Section 8 Radiocarbon Dating

8.1 Introduction

Twenty-eight charcoal samples (Table 265 and Figure 77) of identified short-lived native Hawaiian plant species—or *kukui* nut (*Aleurites moluccana*) shell or coconut (*niu, Cocos nucifera*) shell—were sent to Beta Analytic, Inc. of Miami, Florida for radiocarbon dating. Radiocarbon samples from contexts including post-Contact artifacts or typically post-Contact wood (conifer and temperate hard wood) were excluded from selection for dating. Hence, there was a clear bias in sample selection for what were believed as more likely to be pre-Contact deposits.

The samples were analyzed using the Accelerator Mass Spectrometer method. The conventional radiocarbon age data and analysis determined by Beta Analytic, Inc. are reported for each carbon date at the end of this section (presented in order of Beta Analytic Sample #). These data have then been calibrated to calendar ages using the OxCal calibration program, Version 3.10, developed by the University of Oxford Radiocarbon Accelerator Unit and available as share-ware over the internet, with the results reported for each dated sample as a companion graphic analysis for each reported date (at the end of this section).

Of the 28 samples, 20 (71 percent) yielded carbon dates with 2-sigma date ranges extending into the twentieth century. These 20 “late” dates typically span the past three centuries with stronger probabilities for nineteenth- and twentieth-century calendar ages. Unfortunately, these inconclusive results are common for radiocarbon analysis on samples dating to the last three centuries, making chronological distinctions between archaeological features and deposits dating from this period difficult. This challenge is due to the configuration of the radiocarbon calibration curve, which is derived from the radiocarbon dating of tree-ring samples of known ages and reflects the changes in the actual amount of 14C circulating in the global environment over time. The radiocarbon calibration curve for the period between AD 1650 and 1950 has little slope. This results in multiple calibration curve intercepts and accompanying calibrated calendar ages that largely span the last three centuries.

This very large percentage of “late” dates is suggested to reflect the extraordinary growth of the greater Honolulu area in the early post-Contact period, particularly following the conquest of O‘ahu by Kamehameha I in 1795 and his encouragement of Honolulu as a center of commerce.

All [six] of the exclusively pre-Contact dates overlapped and had date ranges that clustered relatively tightly in the AD 1440–1660 period. It was somewhat surprising that no earlier dates were acquired. The oldest date range was AD 1440–1630.

A more detailed presentation of the project’s carbon dates is presented in the next section, followed by a brief review of previously reported carbon dates along the study corridor with a summary discussion.

The 28 charcoal samples dated were not evenly distributed along the HHCTCP City Center Section study corridor (Table 265 and Figure 77):

- Two were from the West Kalihi Zone.
- Twenty-two were from the West Kaka‘ako Zone.
- Four were from the Kaka‘ako Makai Zone.

This geographically uneven distribution reflects the strategy of selecting appropriate samples for carbon dating according to field observations.

8.1.1 West Kalihi Zone

The radiocarbon results of samples from two test excavations (T-020 and T-020A) in the West Kalihi Zone yielded relatively early dates in comparison with results from excavations in the neighboring West Kaka‘ako and Kaka‘ako Makai Zones.

T-020 was located in the right eastbound lane of Kamehameha Highway, directly *mauka* of the O‘ahu Community Correctional Center (OCCC). The remnants of an earth oven or *imu* (SIHP #50-80-14-7425) were observed 0.3 m from the base of Stratum II (2.35–2.50 mbs). The feature contained large charcoal deposits and 11 small to medium water-rounded basalt cobbles. A charcoal sample identified as being from *‘ūlei* yielded an indicated date range of AD 1440–1640 (see Section 8.6 calibration charts). However, this calibrated date range consists of varying probabilities. The highest probability date range (95.4% confidence) indicated a range of AD 1440–1640, with AD 1440–1530 being the most probable (61.6%). The lower probability date range (68.2% confidence) indicated a range of AD 1450–1620, with AD 1450–1520 being the most probable (54.1%). Thus, the most probable date range for this charcoal sample is AD 1440-1530.

T-020A was an additional test excavation to explore the extent of the *imu* remnant observed in adjacent T-020. T-020A was also located in the right eastbound lane of Kamehameha Highway, adjacent to OCCC and across from the Marukai Wholesale Market. Stratum II had a charcoal lens at approximately 2.30 mbs in the southeast corner. A charcoal sample identified as being from *pūkiawe* yielded an indicated date range of AD 1480–1650. The highest probability date range (95.4% confidence) indicated a range of AD 1480–1650 (95.4%). The lower probability date range (68.2% confidence) indicated a range of AD 1510–1640, with AD 1510–1600 being the most probable (53.3%). Thus, the most probable date range for this charcoal sample is AD 1480–1650.

The date ranges of these two neighboring charcoal samples substantially overlap, and they could have been roughly contemporaneous in the period from AD 1480 to 1640 with a particularly likely overlap date range in the timeframe of AD 1510 to 1530. However, it must be noted that only one of these charcoal samples comes from a designated feature (within T-020), while the second (T-020A) is not completely certain to have derived from cultural activity.

Prior research in this vicinity did not produce radiocarbon dates. The dates produced by this study come from an area indicated by Land Commission Award data to have been well-populated along both margins of Kalihi Stream. This area is likely to have been relatively well-populated by the sixteenth century.

Both of these relatively early West Kalihi dates are shown to be in the immediate vicinity of a land area traditionally known as Hāunapō (although it should be noted that there are other places named “Haunapo” in the vicinity) (Figure 78). “Hāuna-pō” (lit., “night striking”) was the name of a temple (*heiau*) of human sacrifice in the vicinity (Pukui et al. 1974:42). Other place names in the vicinity such as ‘Umi (Pukui et al. 1974:42:215) also appear to relate to this *heiau*. It may not be a coincidence that the direct descendants of Hewahewa, the *kahuna nui*, or highest priest in the archipelago under Kamehameha I, claimed lands between ‘Umi and the Hāunapō parcels. There is no reason to believe that the dated deposits relate directly to the Hāunapō *heiau*. It may be the case, however, that factors such as the proximity to Kalihi Stream, fishponds, habitations, and agricultural lands made this a favorable area for relatively early, relatively intensive settlement (Figure 79).

8.1.2 West Kaka‘ako Zone

The West Kaka‘ako Zone, extending along Halekauwila Street from Richards Street on the west end to Ward Avenue on the east end, yielded 22 of the 28 carbon dates (79 percent of all of the dates) acquired. Carbon dates were collected from nine different test excavations from three different archaeological cultural resources (from SIHP #50-80-14-7428: T-119A, T-120, and T-120A; from SIHP #50-80-14-2963: T-124; and from SIHP #50-80-14-5820: T-142, T-145, T-146A, T-150, and T-151). This density of features in and of itself indicates a high level of activity in this area.

It may not be a coincidence that four of the six carbon dates with ranges entirely within the pre-Contact period (from SIHP #50-80-14-2963: T-124; from SIHP #50-80-14-5820: T-142, T-146A, and T-151) lie within a 500 m stretch of the central portion of the West Kaka‘ako Zone. This indicated density of relatively early activity (circa AD 1440 to 1650) appears to be localized around “Pu‘unui” [large hill, or big hill]. Pu‘unui may have been a higher area of dry land in the midst of a relatively marshy area that would have been attractive for a variety of habitation activities (Figure 79).

8.1.3 Kaka‘ako Makai Zone

The Kaka‘ako Makai Zone designates an additional utility relocation route that extends approximately 1,250 m from the transit corridor, forming a *makai* loop off of the main alignment. Where the main transit line heads off onto Halekauwila Street approximately 100 m southeast of the Downtown Station, the utility relocation route continues to head south on Nimitz Highway. The utility relocation route makes a sharp turn heading *mauka* (northeast) off of Nimitz Highway onto Punchbowl Street and then turns southeast on Pohukaina Street, which runs parallel to and one block *makai* of the main transit route on Halekauwila Street. The utility relocation route then re-connects with the main alignment by turning *mauka* (northeast) on Cooke Street to rejoin the main transit alignment at the intersection of Halekauwila Street and Cooke Street. The four carbon dates were collected from two test excavations within a single archaeological cultural resource (SIHP #50-80-14-2918; three dates from T-226B and one date from T-227A). At the 2-sigma calibration each of the four dates spans approximately 300 years, from AD 1650 to 1950.

