6/6		Y
67	120		70	66	23			TILE	UNIFORM		Y	Y	F1	COM<1.5mm	RARE<1.5mm		2.5YR/5/4	2.5YR/5/6		Y

BAG	WEIGHT(g)	ID	X(mm)	Y(mm)	T(mm)	W(mm)	H(mm)	TYPE	FIRING	GRADE	SILTY	SANDY	FTYPE	FERROUS	CALCITE	QUARTZ	SURFACE	CORE	INNER	KEPT
68	312	HW09	127	55	22	32	26	TEGULA	UNIFORM		Y	Y	F1	COM<2mm	OCC<0.5mm	RARE<1mm	2.5YR/6/8	2.5YR/6/6		Y
70	122		89	58	19			TILE	UNIFORM	FINE			F3	OCC<0.5mm	RARE<1.5mm	RARE<1.5mm	2.5YR/6/6	2.5YR/6/6		Y
70	58		70	44	16			TILE		RED'D		Y	F5	RARE<0.5mm	RARE<0.25mm	RARE<0.5mm	2.5YR/6/6		2.5YR/6/1	Y
87	116	HW13	77	41	22?	21	29?	TEGULA	UNIFORM		Y	Y	F1	OCC<2mm	RARE<0.25mm		2.5YR/6/8	2.5YR/6/6		Y
87	205	HW10	67	67	30	31	21	TEGULA	UNIFORM		Y	Y	F1	COM<1mm		RARE<1.5mm	2.5YR/6/8	2.5YR/6/8		Y
87	248	HW12	105	53	24?	37	28?	TEGULA	UNIFORM		Y	Y	F1	OCC<1mm	RARE<0.5mm		2.5YR/6/8	2.5YR/6/8		Y
87	248	HW11	100	64	31	30	21	TEGULA	UNIFORM				F3	OCC<3mm	RARE<2mm		2.5YR/6/8	2.5YR/6/8		Y
89	73		83	59	12			IMBREX	UNIFORM			Y	F2		RARE<0.5mm	COM<2mm	10R/5/6	10R/5/6		Y
89	140	HW15	97	35	20	26	30	TEGULA	UNIFORM		Y		F1	OCC<2mm	RARE<0.5mm	OCC<1mm	2.5YR/6/8	2.5YR/6/8		Y
89	657	HW14	150	11	25	32	25	TEGULA	UNIFORM		Y		F1	OCC<3mm	RARE<0.5mm	RARE<4mm	2.5YR/6/8	2.5YR/6/8		Y
89	268	HW16	133	67	15	28	36	TEGULA	UNIFORM				F3	OCC<1mm	RARE 6*6mm	OCC<0.5mm	2.5YR/6/8	2.5YR/6/8		Y
90	36		55	42	25			INDET	UNIFORM		Y		F1	OCC<2mm	RARE<1.5mm		5YR/7/6	5YR/6/6		N
90	117		76	74	27			TEGULA	UNIFORM		Y		F1	OCC<0.5mm	RARE<0.5mm	RARE<0.5mm	10R/5/4	2.5YR/6/8		N
90	150	HW17	68	58	20	29	30	TEGULA	UNIFORM		Y		F1	OCC<3mm	RARE<0.5mm	RARE<1mm	2.5YR/6/8	2.5YR/6/8		Y
91	92		78	62	15			IMBREX	UNIFORM		Y		F1	OCC<1mm	COM<0.25mm		5YR/6/6	2.5YR/6/6		N
91	18		45	35	12			INDET	UNIFORM		Y		F1	COM<2mm	RARE<0.5mm	RARE<0.5mm	5YR/7/4	5YR/7/4		N
91	54		68	23				TEGULA	UNIFORM				F3	RARE<0.5mm	RARE<2mm	RARE<0.5mm	2.5YR/6/8	2.5YR/6/6		Y
91	193		120	73	23			TILE	UNIFORM		Y	Y	F1	OCC<0.5mm	RARE<0.5mm	RARE<0.5mm	2.5YR/6/8	2.5YR/6/8		N
92	28		64	30	14			IMBREX	UNIFORM				F3		RARE<0.25mm		2.5YR/6/8	2.5YR/6/6		N
92	198		112	50	30			TILE		SILTY	Y	Y	F1	RARE<0.5mm	RARE<0.25mm		2.5YR/6/8	2.5YR/6/8		Y
92	96		90	57	15			TILE	UNIFORM				F2			OCC<2mm	10R/6/8	10R/6/8		Y
94	88		77	62	19			IMBREX	UNIFORM		Y	Y	F1	OCC<2mm	RARE<0.25	RARE<2mm	2.5YR/6/8	2.5YR/6/8		Y
95	406	HW18	160	60	29	37	27	TEGULA		SILTY	Y		F1	COM<2mm		RARE<0.5	2.5YR/6/6	2.5YR/6/6		Y
96	154		108	75	17			IMBREX	UNIFORM	SILTY	Y		F1	RARE<2mm	RARE<1mm		2.5YR/6/8	2.5YR/6/6		Y
96	80		81	35		31	30?	TEGULA		SILTY	Y		F1	OCC<1mm	OCC<0.5		2.5YR/6/8	2.5YR/6/8		Y
96	460		155	106	23		41	TEGULA	UNIFORM		Y	Y	F1	OCC<2mm		RARE<0.5	2.5YR/6/8	2.5YR/6/8		Y
96	127		88	52	24			TILE	UNIFORM	SILTY	Y		F1	OCC<2mm	RARE<3mm	RARE<3mm	2.5YR/6/8	2.5YR/6/6		N
96	201		153	57	22			TILE	UNIFORM	FINE			F3		RARE 2mm		2.5YR/6/8	2.5YR/6/6		N
