**An Integrated Bioarchaeological Approach to the Medieval ‘Agricultural Revolution’: A Case Study from Stafford, England, *c.* ad 800–1200**

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**Supplementary Material 2**

**Chronometric data and models for archaeobotanical samples**

The models in this report were constructed using OxCal 4.3.2 (Bronk Ramsey, 2009) and the IntCal13 calibration curve (Reimer et al., 2013).

# Revised phasing scheme

|  |  |  |
| --- | --- | --- |
| **Phase** | **Sub-phase** | **Estimated date range (centuries ad)** |
| 1 | 1.1 | late ninth – early tenth |
| 2 | 2.1 | mid tenth |
| 2 | 2.2 | mid tenth – late tenth |
| 2 | 2.3 | late tenth– mid eleventh |
| 3 | 3.1 | mid eleventh – mid twelfth |
| 3 | 3.2 | early twelfth – mid twelfth |
| 3 | 3.3 | early thirteenth |
| 4 | 4.1 | thirteenth – fourteenth |
| 4 | 4.2 | thirteenth – sixteenth |
| 5 | 5.1 | sixteenth and later |

# St Mary’s Grove

Data from Carver 2010

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature** | **Context** | **Material** | **Laboratory no.** | **Uncalibrated age bp** |
| F584 (S12) | 2247 | burnt wood and grain | HAR-7039 | 1270 ± 70 |
| F584 (S12) | 2247 | burnt wood and grain | HAR-7040 | 1120 ± 70 |
| F584 (S12) | 2247 | burnt wood and grain | HAR-7041 | 1310 ± 90 |

Data from FeedSax

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature** | **Context** | **Material** | **Laboratory no.** | **Uncalibrated age bp** |
| 130 | 1682 | 3 x *Avena* grain | OxA-37395 | 1111 ± 25 |
| 585 | 2223 | 3 x *Avena* grain | OxA-37533 | 930 ± 28 |
| 136 | 2136 | 3 x *Avena* grain | OxA-37534 | 1120 ± 27 |
| 136 | 2134 | 3 x *Avena* grain | OxA-37669 | 1076 ± 26 |
| (SFB) | 1988 | 3 x *Triticum* free-threshing grain | OxA-37535  OxA-37536 | 910 ± 27  888 ± 27 |
| 449 | 2178 | 3 x *Secale cereale* grain | OxA-37537 | 973 ± 28 |
| 471 | 1929 | 3 x *Triticum* free-threshing grain | OxA-37538 | 896 ± 28 |
| 435 | 2102 066/077 | 3 x *Secale cereale* grain | OxA-37539 | 962 ± 27 |
| 435 | 2102 066/079 | 3 x *Secale cereale* grain | OxA-37540 | 919 ± 26 |
| 435 | 2102 069/078 | 3 x *Secale cereale* grain | OxA-37541 | 981 ± 27 |

## OxCal model in CQL2

Plot()

{

Outlier\_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");

Sequence("St Marys Grove") {

Boundary("Start whole");

Phase("whole")

{

Phase("North-East area")

{

Sequence("ovens to pits sequence")

{

Boundary ("Start Period 3");

Phase ("Period 3")

{

Phase("Oven F130")

{

R\_Date("OxA-37395", 1111, 25);

};

Phase("Oven F584")

{

R\_Date("HAR-7039", 1270, 70)

{

Outlier("Charcoal",1);

};

R\_Date("HAR-7040", 1120, 70)

{

Outlier("Charcoal",1);

};

R\_Date("HAR-7041", 1310, 90)

{

Outlier("Charcoal",1);

};

};

Phase("Oven F585")

{

R\_Date("OxA-37533", 930, 28);

};

Phase("Pit F136")

{

Sequence("F136 pit fills")

{

Boundary("Start 2136");

Phase("context 2136")

{

R\_Date("OxA-37534", 1120, 27);

};

Boundary("end 2136 start 2134");

Phase("context 2134")

{

R\_Date("OxA-37669", 1076, 26);

};

Boundary("end 2134");

};

};

};

Boundary("end Period 3 start Period 4");

Phase ("Period 4")

{

R\_Date("OxA-37537", 973, 28);

};

Boundary("End Period 4");

};

};

Phase("Central area")

{

Phase("F517 SFB")

{

R\_Date("OxA-37535", 910, 27);

R\_Date("OxA-37536", 888, 27);

};

Phase("F435 quarry pit")

{

R\_Date("OxA-37539", 962, 27);

R\_Date("OxA-37540", 919, 26);

R\_Date("OxA-37541", 981, 27);

};

};

Phase("South-West area")

{

Phase("F471")

{

R\_Date("OxA-37538", 896, 28);

};