Table 265. Summary Table of Radiocarbon Dates from along the HHCTCP City Center Section Study Corridor

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-020, *imu* SIHP #-7425, 2.35–2.50 mbs	1223-4	*ʻŪlei*	342683	400 +/- 30	-26.2 0/00	380 +/- 30	Date range: AD 1440–1640 95.4% probability: ▪ **AD 1440–1530 (61.6%)** ▪ AD 1550–1640 (33.8%) 68.2% probability: ▪ AD 1450–1520 (54.1%) ▪ AD 1590–1620 (14.1%)
T-020A, Str. II, 2.30–2.34 mbs	1302-2	*Pūkiawe*	342818	320 +/- 30	-25.3 0/00	320 +/- 30	Date range: AD 1480–1650 95.4% probability: ▪ **AD 1480–1650 (95.4%)** 68.2% probability: ▪ AD 1510–1600 (53.3%) ▪ AD 1610–1640 (14.9%)
T-119A, SIHP #-7428, Feature 1a, 0.80–0.93 mbs	1302-14	*Kukui* (nutshell)	342819	110 +/- 30	-22.8 0/00	150 +/- 30	Date range: AD 1660–1960 95.4% probability: ▪ **AD 1660–1890 (78.2%)** ▪ AD 1900–1960 (17.2%) 68.2% probability: ▪ AD 1720–1780 (28.9%) ▪ AD 1910–1950 (13.4%) ▪ AD 1670–1700 (12.3%) ▪ AD 1790–1820 (7.7%) ▪ AD 1830–1880 (5.8%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-119A, SIHP #-7428, Feature 1a, 1.25–1.50 mbs	1302-21	*Kukui* (nutshell)	342820	110 +/- 30	-25.0 0/00	110 +/- 30	Date range: AD 1690–1940 95.4% probability: ▪ **AD 1800–1940 (65.6%)** ▪ AD 1680–1770 (29.8%) 68.2% probability: ▪ AD 1810–1920 (49.2%) ▪ AD 1690–1730 (19.0%)
T-120, SIHP #-7428, Feature 4, 1.12–1.26 mbs	1228-1	*Kukui* (nutshell)	342684	130 +/- 30	-25.5 0/00	120 +/- 30	Date range: AD 1670–1940 95.4% probability: ▪ **AD 1790–1940 (62.7%)** ▪ AD 1670–1780 (32.7%) 68.2% probability: ▪ AD 1800–1890 (40.7%) ▪ AD 1680–1740 (18.8%) ▪ AD 1900–1930 (8.7%)
T-120, SIHP #-7428, Feature 5, 1.10–1.18 mbs	1228-20	*Kukui* (nutshell)	342685	50 +/- 30	-25.7 0/00	40 +/- 30	Date range: AD 1690-1960 95.4% probability: ▪ **AD 1810-1920 (67.1%)** ▪ AD 1690-1730 (19.1%) ▪ AD 1950-1960 (9.2%) 68.2% probability: ▪ AD 1880-1920 (41.3%) ▪ AD 1700-1720 (10.6%) ▪ AD 1950-1960 (8.6%) ▪ AD 1810–1840 (7.7%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-120, SIHP #-7428, Feature 7, 1.04–1.07 mbs	1228-103	*Kukui* (nutshell)	342686	90 +/- 30	-24.7 0/00	90 +/- 30	Date range: AD 1680–1930 95.4% probability: ▪ **AD 1800–1930 (68.9%)** ▪ AD 1680–1740 (26.5%) 68.2% probability: ▪ AD 1870–1920 (29.6%) ▪ AD 1690–1730 (21.4%) ▪ AD 1810–1850 (17.2%)
T-120A, Str. II, SIHP #-7428, 1.10–1.18 mbs	1302-33	Kukui (nutshell)	342824	140 +/- 30	-24.3 0/00	150 +/- 30	Date range: AD 1660–1960 95.4% probability: ▪ **AD 1660–1890 (78.2%)** ▪ AD 1900–1960 (17.2%) 68.2% probability: ▪ AD 1720–1780 (28.9%) ▪ AD 1910–1950 (13.4%) ▪ AD 1670–1700 (12.3%) ▪ AD 1790–1820 (7.7%) ▪ AD 1830–1880 (5.8%)
T-120A, SIHP #-7428, Feature 9, 1.28–1.36 mbs	1302-42	*Pilo*	342821	150 +/- 30	-24.4 0/00	160 +/- 30	Date range: AD 1660-1960 95.4% probability: ▪ **AD 1660–1890 (77.3%)** ▪ AD 1910-1960 (18.1%) 68.2% probability: ▪ AD 1720–1810 (42.3%) ▪ AD 1660-1690 (13.0%) ▪ AD 1920-1950 (12.9%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-120A, SIHP #-7428, Feature 10, 1.25–1.37 mbs	1302-45	*Kukui* (nutshell)	342822	150 +/- 30	-24.5 0/00	160 +/- 30	Date range: AD 1660–1960 95.4% probability: ▪ **AD 1660–1890 (77.3%)** ▪ AD 1910–1960 (18.1%) 68.2% probability: ▪ AD 1720–1810 (42.3%) ▪ AD 1660–1690 (13.0%) ▪ AD 1920–1950 (12.9%)
T-120A, SIHP #-7428, Feature 12, 1.28–1.32 mbs	1302-50	*‘Akoko*	342823	100.7 +/- 0.4 pMC	-10.8 0/00	170 +/- 30	Date range: AD 1650–1960 95.4% probability: ▪ **AD 1720–1820 (50.7%)** ▪ AD 1910–1960 (18.9%) ▪ AD 1650–1700 (17.6%) ▪ AD 1830–1880 (8.3%) 68.2% probability: ▪ AD 1730–1810 (41.9%) ▪ AD 1920–1950 (14.3%) ▪ AD 1660–1690 (12.0%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-124, SIHP #-2963, Feature 1, 1.16–1.36 mbs	1228-34	*ʻĀheahea*	342687	70 +/- 30	-26.7 0/00	40 +/- 30	Date range: AD 1690–1960 95.4% probability: ▪ **AD 1810–1920 (67.1%)** ▪ AD 1690–1730 (19.1%) ▪ AD 1950–1960 (9.2%) 68.2% probability: ▪ AD 1880–1920 (41.3%) ▪ AD 1700–1720 (10.6%) ▪ AD 1950–1960 (8.6%) ▪ AD 1810–1840 (7.7%)
T-124, SIHP #-2963, Feature 2, 1.16–1.25 mbs	1228-55	*ʻIlima*	342688	150 +/- 30	-25.4 0/00	140 +/- 30	Date range: AD 1660–1950 95.4% probability: ▪ **AD 1790–1950 (52.5%)** ▪ AD 1660–1780 (42.9%) 68.2% probability: ▪ AD 1830–1880 (19.9%) ▪ AD 1720–1780 (19.8%) ▪ AD 1910–1940 (11.8%) ▪ AD 1670–1700 (9.3%) ▪ AD 1790–1820 (7.4%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-124, SIHP #-2963, Feature 5, 1.40–1.63 mbs	1223-11	*ʻĀheahea*	342689	290 +/- 30	-25.9 0/00	280 +/- 30	Date range: AD 1490–1800 95.4% probability: ▪ **AD 1490–1670 (93.1%)** ▪ AD 1780–1800 (2.3%) 68.2% probability: ▪ AD 1520–1580 (38.2%) ▪ AD 1630–1660 (30.0%)
