12 Park Street
Towcester
Northamptonshire

Tree-ring Analysis of Oak Timbers

Martin Bridge and Cathy Tyers

Discovery, Innovation and Science in the Historic Environment

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SUMMARY
Seven samples were taken from principal rafters and purlins in the roof of this property. Two sets, each of three samples, appear to have been derived from a common parent tree, and were combined to produce two individual tree mean series. A site master was made from these two tree series, and the remaining single ring-width series, and this was dated to the period AD 1634–1747. Only one sample retained complete sapwood, but one had complete sapwood detached from the main core, with few or no rings lost, allowing a narrow felling date range to be applied. Two other samples, which were later found to have come from the same parent tree, also lost a few rings on coring, and also allowed a narrow felling date range to be applied. The dendrochronological evidence therefore suggests construction in AD 1748 or AD1749, or within a year or two after this date.

CONTRIBUTORS
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ARCHIVE LOCATION
Historic England Archive
The Engine House
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HISTORIC ENVIRONMENT RECORD OFFICE
Northamptonshire Historic Environment Record
Northamptonshire Record Office
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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 to facilitate training in building analysis and recording. The local projects are coordinated by Rebecca Lane (Historic England South West Region, Architectural Investigation).

Early Fabric in Towcester Project

Whilst there have been many local investigations of historic buildings in the town over a number of years, no systematic research had been undertaken before this project, coordinated by Brian Giggins.

The project examines vernacular historic buildings in Towcester, 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 aims 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-1750) fabric and revealing the architectural evolution of the town's buildings.

Initially, 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 those that contained oak timber considered suitable for analysis were sampled and analysed.

12 Park Street

Situated on a road to the west of the main Watling Street through the town (Fig 1), number 12 is listed at Grade II, along with number 14 (LEN 1371639), as a pair of houses of eighteenth-century origin in two builds. Number 12 has a two-unit plan with two storeys and an attic and a relatively simple collar-truss roof. Only one set of purlins is visible, but it is suspected there is a lower set behind the ceiling, as drawn in Figure 2. The south-east purlin was larger and squarer than the others and was assumed to be a replacement, so was not sampled.

METHODOLOGY

An initial assessment of the timbers for dendrochronological potential sought accessible oak timbers with more than 50 rings and where possible traces of sapwood, although slightly shorter sequences are sometimes sampled if little other material is available. Those timbers judged to be potentially useful were cored in January 2020 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 early wood 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 12–45 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

Details of the samples taken are given in Table 1, and their locations are illustrated in Figure 2. A total of seven samples were taken from principal rafters and purlins in the roof of this property. All were considered suitable for analysis but some series had bands of very narrow rings which proved challenging with respect to measurement, although reliable ring-width series were in due course obtained. The ring-width series for each sample is provided in the Appendix.

Comparison of the seven measured series identified that two sets of three samples appear to have each been derived from a common parent tree (Table 2). Samples park02, park04, and park05 potentially being from one tree, and samples park03, park06, and park07 potentially from a second tree. Each set of ring-width measurements was combined into a single series (park542m and park763m) for further analysis. Sample park01 cross-matched one of these combined series (763m; *t*-value 4.3 with 54 years overlap) and dated well on its own when compared individually with the database of oak reference chronologies. A 113-year long site master was therefore made from the three series representing the three parent trees and all seven samples (Fig 3), and this was dated to the period AD 1635–1747 (Table 3).

Only sample park03 retained complete sapwood, and was from a tree felled in winter AD 1747/8. The other two samples potentially from this same tree, park06 and park 07, have felling date ranges which are consistent with the precise felling date derived from sample park03 (Table 1; Fig 3).

Sample park02 had complete sapwood but this was detached from the main core, with few or no rings lost, allowing a narrow felling date range to be applied based on the understanding that no more than five additional rings had been lost at the break. Two other cores potentially from the same parent tree as park02, park04 and park05, lost a few rings on coring, again allowing a narrow felling date range to be applied. These three samples were from the same tree; park02 has an earliest possible felling date of AD 1748, and park04 has a latest possible felling date of AD 1749. It appears therefore this second tree was felled in AD 1748 or AD 1749 (Table 1; Fig 3). This is consistent with the known felling of the other tree in winter AD 1747/8, and with the felling date range of AD 1739–66 for the tree from which timber park01 was converted (Table 1; Fig 3). The dating evidence suggests the trees used grew relatively locally (Table 3).