98	8							INDET	RED'D	BURNT?			F5		COM<0.5					N
98	74		60	55	20			TILE	UNIFORM		Y		F1	OCC<3mm	RARE<0.5	RARE<0.5	2.5YR/6/8	2.5YR/6/8		N
101	52							IMBREX	UNIFORM		Y		F1	OCC<2mm	OCC<0.25mm		2.5YR/6/8	2.5YR/6/6		Y

BAG	WEIGHT(g)	ID	X(mm)	Y(mm)	T(mm)	W(mm)	H(mm)	TYPE	FIRING	GRADE	SILTY	SANDY	FTYPE	FERROUS	CALCITE	QUARTZ	SURFACE	CORE	INNER	KEPT
102	86	HW19	57	53	20	32	21	TEGULA	UNIFORM	FLAKEY			F3	COM<1mm	RARE<1mm	RARE<2mm	2.5YR/6/6	2.5YR/6/8		Y
103	33		46	39	19			IMBREX	UNIFORM		Y		F1	OCC<2mm	RARE<1mm	RARE 2mm	2.5YR/6/8	2.5YR/6/6		N
103	23	HW21	38	29		28?	22?	TEGULA	UNIFORM	SILTY	Y		F1	RARE<1mm	RARE<0.25		10R/6/8	10R/6/6		Y
103	80	HW20	42	35	20?	35?	26?	TEGULA	LIGHT	SILTY	Y		F1	COM<3mm	OCC<0.5mm		5YR/6/4	2.5YR/6/6		Y
103	133		86	64	21			TEGULA	UNIFORM	FINE			F3			RARE<0.5	10R/6/8	10R/6/8		N
107	114		70	55	30			TEGULA				Y	F3	RARE<4mm	COM<0.25	RARE<0.5	5YR/5/3	5YR/5/4	7.5YR/6/1	Y
108	18	HW22	42	40	15?	24?	27?	TEGULA	UNIFORM	FINE			F3	RARE<0.5	RARE<0.5	RARE<1mm	10R/6/8	10R/6/8		Y
113	151		92	83	23			TEGULA	UNIFORM	SILTY	Y		F1	ABUND<4mm	RARE<0.5		2.5YR/6/8	2.5YR/6/6		Y
113	339	HW23	152	50	25	31	31	TEGULA	UNIFORM	SILTY	Y		F1	RARE<0.5	RARE<3mm		10R/6/2	2.5YR/6/8		Y
132	48		74	47	16			IMBREX	UNIFORM	FINE			F3	RARE<2mm		RARE<1mm	10R/6/8	10R/6/8		N
132	24		48	30	15			INDET	UNIFORM	FINE			F3	RARE<2mm	RARE<0.5		2.5YR/6/8	2.5YR/5/6		N
135	59		67	48	25			TEGULA	UNIFORM	FINE			F3	OCC<0.25mm	RARE<3mm	RARE<3mm	10R/5/6	10R/5/8		Y
143	44		61	58	15			IMBREX	UNIFORM	FINE			F3	RARE<0.5	RARE<0.5	OCC<2mm	10R/6/8	10R/5/8		N
143	41		54	47	16			INDET	UNIFORM	SILTY	Y		F1	COM<2mm	RARE<3mm		2.5YR/6/8	2.5YR/6/8		N
145	74		68	58	20			IMBREX	UNIFORM	SILTY	Y		F1	OCC<2mm	RARE<1mm	RARE<2mm	10R/6/8	10R/6/6		N
145	71		73	48	18			INDET	UNIFORM	SILTY	Y		F1	COM<3mm	RARE<2mm	RARE<0.5	2.5YR/6/8	2.5YR/6/8		N
149	51		65	54	15			INDET	UNIFORM			Y	F2	OCC<5mm	RARE<1mm	OCC<6mm	10R/5/8	10R/5/8		N
149	160	HW25	91	46	22	28	20	TEGULA	UNIFORM	FINE			F3	OCC<2mm	OCC<0.25mm	RARE<0.5	5YR/6/6	10R/6/6		Y
149	27	HW24	49	21		33?	31?	TEGULA	UNIFORM	FINE			F3	RARE<0.5	COM<0.25mm		2.5YR/6/8	2.5YR/6/6		Y
152	71		72	46	22			TEGULA	UNIFORM	SILTY	Y		F1	COM<1mm	OCC<1mm	RARE<0.5	2.5YR/6/6	2.5YR/6/8		N
158	45		63	47	15			IMBREX	UNIFORM	FINE			F3	OCC<0.5mm	OCC<3mm	OCC<2mm	10R/5/6-4/2	10R/5/8		Y
158	32		53	42	15			INDET	UNIFORM	FINE			F3		RARE<0.5	RARE<1mm	10R/5/6	10R/5/6		N
158	28		52	35	15			INDET	UNIFORM	FINE			F3	RARE<0.5	RARE<0.25	RARE<0.5	2.5YR/6/8	10R/5/8		N
158	26		46	36	15			INDET	UNIFORM			Y	F6	ABUND<1mm	OCC<0.5mm		2.5YR/6/6	5YR/6/4		Y
158	100		68	58	22			TEGULA	UNIFORM	COARSE	Y		F1	OCC<2mm	RARE<0.25	RARE<0.5	10R/5/8	10R/6/8		Y
158	50		58	40	27			TEGULA	UNIFORM				F3	RARE<0.5		RARE<0.5	10R/5/6	10R/6/8		N