T-124, SIHP #-2963, Feature 11, 1.23–1.32 mbs	1223-6	*Lama*	342690	350 +/- 30	-24.6 0/00	360 +/- 30	Date range: AD 1450–1640 95.4% probability: ▪ **AD 1450–1640 (95.4%)** 68.2% probability: ▪ AD 1460–1530 (39.0%) ▪ AD 1570–1630 (29.2%)
T-142, SIHP #-5820, Feature 8, 0.55–0.70 mbs	1228-61	*Kukui* (nutshell)	342691	270 +/- 30	-24.8 0/00	270 +/- 30	Date range: AD 1510–1800 95.4% probability: ▪ **AD 1610–1670 (46.7%)** ▪ AD 1510–1600 (42.2%) ▪ AD 1780–1800 (6.6%) 68.2% probability: ▪ AD 1630–1670 (41.0%) ▪ AD 1520–1560 (27.2%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-145, SIHP #-5820, Feature 9, 0.81–0.92 mbs	1228-67	*‘Ilima*	342984	320+/- 30	-24.8 0/00	320 +/- 30	Date range: AD 1480–1650 95.4% probability: ▪ **AD 1480–1650 (95.4%)** 68.2% probability: ▪ AD 1510–1600 (53.3%) ▪ AD 1610–1640 (14.9%)
T-146A, SIHP #-5820, Feature 12, 0.75–0.90 mbs	1302-62	*Niu* (nutshell)	342985	220 +/- 30	-23.6 0/00	240 +/- 30	Date range: AD 1520–1960 95.4% probability: ▪ **AD 1630–1690 (51.3%)** ▪ AD 1730–1810 (30.8%) ▪ AD 1930–1960 (8.0%) ▪ AD 1520–1560 (5.3%) 68.2% probability: ▪ AD 1640–1670 (45.0%) ▪ AD 1780–1800 (23.2%)
T-146A, SIHP #-5820, Feature 13, 0.83–0.94 mbs	1302-72	*Kukui* (nutshell)	342826	220+/- 30	-23.9 0/00	240 +/- 30	Date range: AD 1520–1960 95.4% probability: ▪ **AD 1630–1690 (51.3%)** ▪ AD 1730–1810 (30.8%) ▪ AD 1930–1960 (8.0%) ▪ AD 1520–1560 (5.3%) 68.2% probability: ▪ AD 1640–1670 (45.0%) ▪ AD 1780–1800 (23.2%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-146A, SIHP #-5820, Feature 14, 0.84–0.95 mbs	1302-76	*Niu* (nutshell)	342827	250 +/- 30	-22.4 0/00	290 +/- 30	Date range: AD 1490–1670 95.4% probability: ▪ **AD 1490–1670 (95.4%)** 68.2% probability: ▪ AD 1520–1580 (45.7%) ▪ AD 1620–1660 (22.5%)
T-146A, SIHP #-5820, Feature 15, 0.84–0.92 mbs	1302-81	*Pilo*	342828	180 +/- 30	-24.1 0/00	190 +/- 30	Date range: AD 1640–1960 95.4% probability: ▪ **AD 1720–1820 (53.5%)** ▪ AD 1640–1700 (22.3%) ▪ AD 1910–1960 (19.6%) 68.2% probability: ▪ AD 1730–1810 (41.6%) ▪ AD 1660–1690 (14.2%) ▪ AD 1930–1960 (12.4%)
T-150 SIHP #-5820, Feature 19, 0.70–0.95 mbs	1228-74	*Kukui* (nutshell)	342692	20 +/- 30	-23.8 0/00	40 +/- 30	Date range: AD 1690–1960 95.4% probability: ▪ **AD 1810–1920 (67.1%)** ▪ AD 1690–1730 (19.1%) ▪ AD 1950–1960 (9.2%) 68.2% probability: ▪ AD 1880–1920 (41.3%) ▪ AD 1700–1720 (10.6%) ▪ AD 1950–1960 (8.6%) ▪ AD 1810–1840 (7.7%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-150, SIHP #-5820, Feature 20, 0.90–1.30 mbs	1228-83	*Kukui* (nutshell)	342693	230 +/- 30	-24.5 0/00	240 +/- 30	Date range: AD 1520–1960 95.4% probability: ▪ **AD 1630–1690 (51.3%)** ▪ AD 1730–1810 (30.8%) ▪ AD 1930–1960 (8.0%) ▪ AD 1520–1560 (5.3%) 68.2% probability: ▪ AD 1640–1670 (45.0%) ▪ AD 1780–1800 (23.2%)
T-151, SIHP #-5820, Feature 25, 0.90–1.07 mbs	1228-86	*Ko‘oko‘o -lau*	342694	290 +/- 30	-24.5 0/00	300 +/- 30	Date range: AD 1480–1660 95.4% probability: ▪ **AD 1480–1660 (95.4%)** 68.2% probability: ▪ AD 1520–1590 (50.1%) ▪ AD 1620–1650 (18.1%)
T-226B, SIHP #-2918, Feature 6, 0.82–0.93 mbs	1304-15	*Kukui* (nutshell)	343422	190 +/- 30	-25.4 0/00	180 +/- 30	Date range: AD 1650–1960 95.4% probability: ▪ **AD 1720–1820 (52.2%)** ▪ AD 1650–1700 (19.5%) ▪ AD 1910–1960 (19.3%) ▪ AD 1830–1880 (4.4%) 68.2% probability: ▪ AD 1730–1810 (41.0%) ▪ AD 1920–1960 (14.7%) ▪ AD 1660–1690 (12.5%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-226B, SIHP #-2918, Feature 8, 0.76–0.90 mbs	1304-24	*Niu* (nutshell)	343423	200 +/- 30	-23.0 0/00	230 +/- 30	Date range: AD 1630–1960 95.4% probability: ▪ **AD 1630-1690 (44.7%)** ▪ AD 1730-1810 (39.5%) ▪ AD 1930-1960 (11.3%) 68.2% probability: ▪ AD 1640-1670 (35.8%) ▪ AD 1780-1800 (26.0%) ▪ AD 1940-1960 (6.4%)
T-226B, SIHP #-2918, Feature 11, 0.78–0.94 mbs	1304-43	*Niu* (nutshell)	343424	160 +/- 30	-24.0 0/00	180 +/- 30	Date range: AD 1650–1960 95.4% probability: ▪ **AD 1720–1820 (52.2%)** ▪ AD 1650-1700 (19.5%) ▪ AD 1910-1960 (19.3%) ▪ AD 1830-1880 (4.4%) 68.2% probability: ▪ AD 1730-1810 (41.0%) ▪ AD 1920-1960 (14.7%) ▪ AD 1660-1690 (12.5%)