The dendrochronological evidence therefore suggests construction shortly after felling in AD 1748 or AD 1749, or within a year or two after this date. Local historian (Brian Giggins) has newspaper articles discussing a large fire in the town in October AD 1749 which destroyed thirty-six dwellings in the immediate vicinity, and there is some evidence of burn marks on the stone walls, so it seems likely that this property was either re-roofed or substantially rebuilt immediately following this fire, perhaps using wood that was already in stock.

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TABLES

Table 1: Details of the samples taken from 12 Park Street, Towcester

Sample No	Location	Number of rings	Date of sequence (AD)	Sapwood	Mean ring width (mm)	Mean sensitivity	Felling date range (AD)
park01	North purlin, middle bay	54	1686–1739	18	1.35	0.28	1739–66
park02	North principal rafter, east truss	87	1640–1726	h/s+22NMC	1.29	0.18	1748–c53*
park03	North purlin, east bay	95	1653–1747	34C	1.32	0.21	winter 1747/8
park04	South purlin, middle bay	74	1668–1741	12 +3NM	1.42	0.19	1744–c49*
park05	South principal rafter, west truss	109	1635–1743	14 +3NM	1.57	0.20	1746–c51*
park06	South purlin, west bay	64	1675–1738	20	1.77	0.21	1738–63**
park07	North purlin, west bay	83	1656–1738	19	1.65	0.21	1738–64**

Key: h/s = heartwood/sapwood boundary; NM = not measured; C = complete sapwood, felled in winter;
* these samples are from the same tree, so actual felling date is AD 1748 or AD 1749;
** these samples are from the same tree as park03, so have an actual felling date of winter AD 1747/8

Table 2: Cross-matching between the dated samples, values of t *3.5 and above are considered significant*

	t-value (number of years overlap)					
Sample number	park02	park03	park04	park05	park06	park07
park01	2.3 (41)	4.3 (54)	2.6 (54)	2.5 (54)	4.0 (53)	3.7 (53)
park02		2.2 (74)	7.5 (59)	**10.9** (87)	2.5 (52)	2.1 (71)
park03			4.0 (74)	4.0 (91)	**11.4** (64)	9.4 (83)
park04				**10.8** (74)	3.3 (64)	4.2 (71)
park05					3.6 (64)	3.5 (83)
park06						7.5 (64)

Table 3: Dating evidence for the site chronology PARKt7, AD 1635–1747

Source region	Chronology	Publication reference	Filename	Span of chronology (AD)	Overlap (years)	*t*-value
Oxfordshire	Wardington Manor, Wardington	Miles *et al* 2006	WRD-B	1547–1738	104	7.5
Buckinghamshire	Home Farm Barn, Stowe	Miles *et al* 2003	STOWE7	1652–1781	96	7.2
Northamptonshire	Kirby Hall, Deene	Arnold *et al* forthcoming	KRBHSQ01	1378–1795	113	7.1
Buckinghamshire	West Lake Pavilion, Stowe	Miles *et al* 2003	STOWE6	1610–1762	113	7.1
Lincolnshire	St Firmin's Church, Thurlby	Arnold and Howard 2010	THUBSQ01	1599–1792	113	6.8
Buckinghamshire	The Hovel, Ludgershall	Miles and Worthington 1999	THEHOVEL	1671–1811	77	6.5
Buckinghamshire	Corinthian Arch, Stowe	Miles *et al* 2004	STOWE8	1653–1765	95	6.2
Northamptonshire	Apethorpe Hall, Apethorpe	Arnold *et al* 2008	APTASQ02	1574–1749	106	6.2
Oxfordshire	Christ Church Library, Oxford	Bridge and Miles 2020	CCL	1565–1737	103	6.1
Rutland	Oakham Castle	Arnold and Howard 2013	OKMCSQ03	1598–1737	103	6.0
Buckinghamshire	Claydon House	Bridge and Miles 2020	CLAYDON2	1618–1760	113	6.0

