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1 Spring Street Chipping Norton Oxfordshire

Tree-ring Analysis of Oak Timbers

Martin Bridge and Cathy Tyers

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1 SPRING STREET
CHIPPING NORTON
OXFORDSHIRE

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SUMMARY

Six oak timbers were sampled for dendrochronology. The ring-width series from two pairs of samples cross-matched each other, but only the mean series from the tiebeam and collar of the north truss cross-matched securely with the reference data. The mean heartwood/sapwood boundary date for the two dated timbers was AD 1436, giving a likely felling date range of AD 1444–77. This is important within the context of the history of the town, as this represents another building constructed in the mid-fifteenth century around the perimeter of the Market Square.

CONTRIBUTORS

Martin Bridge and Cathy Tyers

ACKNOWLEDGEMENTS

We are grateful to the owners for allowing this work to be carried out. The site was one of several examined as part of the Historic Fabric in Historic Towns: Chipping Norton project and we thank Rebecca Lane for managing the project on behalf of Historic England. We are indebted to members of the Oxfordshire Buildings Record and Chipping Norton Buildings Record, especially Victoria Hubbard for her extensive input on coordinating the project, and her friendly encouragement, and Jan Cliffe for permission to reproduce her drawings in Figures 2 and 3. We'd also like to thank Shahina Farid for commissioning the work, and her input into preparing this report.

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INTRODUCTION

The Early Fabric in Historic Towns: Voluntary Group Projects, funded by Historic England, have been developed in the recognition and acknowledgement of the excellent work being undertaken by local vernacular groups in the study of local architectural trends and fabrics. The intention of these projects is to encourage this type of study through the provision of support and facilitate training of more people in building analysis and recording. The local projects were coordinated by Rebecca Lane (Historic England South West Region: Architectural Investigation).

Early Fabric in Chipping Norton Project

Whilst Chipping Norton features in a study on historic towns in Oxfordshire (Rodwell 1975), and some buildings have been recorded and published in detail (eg Simons and Phimester 2005), no systematic research had been undertaken on the buildings of the town before this project.

The project examined vernacular historic buildings in the centre of Chipping Norton, aiming to improve understanding of the morphology and development of the historic town plan and to understand this within the framework of economic and social change. It aimed to identify early plan forms and to understand the dates of the introduction of vernacular architectural details (eg in materials, carpentry, fenestration, and decorative features), thus mapping the survival of early (pre-1900) fabric and revealing the architectural evolution of the town's buildings.

Initially, 21 properties were identified that were thought to be key to understanding the town's architectural development for a programme of comprehensive investigation. These properties were assessed for their suitability for dendrochronology and 12 that contained oak timber considered suitable for analysis were initially sampled and analysed. Oak timbers from seven of these buildings could be dated by ring-width dendrochronology, whilst radiocarbon wiggle-matching was undertaken for one of the buildings where the ring-width dendrochronology had produced an undated site master chronology.

The results of the project are presented by Rosen and Cliffe (2017). The reports produced on the historic buildings recorded as part of this project by the Chipping Norton Buildings Record/Oxfordshire Buildings Record (OBR) will be deposited in the Oxfordshire Historic Environment Record.

1 Spring Street

The unlisted building at 1 Spring Street is an important early survival in the town, and was a natural candidate for dendrochronological investigation as part of the *Early Fabric in Historic Towns: Chipping Norton* project. It was hoped that any results might give additional evidence on the development of both the building itself, and that of the market square, as it sits on the south-west corner of the square, on the corner plot of Spring Street and Church Street, an original entranceway to the square (Fig 1). It is opposite the Chequers Public House, the earliest parts of which have been dated to AD 1444–76 (Bridge and Tyers 2020a),

and close to 8 Market Street, dated AD 1424–56 (Bridge and Tyers 2020b). The OBR investigated this property and its neighbour to the north (5 Spring Street), which were originally built together. The main range consists of three bays, of which two curved principal-rafter trusses remain in 1 Spring Street, the northern one of which forms the party wall with 5 Spring Street, and has a ‘Tudor’ doorway in the tiebeam, now closed-up, at first-floor level. The principal rafters of the south truss show evidence for wind-bracing to the north. There are two rows of purlins, but the common rafters have all been renewed. Number 1 has been extended to the south.