Provenience	WIDL #	Plant	Beta # (Beta-)	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	Calibration (and likely date ranges from OxCal) at Two Standard Deviations [highest probability date range in bold]
T-227A, SIHP #-2918, Feature 23, 1.08–1.31 mbs	1302-146	*Kōpiko*	342829	190 +/- 30	-24.6 0/00	200 +/- 30	Date range: AD 1640–1960 95.4% probability: ▪ **AD 1720-1810 (51.6%)** ▪ AD 1640-1690 (25.5%) ▪ AD 1920-1960 (18.3%) 68.2% probability: ▪ AD 1760-1810 (35.4%) ▪ AD 1650-1680 (18.9%) ▪ AD 1930-1960 (13.9%)

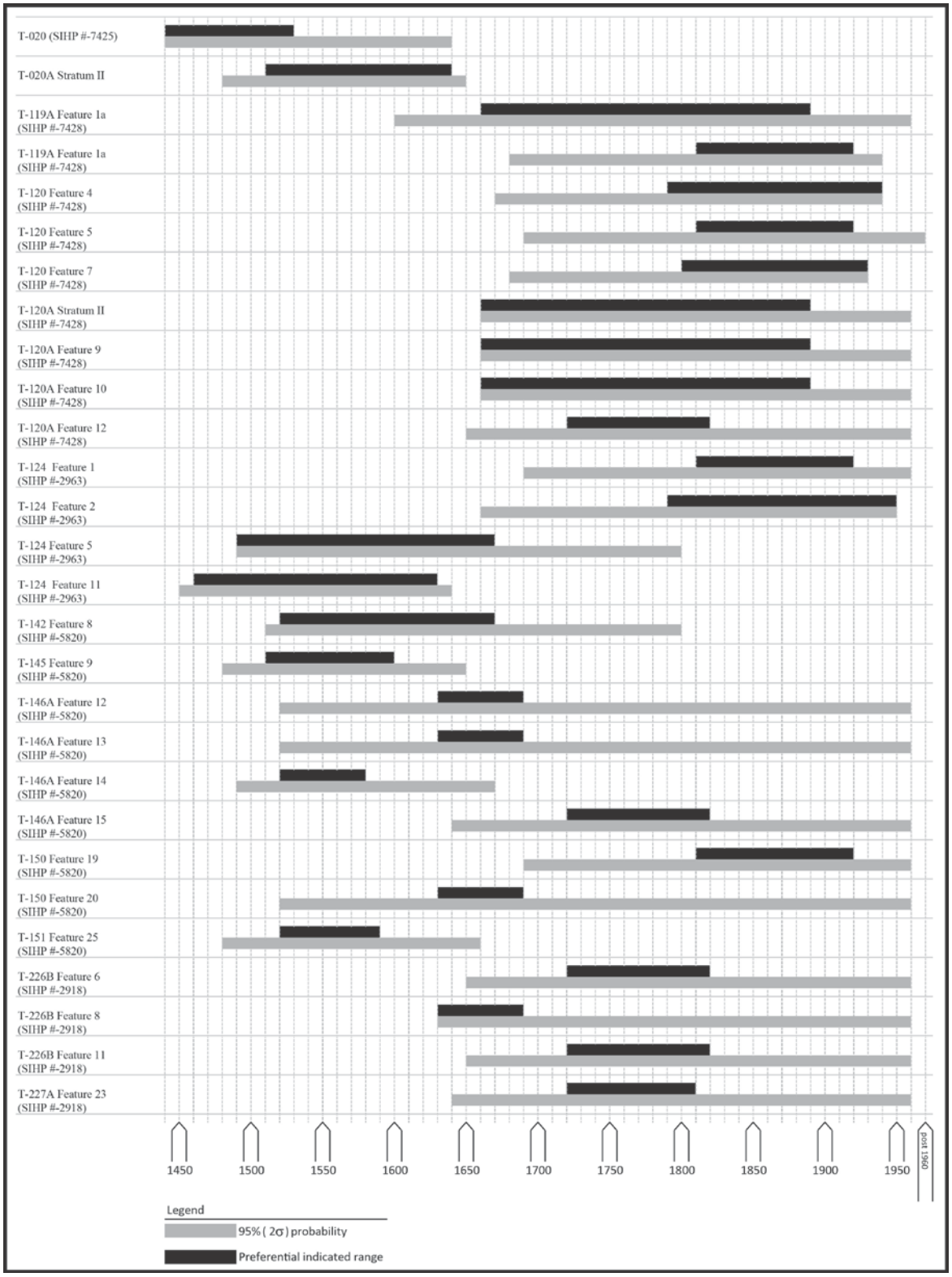


Figure 77. Bar Graph of HHCTCP Radiocarbon Dating Results

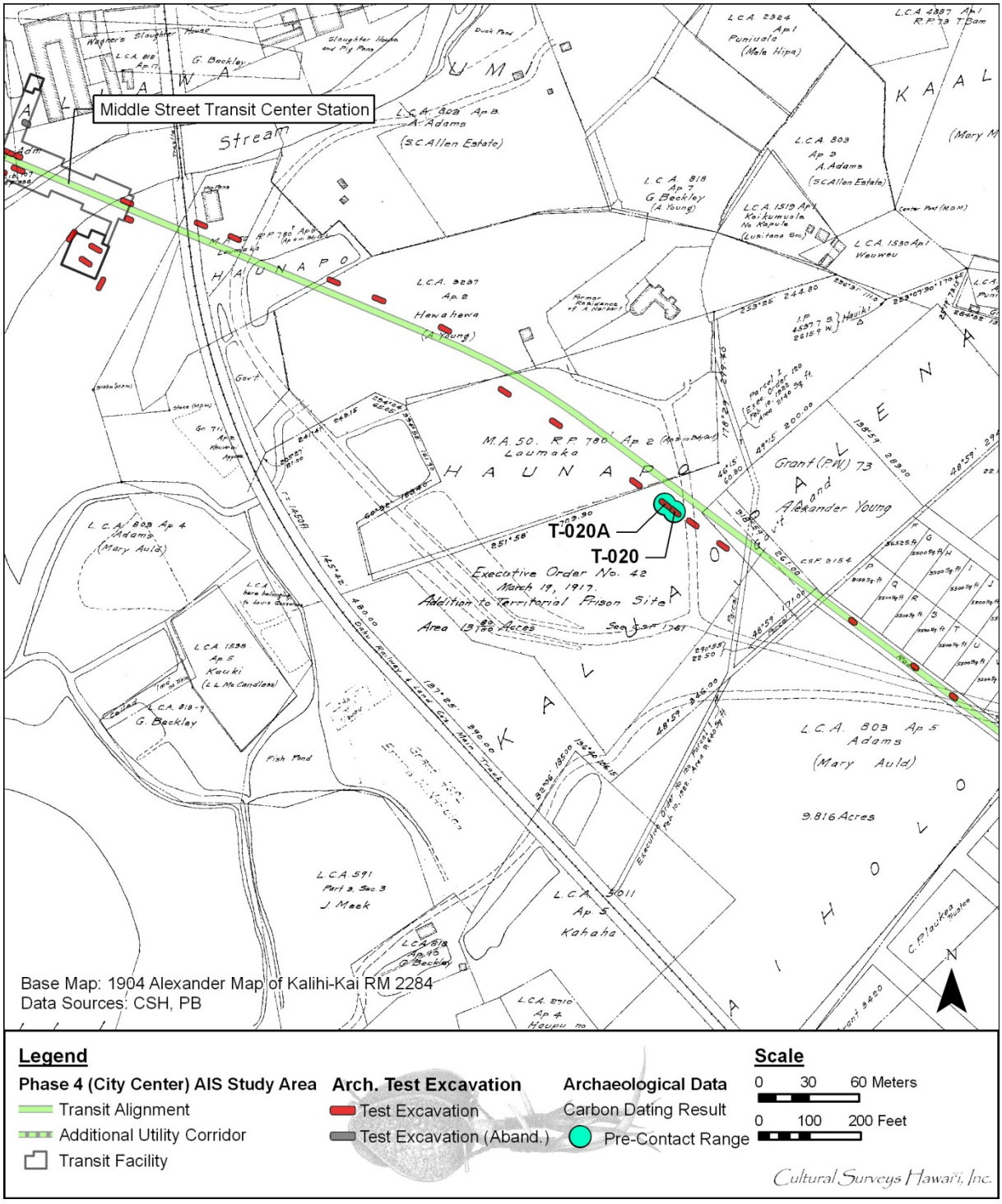


Figure 78. Location of two relatively early (95% probability ranges of AD 1440–1640 and 1480–1650) radiocarbon dates from excavations T-020 and T-020A in West Kalihi overlain on the 1904 Alexander map (RM 2284) of Kalihi-Kai, showing Kalihi Stream, LCAs, and place named “Haunapo”