FIGURES
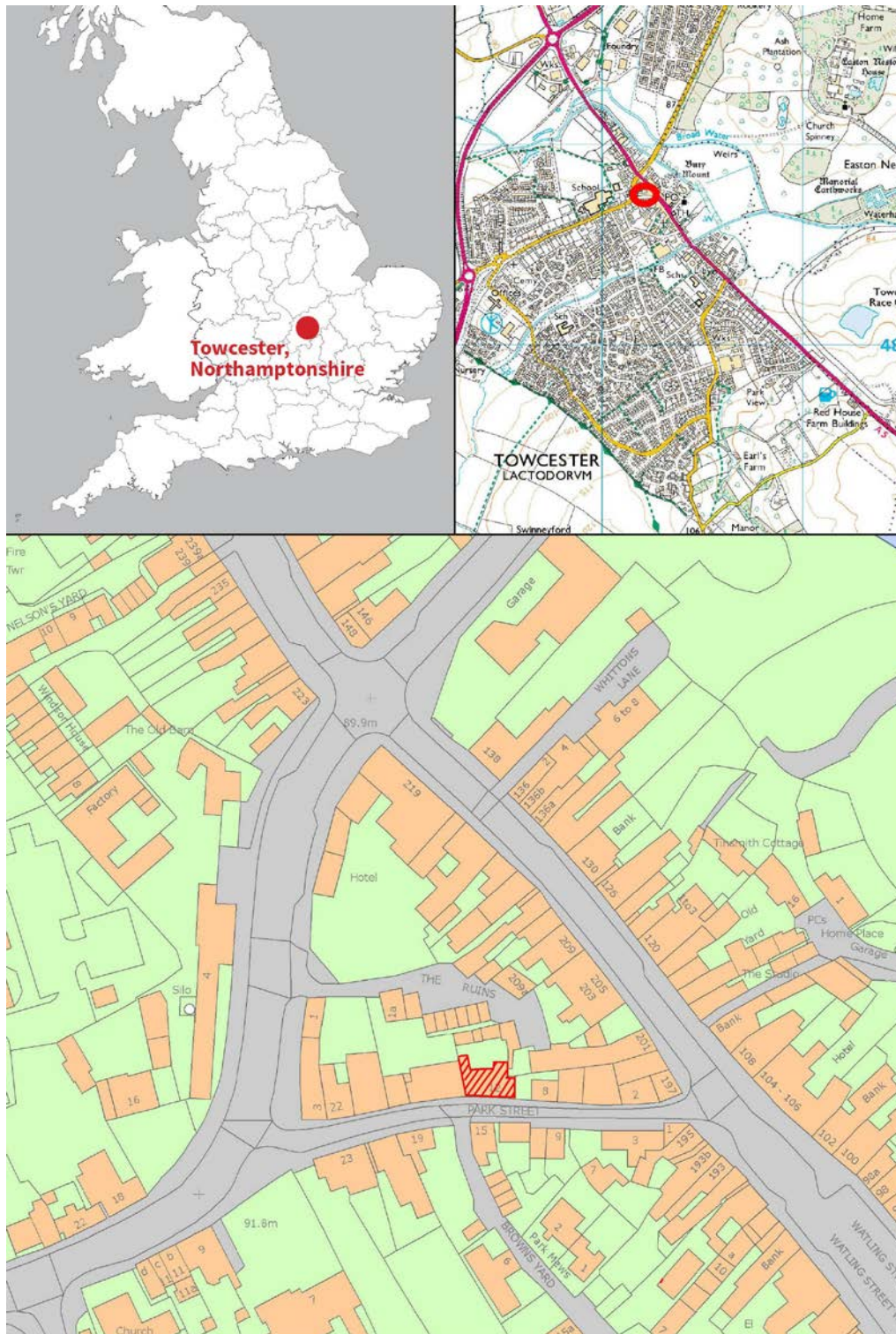
Figure 1: Maps to show the location of 12 Park Street in Towcester, Northamptonshire, marked in red. Scale: top right 1:25000; bottom 1:1300. © Crown Copyright and database right 2020. All rights reserved. Ordnance Survey Licence number 100024900. © British Crown and SeaZone Solutions Ltd 2020. All rights reserved. Licence number 102006.006. © Historic England
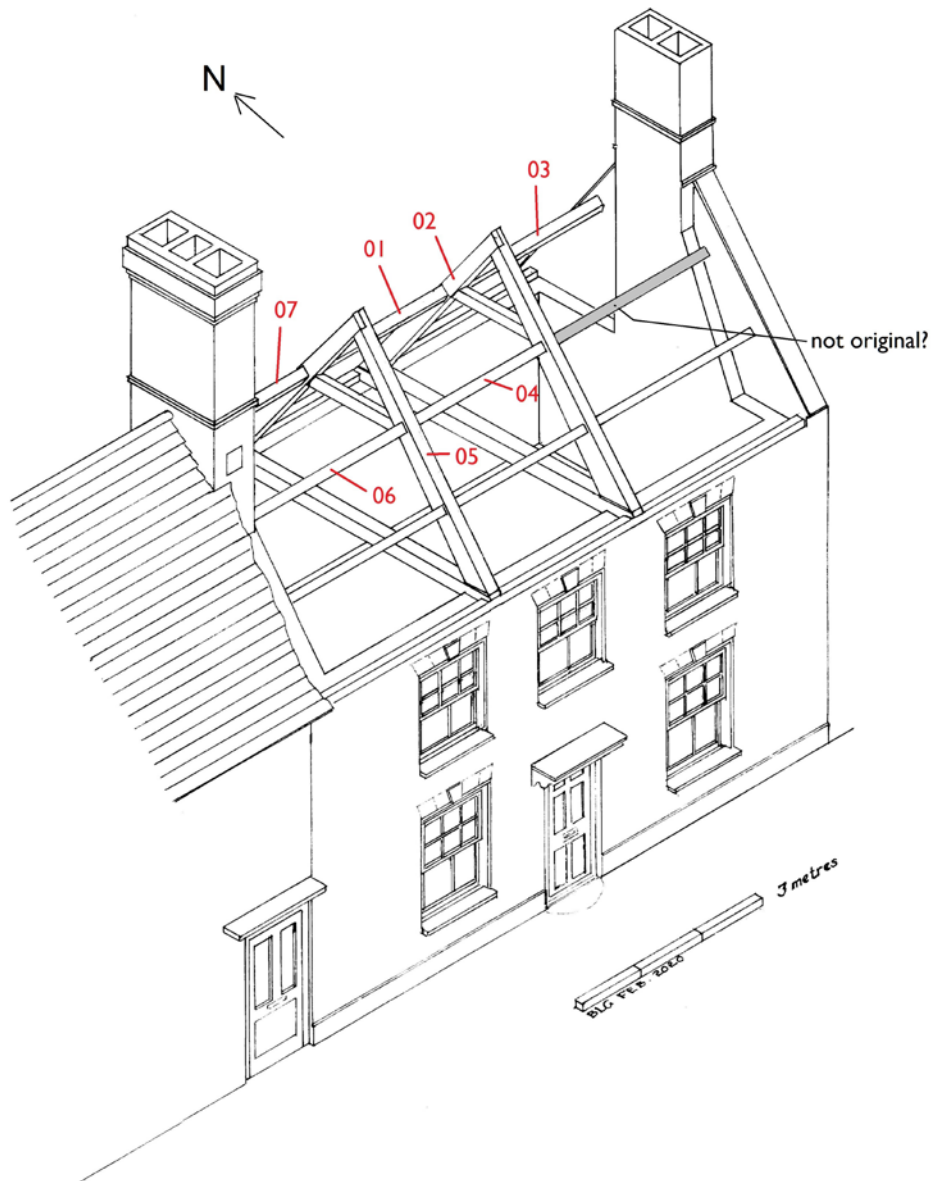
Figure 2: Isometric drawing of 12 Park Street, Towcester, by Brian Giggins, adapted to show the timbers sampled for dendrochronology