METHODOLOGY

Fieldwork for the present study was carried out in April 2016, following an initial assessment of the potential for dating a few weeks beforehand, and consultation with those involved in the project and the owners. In the initial assessment, accessible oak timbers with more than 50 rings and where possible traces of sapwood were sought, although slightly shorter sequences are sometimes sampled if little other material is available. Those timbers judged to be potentially useful were cored using a 16mm auger attached to an electric drill. The cores were labelled, and stored for subsequent analysis.

The cores were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The samples had their tree-ring sequences measured to an accuracy of 0.01mm, using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (2004). Cross-matching was attempted by a process of qualified statistical comparison by computer, supported by visual checks. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted on the computer monitor to allow visual comparisons to be made between sequences. This method provides a measure of quality control in identifying any potential errors in the measurements when the samples cross-match.

In comparing one sample or site master against other samples or chronologies, *t*-values over 3.5 are considered significant, although in reality it is common to find demonstrably spurious *t*-values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some *t*-value in the range of 5, 6, and higher, and for these to be well replicated from different, independent chronologies with both local and regional chronologies well represented, except where imported timbers are identified. Where two individual samples match together with a *t*-value of 10 or above, and visually exhibit exceptionally similar ring patterns, they may have originated from the same parent tree. Same-tree matches can also be identified through the external characteristics of the timber itself, such as knots and shake patterns. Lower *t*-values however do not preclude same tree derivation.

Ascribing felling dates and date ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straightforward. Depending on the completeness of the final ring (ie if it has only the spring vessels or earlywood formed, or the latewood or summer growth) a precise felling date and season can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an estimated felling date range can be given for each sample. The number of sapwood rings can be estimated by using an empirically derived sapwood estimate with a given confidence limit. If no sapwood or heartwood/sapwood boundary survives then the minimum number of sapwood rings from the appropriate sapwood estimate is added to the last measured ring to give a *terminus post quem* (*tpq*) or felled-after date.

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 9–41 rings (Miles 1997). It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure or object under study.

RESULTS AND DISCUSSION

A total of six timbers were sampled, all of which were suitable for measurement. Details of the samples taken are given in Table 1 with the ring width data for the measured samples given in the Appendix. The location of the sampled timbers is shown in Figures 2–6.

Internal cross-matching revealed two pairs of matching samples, cn1spr01 and cn1spr05 ($t = 5.4$ with 67 years overlap), and cn1spr02 and cn1spr06 ($t = 4.1$ with 41 years overlap). These were combined to form two mean series cn1spr51m and cn1spr62m for subsequent analysis. The relative positions of overlap of the two pairs of samples are shown in Figures 7 and 8. These combined sequences and the two other unmatched series were compared with an extensive range of reference chronologies. This resulted in the successful dating of series cn1spr51m to the period AD 1361–1439, the strongest matches being shown in Table 2. No secure dating could be obtained for the other site mean series, cn1spr62m, nor for the unmatched rings sequences, all of which remain undated.

The mean heartwood/sapwood boundary date for the two dated timbers was AD 1436, resulting in a likely felling date range for the pair of AD 1444–77. Evidence suggests that, with the exception of reused timbers, in most historical periods construction took place within a very few years of felling (Miles 2006), and so this felling date for these two timbers, a tiebeam and collar to the north truss, indicates construction shortly after felling in the mid-fifteenth century. This is a similar time period to the dated timbers from the Chequers Public House (AD 1444–76; Bridge and Tyers 2020a) and 8 Market Street (AD 1424–56; Bridge and Tyers 2020b), showing when the market square area of the town was originally developed.