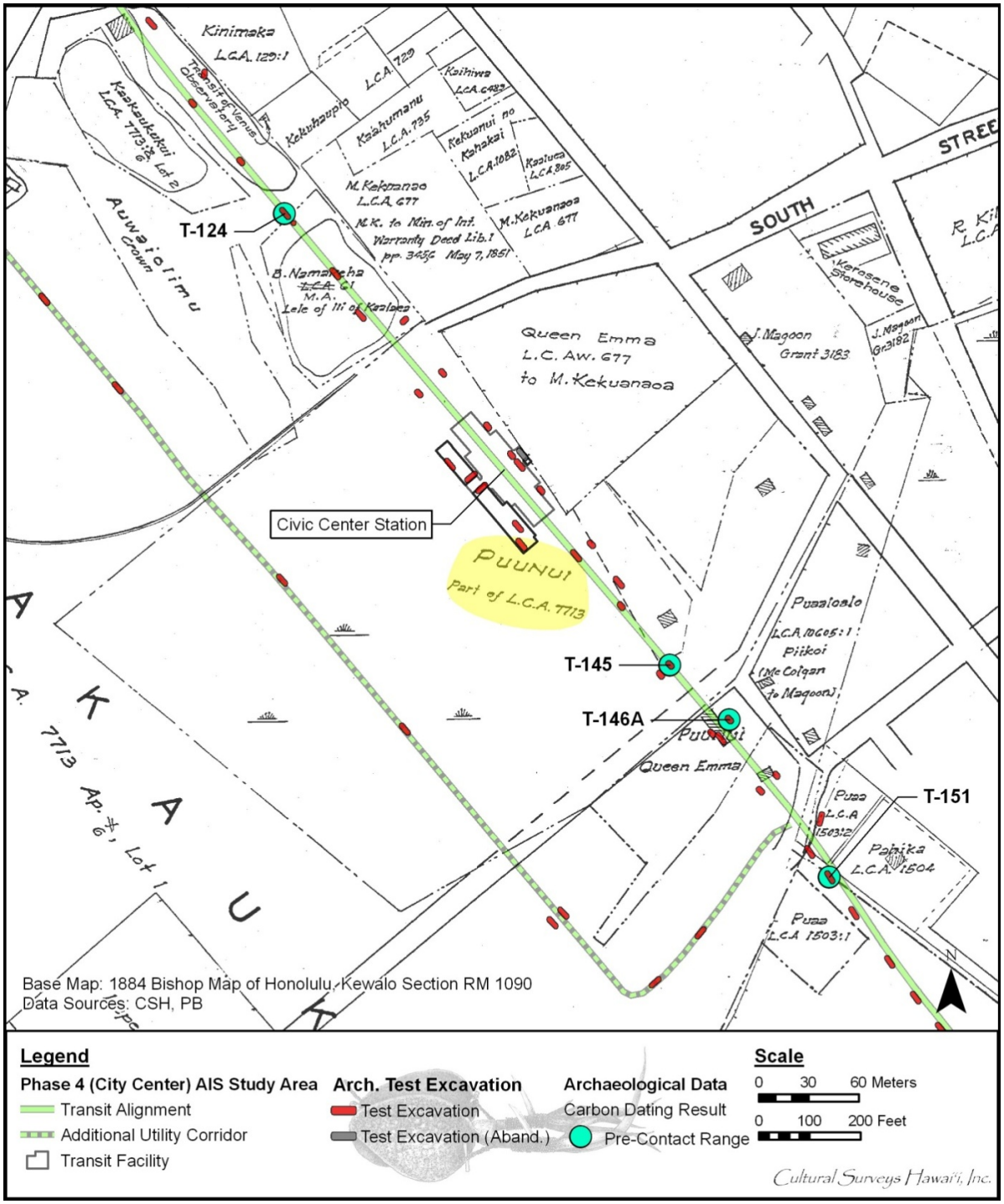


Figure 79. Location of four relatively early (95% probability ranges within AD 1450–1670) radiocarbon dates from excavations T-124, T-145, T-146A, and T-151 in West Kaka‘ako overlain on the 1884 Bishop map (RM 1090) of Honolulu, Kewalo Section, showing proximity to the place named “Pu‘unui,” later LCAs, ponds, etc.

8.2 Prior Radiocarbon Dating Results from the HHCTCP City Center Vicinity

The majority of carbon dates reported from archaeological studies in the vicinity of the HHCTCP City Center project area have been from major projects in downtown Honolulu inland of the present study alignment. These dates are summarized in Table 266 with a brief review of projects that have produced radiocarbon dates near the corridor presented below (both organized chronologically by the date of the project). Discussions of the present radiocarbon dating results in the context of our knowledge of the chronology in the vicinity of the HHCTCP City Center route and in the wider framework of Hawaiian cultural chronologies follow.

8.2.1 Makai Parking Garage Archaeological Monitoring (Clark 1987)

Stephen Clark, then of the Department of Anthropology at the Bishop Museum, prepared an archaeological monitoring report of the Makai Parking Garage at the *mauka*/Diamond Head corner of Punchbowl and Halekauwila Streets. Seven burials were identified at the designated historic property, SIHP #50-080-14-2963. Two radiocarbon dates are reported. A date of AD 1270–1410 is reported from charcoal in burial pit fill (Clark 1987:105). A date is also reported for "a buried A horizon in layer II although no Hawaiian cultural materials or features were found in association with this buried surface…." (Clark 1987:107). Two different systems of date processing are used for this buried A horizon, with the Stuiver and Pearson (1986) analyses yielding a date range of AD 600–790 and Klein et al. (1982) yielding a date range of AD 430–905. In the absence of any associated Hawaiian cultural materials, it remains uncertain that this date range should be understood as a cultural date.

8.2.2 River-Nimitz Redevelopment Project Inadvertent Discovery (Landrum and Dixon 1992)

The Bernice Pauahi Bishop Museum Public Archaeology Section became involved in a River Street-Nimitz Highway redevelopment project (Landrum and Dixon 1992) in response to the inadvertent discovery of a human burial. This burial find was unusually deep—"approximately 2.5 m beneath the surface in a water-saturated matrix" (Landrum and Dixon 1992:8). A radiocarbon date on the burial was evaluated at AD 1430–1650.

8.2.3 Nuuanu Court Project Archaeological Inventory Survey (Dunn and Rosendahl 1993)

Paul H. Rosendahl, Inc. (Dunn and Rosendahl 1993) carried out an archaeological inventory survey for the Nuuanu Court Project on a parcel bounded by Bethel Street on the south, Nimitz Highway on the west, Nu‘uanu Avenue on the north, and buildings on the east. Three radiocarbon dates are reported, for which two of the date ranges extend into the modern period. The study concludes that occupation in the project area began "perhaps…as early as AD 1250 at Site 2456)" (Dunn and Rosendahl 1993:9).

8.2.4 Kekaulike ‘Ewa Block Paleoenvironmental Investigations (Athens and Ward 1994)

The International Archaeological Research Institute, Inc. (IARII; Athens and Ward 1994) prepared a report on paleoenvironmental investigations for the Archaeological Consultants of Hawai‘i in coordination with their Kekaulike ‘Ewa Block archaeological data recovery (Riley et al. 1995). Three samples from a core were submitted for dating. All three dates are in pre-

Polynesian times. By a core depth of 3–42 cmbs (Stratum IIa), a time-depth of 2201–2608 Before Present (B.P.) was suggested (Athens and Ward 1994:16).

8.2.5 Kekaulike Ewa Block Archaeological Inventory Survey (Kennedy et al. 1994)

Archaeological Consultants of Hawai‘i (Kennedy et al. 1994) conducted an archaeological inventory survey for the Kekaulike Revitalization Project ‘Ewa Block in an area bounded by Hotel, River, King, and Kekaulike Streets (one block inland from the present study corridor), reporting seven radiocarbon dates. Two of the dates were basically modern and three of the dates pre-date posited Polynesian arrival. These carbon samples are posited to actually have been blackened wood (Kennedy et al. 1994:132). The authors conclude that occupation in an age range of AD 1386–1710 is indicated (Kennedy et al. 1994:132).