Span of ring sequences

park01 AD1739-66

park04 AD1744-*c*49

park05 AD1746-*c*51 AD1748 or AD1749

park02 AD1748-*c*53

park06 AD1738-63

park07 AD1738-64 winter AD1747/8

park03 winter AD1747/8

AD1650 AD1700 AD1750
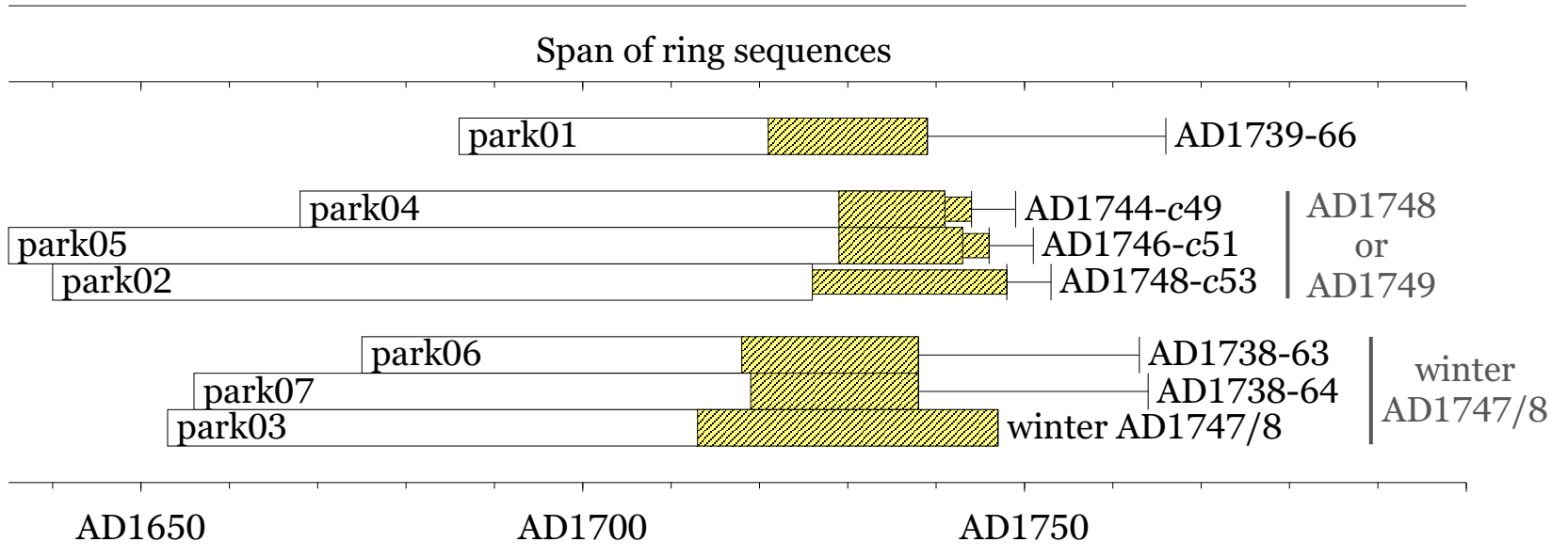
Figure 3: Bar diagram showing the relative positions of overlap of the dated samples, along with their individual interpreted felling date or felling date range. White bars represent heartwood rings; yellow hatched bars represent sapwood rings; narrow sections of bars represent additional unmeasured rings present on the sample. Although the individual sample felling date ranges are shown, multiple samples potentially from the same tree also have the derived tree-felling date given