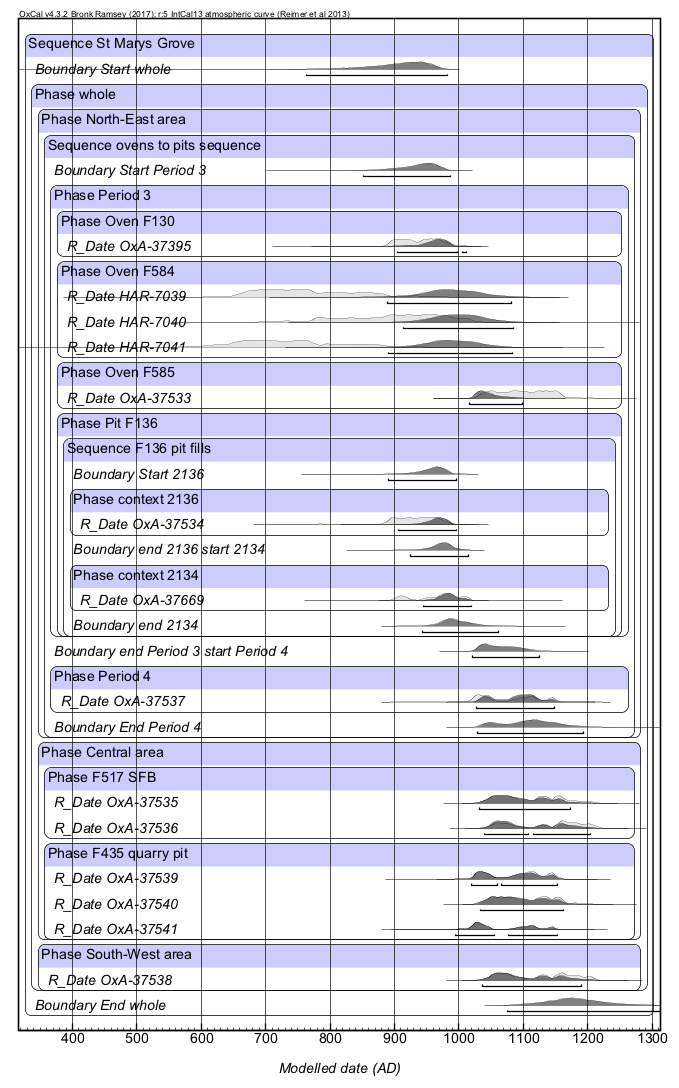
};

};

Boundary("End whole");

};

};



# Bath Street

## Data from Carver 2010

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature** | **Context** | **Material** | **Laboratory no.** | **Uncalibrated age bp** |
| Posthole F58 | 1082 | Charcoal (oak heartwood and hazel) | HAR-5291 | 1320 ± 70 |

## Data from FeedSax

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Feature** | **Context** | **Sample** | **Material** | **Laboratory no.** | **Uncalibrated age bp** |
| Pit F227 | 1069B | IIB | 3 x *Secale cereale* grain | OxA-37630 | 938 ± 26 |
| Pit F227 | 1071A | IA | 3 x *Secale cereale* grain | OxA-37790 | 949 ± 25 |

Modelling was not deemed necessary for the interpretation of these data.

# Tipping Street

## Data from Dodd et al. 2014

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Feature** | **Context** | **Sample** | **Material** | **Laboratory no.** | **Uncalibrated age bp** |
| Kiln 3408 | 3203 | 205 | *Triticum* sp. grain | SUERC-38774 | 1160 ± 30 |
| *Alnus glutinosa* charcoal fragment | SUERC-38773 | 1230 ± 30 |
| Kiln 4301 | 3201 | 203 | *Triticum* sp. grain | SUERC-38778 | 1105 ± 30 |
| *Corylus avellana* charcoal fragment | SUERC-38779 | 1130 ± 30 |
| Kiln 4287 | 4338 | 407 | *Triticum* sp. grain | SUERC-38997 | 1160 ± 30 |
| 4304 | 403 | *Triticum* sp. grain | SUERC-38780 | 1100 ± 30 |

## Data from FeedSax

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Feature** | **Context** | **Sample** | **Material** | **Laboratory no.** | **Uncalibrated age bp** |
| Kiln 3408 | 3203 | 205 | 3 x *Triticum* free-threshing grains | OxA-37625 | 1082 ± 25 |
| 3205 | 204 | 3 x *Triticum* free-threshing grains | OxA-37626 | 1159 ± 26 |
| Kiln 3401 | 3201 | 203 | 3 x *Triticum* free-threshing grains | OxA-37627 | 1121 ± 26 |
| Kiln 4287 | 4319 | 406 | 3 x *Triticum* free-threshing grains | OxA-37628 | 1109 ± 26 |
| Pit 366 | 381 | 11 | 3 x *Secale cereale* grains | OxA-37629 | 1110 ± 24 |

## OxCal model in CQL2

Plot()

{

Outlier\_Model("Charcoal",Exp(1,-10,0),U(0,3),"t");

Sequence("whole")

{

Boundary("Start Phase 2");

Phase("Phase 2")