8.2.6 Kekaulike ‘Ewa Block Archaeological Data Recovery (Riley et al. 1995)

Archaeological Consultants of Hawai‘i (Riley et al. 1995) conducted archaeological data recovery work for the Kekaulike Revitalization Project ‘Ewa Block (one block inland from the present study corridor) as a follow-up to the archaeological inventory survey effort (Kennedy et al. 1994, discussed previously). Eight radiocarbon dates are reported. Four of the dates are Before the Common Era (BCE) and relate to pre-Polynesian geological processes, and four of the dates are believed to relate to Hawaiian activity. The date range of AD 1664–1955 (Beta #67534) “was taken at the interface between prehistoric Hawaiian occupation and Western materials. The date was not unexpected” (Riley et al. 1995:95). The date range of AD 796–1000 (Beta #67535) was associated with “a well-defined coral block platform with the remains of a human burial beneath it…” (Riley et al. 1995:95). The date range of AD 874–1061 came from a sample (Beta #67536) that “consisted of coconut and other wood that was lodged in the wall of the Fishpond (Site #4587) [and] the date may be an accurate record of the fishpond construction, in which case it is the earliest date obtained for a fishpond in the Hawaiian Islands” (Riley et al. 1995:95). The date range of AD 1445–1693 (ISGS 2731) was from a pit feature (Riley et al. 1995:95).

8.2.7 Kekaulike Diamond Head Block Archaeological Inventory Survey (Goodwin 1997)

The International Archaeological Research Institute (Goodwin 1997) reported on an archaeological inventory survey at SIHP #50-80-14-4875 in an area bounded by Kekaulike Street, Hotel Street, Maunakea Street, and King Street (one block inland from the present study corridor; this project area was further reported on by Goodwin and Allen 2005). A firepit (Feature 25) in their Test Trench 2 “yielded a radiocarbon date between AD 1200–1390” (Goodwin 1997:44). Three samples were submitted for radiocarbon dating (Goodwin 1997:19), but two yielded modern dates.

8.2.8 Kūwili Fishpond/Liliha Paleoenvironmental Study (Athens and Ward 1997)

The International Archaeological Research Institute (Athens and Ward 1997) carried out a Liliha paleoenvironmental coring project at the former Kūwili Fishpond with carbon dates reported for two cores (Core 4 and Core 5). The two dates from Core 4 are in pre-Contact Polynesian times, but the five dates from Core 5 are Before the Common Era and prior to human arrival in the Hawaiian Islands. These two radiocarbon dates “suggest that construction and use

of the fishpond probably occurred during the AD 1500s and that infilling occurred very rapidly…. Presumably the fishpond was largely filled with sediment by the early AD 1600s; apparently it was not well-maintained following initial construction" (Athens and Ward 1997:18). The dating of Kūwili Fishpond would be revisited by McGerty et al. 1997 and Hammatt et al. 2008 (both discussed below) with different conclusions reached.

8.2.9 Kūwili Fishpond/Liliha Civic Center Archaeological Excavations (McGerty et al. 1997)

Scientific Consultant Services (SCS, McGerty et al. 1997) carried out archaeological excavations at the former Kūwili Fishpond (SIHP #50-80-14-5368) for a proposed Liliha Civic Center project. Twelve radiocarbon samples were analyzed from a stratigraphic sequence. Nine show an overall steady decrease in conventional age from the stratigraphically lowest sample (McGerty et al. 1997:63). The chronological anomalies or inversions in the chronological record are explained as resulting from re-deposited pond material used as fill. The SCS study concluded that fishpond initial construction and utilization dated from approximately AD 1100. This comparatively early date was noted to be a "major discrepancy" and to "vary greatly" from the dates for initial construction in the IARII study (McGerty et al. 1997:73).

8.2.10 Kawa Fishpond Archaeological Inventory Survey (McDermott and Mann 2001)

McDermott and Mann (2001) conducted an archaeological inventory survey for a proposed Nimitz Highway water system improvements project and report a total of four radiocarbon dates from Kawa Fishpond (SIHP #50-80-14-5966). A radiocarbon date from a coconut shell fragment and a date from wood charcoal appear to be straightforward. The other two dates on organic sediments were complicated because "it is a virtual certainty that a significant portion of the carbon in both sediment samples was marine in origin" and corrections are presented to address the "marine reservoir effect" (McDermott and Mann 2001:56). The authors conclude that "pond sediments were accumulating at least as early as AD 1150–1350" (McDermott and Mann 2001:65). This date is "associated with the transformation of the previously higher-energy lagoonal environment into the lower-energy ponded environment that is often characteristic of traditional Hawaiian fishponds" (McDermott and Mann 2001:65, 66).

The authors note the following:

> Age determinations on presumed culturally derived wood and charcoal from the fishpond layer and the lagoonal layer immediately below yielded significantly younger ages. A coconut shell fragment from the fishpond layer, Stratum XIII, dated to AD 1450–1650. Wood charcoal from the lagoonal layer immediately beneath the presumed fishpond deposit yielded an age of AD 1670–1960. As well as their inconsistency with the results of the sediment samples, these dates are clearly inverted. They are more consistent with the hypothesized later prehistoric and known historic use of the pond. (McDermott and Mann 2001:65)

8.2.11 Harbor Court Archaeological Data Recovery (Lebo 2002)

A Paul H. Rosendahl, Inc. and Bishop Museum data recovery project (Lebo 2002) at the Harbor Court, bounded by Nimitz Highway, Bethel, and Queen Streets in downtown Honolulu, reports thirteen charcoal dates and seven sediment dates. The study concludes that the

radiocarbon dates suggest “a fairly dense or consistent occupation of this area beginning between AD 1000–1200” (Lebo 2002:5–10). Six of the carbon dates (Beta #56365, #56367, #56372, #56374, #56375, and #56381) appear to provide solid support for this conclusion (Lebo 2002:5–11).

8.2.12 Kekaulike Diamond Head Block Archaeological Data Recovery (Goodwin and Allen 2005)

IARII (Goodwin and Allen 2005) report on archaeological data recovery work as a follow-up to the archaeological inventory survey effort (Goodwin 1997) at SIHP #50-80-14-4875 in an area bounded by Kekaulike Street, Hotel Street, Maunakea Street, and King Street (one block inland from the present study corridor) two radiocarbon dates were obtained. The authors concluded that a *kī* (*ti*) charcoal sample “suggest[s] a date around AD 1450 or 1500,” and that a second sample from “a rake-out deposit that may also have been used as a more general refuse pit” most likely dated to the one-sigma ranges of AD 1630–1685 and 1740–1810 (Goodwin and Allen 2005:231). Taking into consideration a carbon date from the survey phase of research, it was concluded that the site “may have been in use as early as the 13th century, and was very likely occupied by the 16th century” (Goodwin and Allen 2005:231).

8.2.13 Victoria Ward Village Shops Archaeological Inventory Survey (Bell, McDermott, and O’Leary 2006)

In the course of an archaeological inventory survey for a Victoria Ward Village Shops Project, bounded by Auahi, Kamake‘e, and Queen Streets, it was noted that while portions of SIHP #50-80-14-6855 showed evidence of historic disturbance and land use, large portions of the historic property, based on extensive sampling of features, contained no historic artifacts, only traditional Hawaiian cultural material. In order to better establish the age of deposition for this apparently pre-Contact or early historic traditional Native Hawaiian cultural deposit, CSH carried out radiocarbon dating for two wood charcoal samples from two different pit features, located in the exclusively traditional Native Hawaiian portion of the cultural layer.

Despite the fact that both carbon dates have date ranges into modern times, the authors concluded the following:

> …based on this lack of evidence for non-traditional Native Hawaiian goods or activities, and the results of radiocarbon dating, it is more likely that the preserved traditional Hawaiian components of SIHP 50-80-14-6855 accumulated in the late prehistoric or early historic period, likely between AD 1690 and 1810. (Bell, McDermott, and O’Leary 2006:243)

8.2.14 Kūwili Fishpond Data Recovery (Hammatt, Hazlett, and Shideler 2008)

Cultural Surveys Hawai‘i (Hammatt, Hazlett, and Shideler 2008) reported seven radiocarbon dates from data recovery work at Kūwili Fishpond. The study concluded that the earliest pond sediments were deposited circa AD 1020 to 1120, which was consistent with the estimates of AD 1100 from McGerty et al. (1997), and significantly earlier than the estimate for fishpond construction of Athens and Ward (1997) of the AD 1500s.