APPENDIX

Ring width values (0.01mm) for the sequences measured

park01

278	215	215	169	117	60	103	115	142	83
59	113	129	124	143	109	177	240	251	162
177	182	140	106	61	101	104	125	97	81
143	132	73	99	176	198	188	146	240	146
182	177	118	83	72	74	76	111	93	180
117	85	91	133						

park02

170	165	203	216	201	211	338	226	254	255
249	207	220	205	246	126	97	80	89	96
107	93	59	70	58	68	81	105	112	127
144	171	144	191	200	235	180	288	275	303
209	218	275	212	129	94	102	68	82	87
78	75	69	74	111	99	72	82	88	58
71	84	101	144	108	72	107	90	67	46
44	40	54	53	50	45	51	54	56	63
50	89	88	88	95	109	120			

park03

179	155	206	177	168	124	74	83	112	103
120	181	135	150	156	182	125	146	105	101
107	91	141	231	255	201	199	205	183	236
208	137	123	199	169	219	184	102	148	101
127	155	101	95	142	154	124	111	103	107
138	144	92	103	114	96	106	118	171	147
161	105	120	133	79	100	100	139	166	124
114	124	66	123	140	153	118	123	126	97
84	78	111	112	111	150	134	113	80	89
81	91	79	99	66					

park04

153	156	173	190	210	258	241	248	197	266
264	247	226	194	236	233	193	119	133	106
103	100	70	86	74	98	149	99	84	114
123	82	108	160	132	226	173	142	197	194
116	95	70	71	82	71	84	71	72	82
81	80	107	155	145	123	171	149	142	212
200	200	192	190	224	107	55	59	50	76
95	100	97	110						

park05

302	346	290	304	227	283	239	223	267	237
274	336	236	274	257	255	227	204	192	218
116	109	71	148	93	88	82	68	95	90
105	137	179	170	183	217	248	233	269	238
230	198	275	261	271	211	201	244	192	123
86	104	82	128	111	88	99	93	77	112

119	72	109	118	85	105	135	136	188	170
96	124	134	81	65	51	55	58	43	46
44	60	58	63	64	77	140	116	123	145
165	202	255	194	219	201	245	291	135	54
67	80	84	123	118	131	124	127	154	

park06

176	221	279	231	242	326	289	272	256	158
220	218	186	241	237	148	269	161	191	238
141	98	214	204	174	170	156	177	186	233
155	151	177	143	145	143	202	159	208	129
154	155	96	105	122	129	163	142	119	158
105	157	194	180	140	163	129	121	123	108
152	155	160	202						

park07

213	239	245	180	187	184	214	179	197	186
114	130	182	158	186	129	110	95	78	172
204	263	220	268	330	228	275	313	143	138
245	214	229	177	117	181	141	175	174	133
116	205	210	130	149	153	132	177	200	136
176	159	145	120	147	167	157	160	122	143
138	97	103	119	186	171	168	117	130	116
129	155	193	108	135	117	116	100	82	138
106	119	166							

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