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TABLES

Table 1: Details of samples taken from 1 Spring Street, Chipping Norton, Oxfordshire

Sample number	Timber and position	No of rings	Mean ring width (mm)	Dates spanning (AD)	h/s boundary date (AD)	Sapwood rings	Mean sensitivity	Felling date ranges (AD)
cn1spr01	Tiebeam, north truss	79	1.45	1361–1439	1435	4	0.28	1444–76
cn1spr02	East principal rafter, north truss	47	3.05	-	-	h/s	0.25	-
cn1spr03	West principal rafter, south truss	77	2.35	-	-	h/s	0.28	-
cn1spr04	East principal rafter, south truss	62	2.56	-	-	?h/s	0.23	-
cn1spr05	Collar, north truss	67	2.30	1371–1437	1437	h/s	0.20	1446–78
cn1spr06	West principal rafter, north truss	62 (+c 9NM)	2.45	-	-	-	0.31	-

Key: NM = not measured; h/s = heartwood/sapwood boundary

Table 2: Dating evidence for the site sequence cn1spr51m, dated as spanning AD1361–1439

Source region:	Chronology name:	Publication reference:	File name:	Span of chronology (AD)	Overlap (years)	<i>t</i> -value
Oxfordshire	25 Sheep Street, Burford	(Miles <i>et al</i> 2006)	BURFRD2	1321–1486	79	8.5
Hampshire	Old Stables, Pilgrims Hall, Winchester	(Miles <i>et al</i> 2009)	PILGRIM2	1245–1478	79	8.0
Herefordshire	Booth Hall, Hereford	(Boswijk and Tyers 1997)	HIGHTOWN	1302–1487	79	7.7
Rutland	Lyddington Bede House	(Arnold <i>et al</i> 2015)	LYBHSQ03	1245–1494	79	7.3
Warwickshire	Gorcott Hall	(Nayling 2006)	GORC_T17	1385–1531	55	7.0
West Midlands	St Mary's Abbey, Halesowen	(Arnold and Howard 2008)	HLNASQ01	1310–1535	79	7.0
Herefordshire	Farmer's Club, Hereford	(Tyers 1996)	HEREFC	1313–1617	79	6.9
Wiltshire	Saxon House, Malmsbury	(Miles <i>et al</i> 2003)	MALMSBRY	1304–1486	79	6.9
Gloucestershire	Ashleworth Tithe Barn	(Bridge 2002)	ASHLEWTH	1319–1475	79	6.9
Herefordshire	Cathedral Barn, Hereford	(Tyers 1996)	HERECB2	1359–1491	79	6.9
Warwickshire	Guildhall, Stratford-on-Avon	(Arnold <i>et al</i> 2006a)	SUABSQ02	1377–1502	63	6.8
Worcestershire	The Commandery, Worcester	(Arnold <i>et al</i> 2006b)	WORDSQ01	1284–1473	79	6.8
Oxfordshire	Corpus Christi College Porters' Lodge	(Miles and Bridge 2014)	CCPL	1323–1525	79	6.8