8.2.15 Block 2 Parking Lot Archaeological Inventory Survey (Pammer, Fong, and Hammatt 2011)

Cultural Surveys Hawai‘i (Pammer et al. 2011) carried out an archaeological inventory survey for Kamehameha Schools Block 2 Parking Lot re-development on a parcel bounded by South Street to the northwest, Halekauwila Street to the northeast, Keawe Street to the southeast, and Pohukaina Street to the southwest. Two carbon dates were obtained; one was modern and the other on a pit feature had a range of AD 1640 to 1950 with a 44.5% probability of AD 1735 to 1805.

8.2.16 Ko‘olani Phase II Project Archaeological Inventory Survey (Runyon et al. 2011)

Cultural Surveys Hawai‘i (Runyon et al. 2011) carried out an archaeological inventory survey for a Ko‘olani Phase II (now called Waihonua) within the city block bound by Kamake‘e Street to the west, Ala Moana Boulevard to the south, Waimanu Street to the north, and Pi‘ikoi Street to the east. They report three radiocarbon dates, and all have relatively wide ranges extending into modern times. Based on three radiocarbon dates, it was concluded that the cultural layer (SIHP #50-80-14-7115) was utilized between AD 1615 and 1891.

Table 266. Radiocarbon Dates from Previous Studies in the Project Area (organized chronologically by date of study)

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Clark 1987 (Clark, Stephen)	Makai Parking Garage, Trench SB-2, Layer I, Feat. 28, 20–30 cmbs	Charcoal	19460	580 +/- 60	-		AD 1270–1410
Clark 1987 (Clark, Stephen)	Makai Parking Garage, Trench C10, Layer II, Feat. 25, 126–130 cmbs	Charcoal	19461	1330 +/- 120	-		AD 430–905
Landrum and Dixon 1992	River-Nimitz Redevelopment Project (SIHP #50-80-14-4193)	Bone	33957	260 +/- 60	-18.6 0/00	360 +/- 60	AD 1430–1650
Dunn and Rosendahl 1993	Nuuanu Court project, BT-1, Layer V, 51/53–41/68 cmbs	Charcoal	60189	300 +/- 110	-22.2 0/00	350 +/- 110	AD 1390–1955 (82% probability AD 1390–1700)
Dunn and Rosendahl 1993	Nuuanu Court project, BT-3, Layer VB, 98–112 cmbs	Charcoal	60190	500 +/- 100	-21.5 0/00	560 +/- 100	AD 1250–1622 (94% probability AD 1250–1520)
Dunn and Rosendahl 1993	Nuuanu Court project, BT-6, Layer V, 64–70 cmbs	Charcoal	60191	210 +/- 90	-28.0 0/00	160 +/- 90	AD 1522–1955 (92% probability 1627–1955)
Athens and Ward 1994	Kekaulike ‘Ewa Block, Core 1, IIa, 9–12 cmbs	Wood	64218	2400 +/- 60	-29.5 0/00	2330 +/- 60	BP 2152–2706
Athens and Ward 1994	Kekaulike ‘Ewa Block, Core 1, IVa, 278–292 cmbs	Sediment	63533	4510 +/- 80	-28.0 0/00	4460 +/- 80	BP 5303–4866
Athens and Ward 1994	Kekaulike ‘Ewa Block, Core 1, IVb, 468–480 cmbs	Sediment	63534	5370 +/- 60	-27.6 0/00	5370 +/- 60	BP 6290–5949

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, FE 7, 111 cmbd	Charcoal	57066	120 +/- 100	-26.9 0/00	90 +/- 100	AD 1650–1955
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, Layer III, 139 cmbd	Charcoal	57067	100.7 +/- 0.9%	-25.2 0/00	100.8 +/- 0.9%	Modern
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, Layer III, 145 cmbd	Charcoal	57069	280 +/- 120	-25.9 0/00	270 +/- 120	AD 1440–1710 (63% probability for this date range)
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, Layer III, 145 cmbd	Charcoal	57273	450 +/- 90	-25.7 0/00	440 +/- 90	AD 1386–1648
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, Layer VI, 226 cmbd	Charcoal ?	57070	2870 +/- 90	-28.4 0/00	2820 +/- 90	BC 1196–812
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, Layer VII, 286 cmbd	Charcoal ?	57068	3130 +/- 60	-30.7 0/00	3040 +/- 60	BC 1443–1208
Kennedy et al. 1994	Kekaulike ‘Ewa Block Trench 2, Layer VI, 294 cmbd	Charcoal ?	57071	2650 +/- 80	-29.5 0/00	2580 +/- 80	BC 852–484
Riley et al. 1995	Kekaulike ‘Ewa Block, C:A5 V/1, 90 cmbd	Wood	66504	2170 +/- 70	-29.1 0/00	2100 +/- 70	BC 215–AD 33
Riley et al. 1995	Kekaulike ‘Ewa Block, C:A5 V/1, 95 cmbd	Wood	66505	4280 +/- 60	-27.1 0/00	4240 +/- 60	BC 2927–2623
Riley et al. 1995	Kekaulike ‘Ewa Block, C:A5 V/3, 111 cmbd	Wood	66508	2800 +/- 90	-26.7 0/00	2770 +/- 90	BC 1113–787

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Riley et al. 1995	Kekaulike ‘Ewa Block, C:J5 VI/4, 180 cmbd	Wood	66509	3040 +/- 80	-29.4 0/00	2970 +/- 80	BC 1393–971
Riley et al. 1995	Kekaulike ‘Ewa Block, C:F5 III/7–8, 75–90 cmbd	Charred material	67534	140 +/- 100	-27.9 0/00	90 +/- 100	AD 1664–1955
Riley et al. 1995	Kekaulike ‘Ewa Block, C:14 IV/2, 108 cmbd	Charred material	67535	1160 +/- 60	-25.1 0/00	1160 +/- 60	AD 796–1000
Riley et al. 1995	Kekaulike ‘Ewa Block, B:A1/A2 FE102, 140 cmbd	Charred material	67536	1100 +/- 50	-27.3 0/00	1060 +/- 50	AD 874–1061
Riley et al. 1995	Kekaulike ‘Ewa Block, A:J3 III/3 FE 123, 50–60 cmbd	Charcoal	ISGS-2731	280 +/- 70	-26.5 0/00	NA	AD 1445–1693
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 4, Layer III 167–176 cmbs	Sediment	69559	450 +/- 80	-18.9 0/00	540 +/- 80	BP 480–289
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 4, Layer III, 228–235 cmbs	Sediment	69560	460 +/- 100	-18.1 0/00	570 +/- 100	BP 507–293
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 5, Layer III, 3.27 m	Wood	69561	2400 +/- 90	-32.2 0/00	2280 +/- 90	BP 2351–2148
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 5, Layer IV, 6.45 m)	Wood	69562	3070 +/- 70	-28.0 0/00	3020 +/- 70	BP 3337–3079
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 5, Layer IV, 12.4 m	Wood	69563	5360 +/- 60	-27.4 0/00	5320 +/-60	BP 6188–5960

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 5, Layer V, 19.94–20.09 m	Sediment	69564	7900 +/- 90	-25.5 0/00	7890 +/- 90	BP 8948–8515
Athens and Ward 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Core 5, Layer V, 23.17–23.32 m	Sediment	69565	8060 +/- 70	-27.5 0/00	8020 +/- 70	BP 8988–8675
Goodwin 1997	Kekaulike Diamond Head Block (SIHP #50-80-14-4875), TT 2 Feat. 25	Ash/ Sediment	-	-	-	740 +/- 60	AD 1184–1394
Goodwin 1997	Kekaulike Diamond Head Block (SIHP #50-80-14-4875), TT 11 Feat. 50	Charcoal or ash/ sediment	-	-	-	-	Modern
Goodwin 1997	Kekaulike Diamond Head Block (SIHP #50-80-14-4875), TT 12 Feat. 54	Charcoal or ash/ sediment	-	-	-	-	Modern
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIi, 128 cmbs	Sediment	72644		-19.0 0/00	1190 +/- 80	AD 670–1010
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIe, 143 cmbs	Sediment	72645		-20.9 0/00	1060 +/- 60	AD 880–1050 AD 1100–1115
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIe, 155 cmbs	Sediment	72647		-19.9 0/00	1110 +/- 60	AD 790–1030
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIf, 165 cmbs	Sediment	72648		-20.0 0/00	530 +/- 50	AD 1310–1350 AD 1380–1450