{

Phase ("Context 381")

{

R\_Date("OxA-37629", 1110, 24);

};

Sequence ("Area 3 kilns")

{

Boundary("Start kiln 3408 use");

Phase ("Kiln 3408 use")

{

R\_Date("SUERC-38774", 1160, 30);

R\_Date("SUERC-38773", 1230, 30)

{

Outlier("Charcoal",1);

};

R\_Date("OxA-37625", 1082, 25);

};

Boundary("End kiln 3408 use start kiln 3408 demolition");

Phase("Kiln 3408 demolition")

{

R\_Date("OxA-37626", 1159, 26);

};

Boundary("End kiln 3408 demolition start kiln 3401 use");

Phase("Kiln 3401 use")

{

R\_Date("SUERC-38778", 1105, 30);

R\_Date("SUERC-38779", 1130, 30)

{

Outlier("Charcoal",1);

};

R\_Date("OxA-37627", 1121, 26);

};

Boundary("End kiln 3401 use");

};

Sequence("Kiln 4287")

{

Boundary("Start kiln 4287 use");

Phase("Kiln 4287")

{

R\_Date("SUERC-38997", 1160, 30);

R\_Date("SUERC-38780", 1100, 30);

R\_Date("OxA-37628", 1109, 26);

};

Boundary("End kiln 4287");

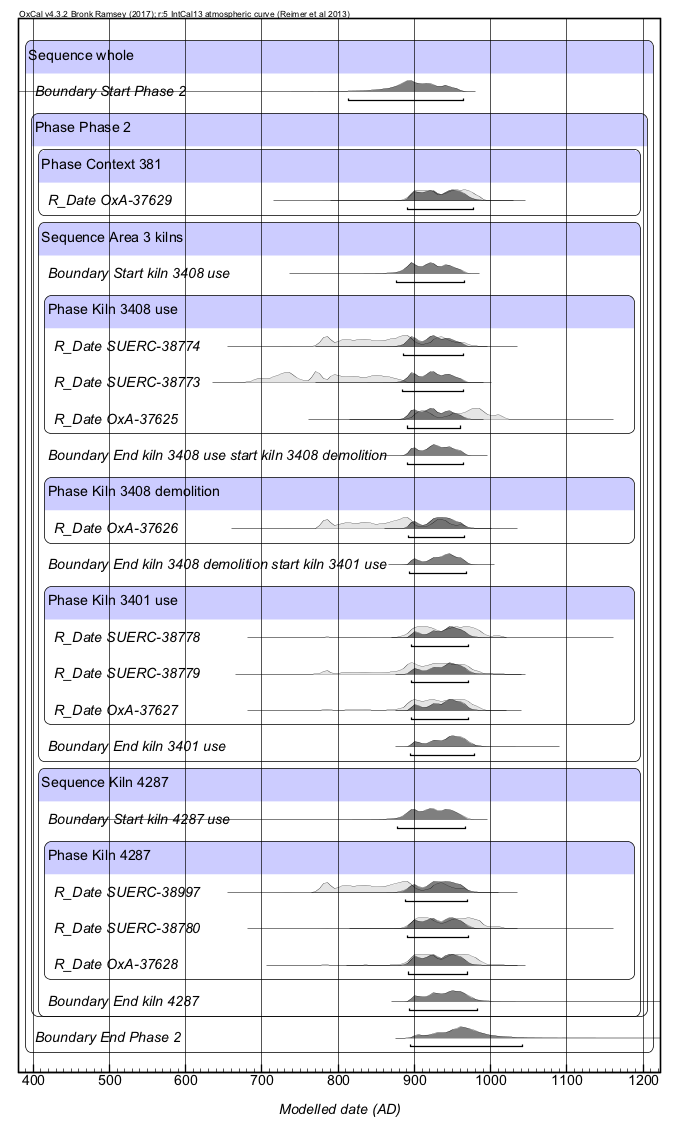
};

};

Boundary("End Phase 2");

};

};



# References

Bronk Ramsey, C. 2009. Bayesian analysis of radiocarbon dates. *Radiocarbon*, 51: 337–60.

Reimer, P.J., Bard, E., Bayliss, A., Beck, J.W., Blackwell, P.G., Bronk Ramsey, C., Buck, C.E., Cheng, H., Edwards, R.L., Friedrich, M., Grootes, P.M., Guilderson, T.P., Haflidason, H., Hajdas, I., Hatté, C., Heaton, T.J., Hoffman, D.L., Hogg, A.G., Hughen, K.A., Kaiser, K.F., Kromer, B., Manning, S.W., Niu, M., Reimer, R.W., Richards, D.A., Scott, E.M., Southon, J.R., Staff, R.A., Turney, C.S.M. & van der Plicht, J. 2013. IntCal13 and Marine13 Radiocarbon Age Calibration Curves 0–50,000 Years cal bp. *Radiocarbon*, 5: 1869–87.