FIGURES

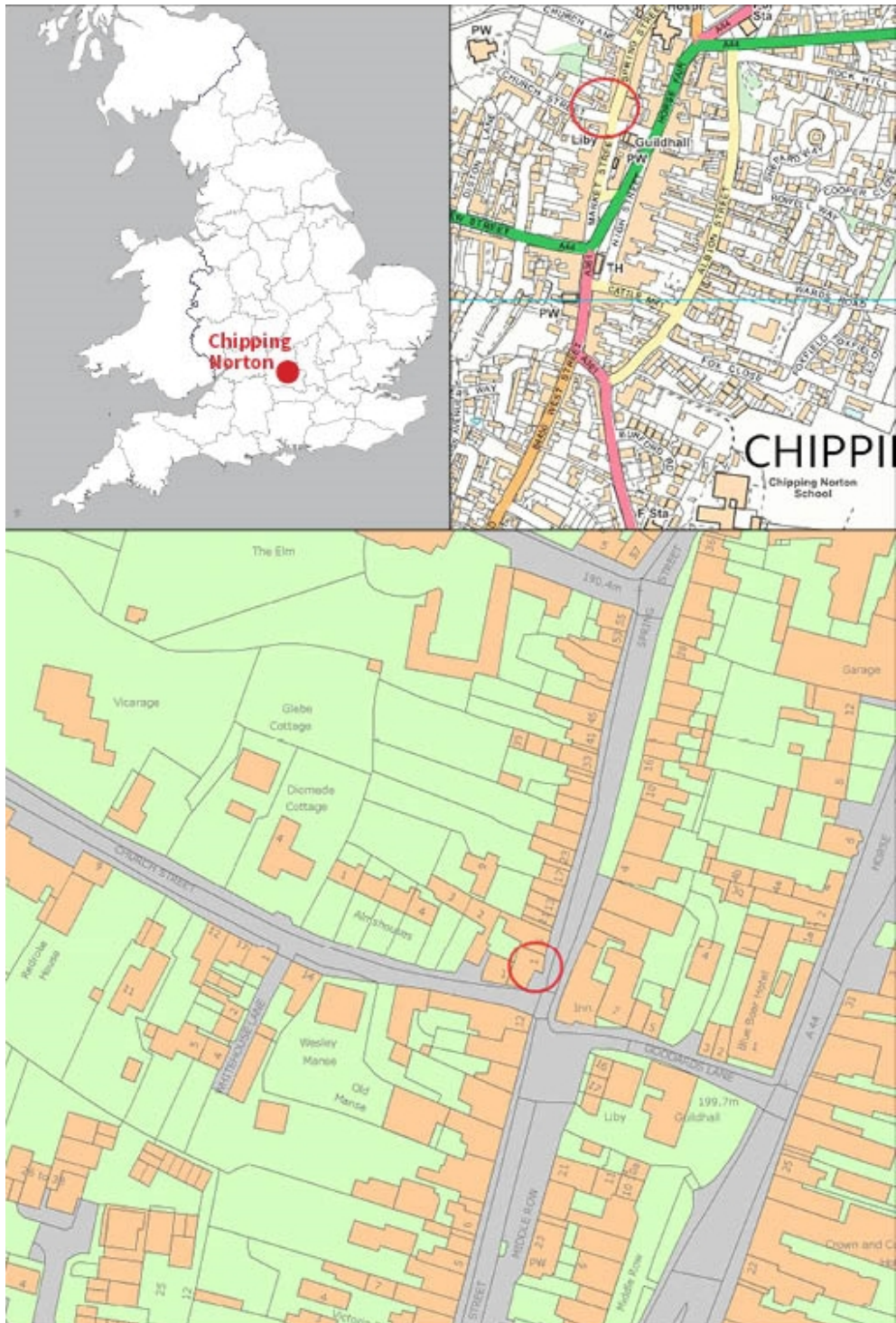


Figure 1: Maps to show the location of 1 Spring Street in Chipping Norton, circled. Scale: top right 1:7000; bottom 1:1250. © Crown Copyright and database right 2020. All rights reserved. Ordnance Survey Licence number 100024900. © British Crown and SeaZone Solutions Ltd 2020. All rights reserved. Licence number 102006.006. © Historic England

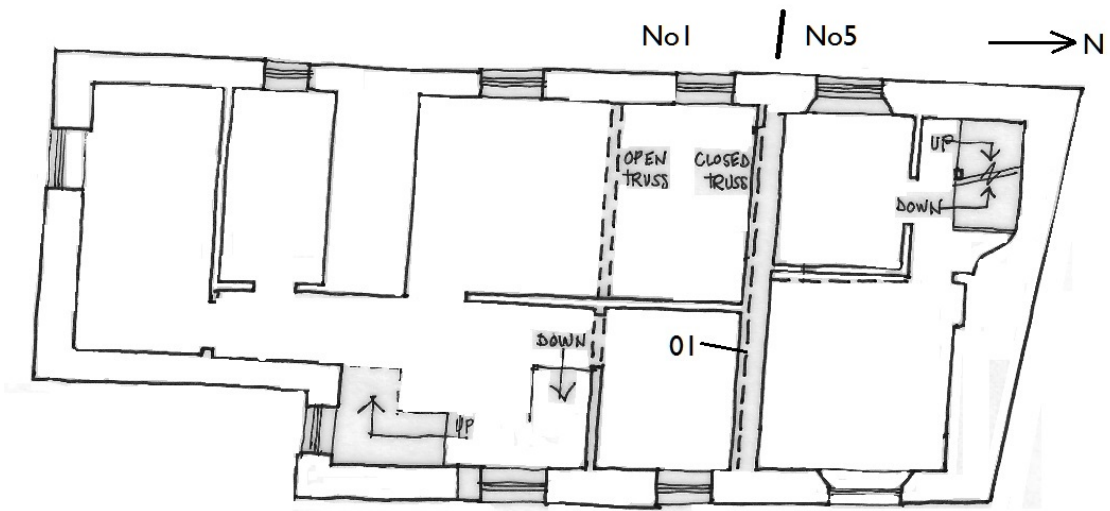


Figure 2: Plan of the first floor of Nos 1 and 5 Spring Street, showing the location of one of the cores taken for dendrochronology. Adapted from an original drawing by Jan Cliffe, Chipping Norton Buildings Record working with the Oxfordshire Buildings Record

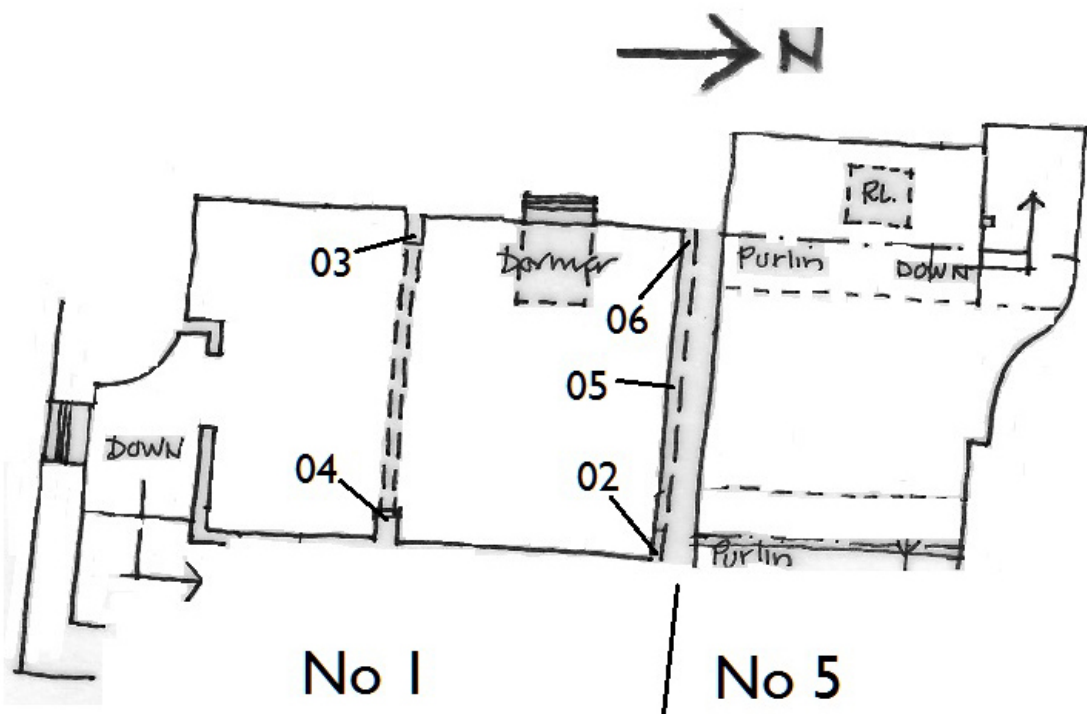


Figure 3: Plan of the second floor of Nos 1 and 5 Spring Street, showing the location of one of the cores taken for dendrochronology. Adapted from an original drawing by Jan Cliffe, Chipping Norton Buildings Record working with the Oxfordshire Buildings Record



Figure 4: Photograph showing the tiebeam of the north truss sampled for dendrochronology (photograph Martin Bridge)



Figure 5: Photograph showing the north truss at first-floor level, indicating timbers sampled for dendrochronology (photograph Martin Bridge)



Figure 6: Photograph showing the west principal rafter of the south truss sampled for dendrochronology (photograph Martin Bridge)

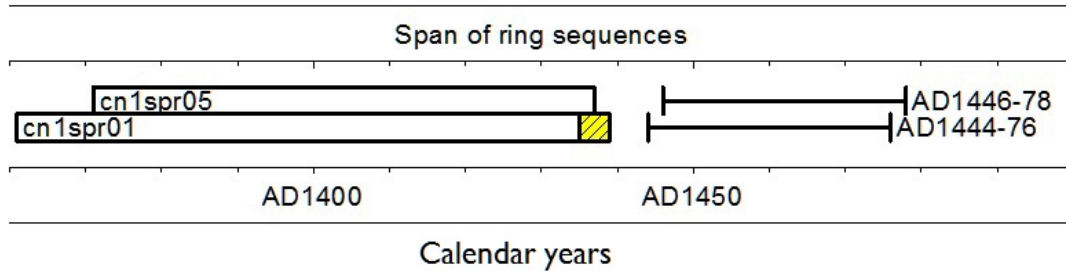


Figure 7: Bar diagram showing the relative positions of overlap and individual felling date ranges of the two dated samples in site chronology cn1spr51m from 1 Spring Street, Chipping Norton, Oxfordshire. White bars – heartwood; hatched bar – sapwood

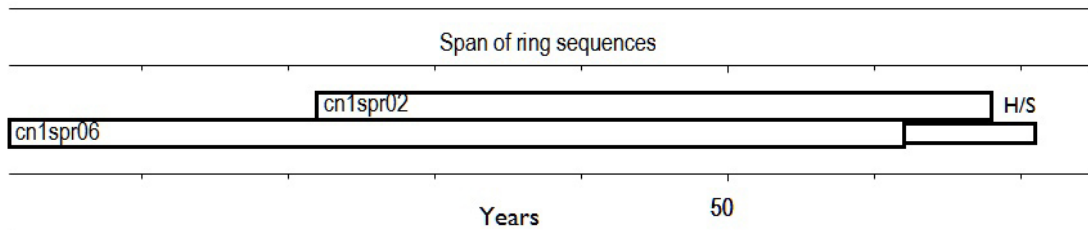


Figure 8: Bar diagram showing the relative positions of overlap for the two cross-matched but undated samples in site chronology cn1spr62m from 1 Spring Street, Chipping Norton, Oxfordshire. White bars – heartwood; HS – heartwood/sapwood boundary

APPENDIX

Ring width values (0.01mm) for the sequences measured

cn1spr01

99	102	141	170	60	57	38	38	88	143
89	86	94	56	76	80	122	124	169	110
96	104	92	92	103	157	178	150	90	110
156	189	231	171	112	258	181	205	205	162
168	118	173	183	139	180	128	194	129	118
130	177	145	211	174	153	174	342	191	290
212	185	324	210	167	121	120	189	190	180
127	216	125	110	138	65	106	86	88	

cn1spr02

590	557	418	625	442	594	543	410	530	300
280	268	341	359	328	184	169	163	189	155
211	91	42	53	64	67	110	91	109	190
158	151	332	351	332	286	203	376	351	400
574	686	379	426	461	237	198			

cn1spr03

315	253	193	283	462	231	245	151	178	171
161	191	167	363	616	415	259	155	181	199
349	233	270	180	397	369	293	392	270	139
189	214	182	274	130	76	78	63	70	71
134	97	197	259	247	149	183	201	355	404
390	390	323	249	171	160	187	351	284	261
321	206	246	296	218	182	153	209	298	344
303	195	149	133	105	103	122			

cn1spr04

443	340	354	280	231	341	406	405	446	634
561	380	217	285	322	296	258	285	224	339
379	423	440	344	274	290	381	426	380	149
110	42	46	63	50	48	80	99	107	109
113	143	221	273	186	192	145	104	176	354
352	285	255	197	251	237	168	155	132	170
256	198								

cn1spr05

278	297	287	334	229	248	236	257	400	273
295	340	387	218	311	332	237	187	139	204
328	192	248	233	202	334	273	321	329	364
402	289	293	360	287	253	231	250	251	135
157	203	204	242	220	199	153	187	132	195
194	148	229	199	156	124	144	192	142	137
122	139	104	113	122	96	109			

cn1spr06

222	178	137	150	221	192	324	182	121	87
101	242	293	213	223	180	241	173	214	152
341	320	462	285	496	325	567	512	538	616

393	401	423	577	537	405	339	240	161	269
142	215	94	106	75	103	85	96	96	116
115	83	80	209	196	86	60	93	183	204
302	383								



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