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIf, 175 cmbs	Sediment	72650		-18.9 0/00	760 +/- 40	AD 1220–1300
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIg, 192 cmbs	Sediment	72652		-18.9 0/00	940 +/- 60	AD 1000–1240
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIg, 198 cmbs	Sediment	72653		-17.8 0/00	1120 +/- 40	AD 870–1010
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIg, 216 cmbs	Sediment	72654		-19.5 0/00	1060 +/- 60	AD 880–1050 AD 1100–1110
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIg, 222 cmbs	Sediment	72655		-17.0 0/00	1230 +/- 60	AD 670–970
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IIIg, 241 cmbs	Sediment	72657		-20.0 0/00	1160 +/- 60	AD 720–740 AD 760–1010
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IV, 252 cmbs	Sediment	72658		-22.8 0/00	1630 +/- 60	AD 260–290 AD 320–570
McGerty et al. 1997	Kūwili Fishpond (SIHP #50-80-14-5368) Trench 1, Layer IV, 260 cmbs	Sediment	72660		-24.5 0/00	1530 +/- 60	AD 410–650
McDermott and Mann 2001	Kawa Fishpond (SIHP #50-80-14-5966) Trench 3, Str. XIII, 205-230 cmbs	Organic sediment	157191	810 +/- 40	-25.5 0/00	800 +/- 40	AD 1150–1357*

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
McDermott and Mann 2001	Kawa Fishpond (SIHP #50-80-14-5966) Trench 3, Str. XIV, 230-240 cmbs	Organic sediment	157192	1230 +/- 50	-21.3 0/00	1290 +/- 50	AD 711–1029*
McDermott and Mann 2001	Kawa Fishpond (SIHP 50-80-14-5966) Trench 3, Str. XIII 205-230 cmbs	Coconut shell	157193	350 +/- 40	-25.8 0/00	340 +/- 40	AD 1450–1650
McDermott and Mann 2001	Kawa Fishpond (SIHP #50-80-14-5966) Trench 3, Str. XIV, 230-240 cmbs	Wood charcoal	157194	120 +/- 40	-26.0 0/00	100 +/- 40	AD 1670–1770 (30.3% probability for this date range) AD 1800–1960 (65.1% probability for this date range)
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III/V, Feat. 4	Charcoal	56363	5650 +/- 70	-30.0 0/00	5570 +/- 70	BC 4686–4344
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. V Feat. 1	Charcoal	56364	270 +/- 110	-26.0 0/00	250 +/- 110	AD 1429–1953
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. V/III, Feat. 9	Charcoal	56365	830 +/- 60	-27.0 0/00	800 +/- 60	AD 1036–1144 AD 1147–1288
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. V, Feat. 2	Charcoal	56366	2290 +/- 100	-25.2 0/00	2280 +/- 100	BC 760–94
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456) Str. III Feat. 8	Charcoal	56367	980 +/- 80	-27.1 0/00	940 +/- 80	AD 894–1221

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. V, Feat. 2	Charcoal	56368	200 +/- 50	-26.1 0/00	180 +/- 50	AD 1637–1710 AD 1718–1886 AD 1912–1950
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. V, Feat. 7	Charcoal	56369	270 +/- 100	-27.5 0/00	230 +/- 100	AD 1436–1952
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. V/ III, Feat. 6	Charcoal	56370	130 +/- 60	-26.4 0/00	110 +/- 60	AD 1652–1955
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456) Str. III/V, Feat. 8	Charcoal	56371	110 +/- 140	-31.3 0/00	10 +/- 140	AD 1476–1955
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III, Feat. 8	Charcoal	56372	910 +/- 50	-25.9 0/00	890 +/- 50	AD 1019–1224 AD 1228–1245
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. IV	Charcoal	56373	190 +/- 60	-26.3 0/00	170 +/- 60	AD 1530–1546 AD 1635–1952
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III, Feat. 10	Charcoal	56374	1020 +/- 50	-26.3 0/00	1000 +/- 50	AD 898–920
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III, Feat. 13	Charcoal	56375	770 +/- 50	-26.7 0/00	750 +/- 50	AD 1164–1168 AD 1186–1298
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III, Feat. 9	Soil	56376	790 +/- 160	-21.5 0/00	850 +/- 160	AD 902–917 AD 961–1437
Lebo	Harbor Court (SIHP #50-	Soil	56377	410 +/- 60	-22.9 0/00	440 +/- 60	AD 1411–1640

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
2002+	80-14-2456), Str. III, Feat. 6						
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III/V, Feat. 7	Soil	56378	1800 +/- 70	-22.8 0/00	1840 +/- 70	AD 68–409
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III, Feat. 9	Soil	56379	2360 +/- 90	-23.9 0/00	2380 +/- 90	BC 782–333 BC 325–202
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III, Feat. 9	Soil	56380	5110 +/- 230	-23.6 0/00	5150 +/- 230	BC 4440–3374
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III	Soil	56381	1030 +/- 80	-24.0 0/00	1050 +/- 80	AD 783–788 AD 831–838 AD 875–1189 AD 1204–1206
Lebo 2002+	Harbor Court (SIHP #50-80-14-2456), Str. III/V, Feat. 8	Soil	56382	1060 +/- 80	-24.1 0/00	1070 +/- 80	AD 779–1160
Goodwin and Allen 2005	Kekaulike Diamond Head Block (SIHP #50-80-14-4875), Feat. 484 “rake-out deposit in EU 13”	Wood charcoal	76258	280 +/- 90	-27.8 0/00	240 +/- 90	AD 1455–1950
Goodwin and Allen 2005	Kekaulike Diamond Head Block (SIHP #50-80-14-4875), Feat. 591, refuse deposit in EU 13	*Cordyline fruticosa* charcoal	182116	380 +/- 40	-23.8 0/00	400 +/- 40	AD 1430–1525 AD 1560–1630

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Bell et al. 2006	Ward Village Shops (SIHP #50-80-14-6855), Trench F2, Feat. A, Str. IV, 50–65 cmbs	Wood charcoal	215873	-	-18.4 0/00	20 +/- 40	AD 1690–1730 (15.7% probability for this date range) AD 1810–1920 (55.4% probability for this date range) AD post-1940 (24.3% probability for this date range)
Bell et al. 2006	Ward Village Shops (SIHP #50-80-14-6855), Trench F9, Feat. H, Str. II, 80–100 cmbs	Wood charcoal	215874	-	-22.2 0/00	0 +/- 40	AD 1690–1730 (12.1% probability for this date range) AD 1810–1920 (47.0% probability for this date range) AD post-1940 (36.3% probability for this date range)
Hammatt et al. 2008	Kūwili Fishpond, Trench 1, Str. IIIa, 180–190 cmbs	Sediment	-	870 +/- 40	-19.2 0/00	970 +/- 40	AD 990–1160

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Hammatt et al. 2008	Kūwili Fishpond, Trench 1, Str/ IIIc, 217–224 cmbs	Sediment	-	1030 +/- 40	-20.0 0/00	1110 +/- 40	AD 810–1020
Hammatt et al. 2008	Kūwili Fishpond, Trench 1, Str. IVa, 228–238 cmbs	Sediment	-	840 +/- 40	-17.1 0/00	970 +/- 40	AD 990–1160
Hammatt et al. 2008	Kūwili Fishpond, Trench 1, Str. IVb, 248–257 cmbs	Sediment	-	820 +/- 40	-18.7 0/00	920 +/- 40	AD 1020–1210
Hammatt et al. 2008	Kūwili Fishpond, Trench 2, Str. III, 230–240 cmbs	Sediment	-	1820 +/- 40	-21.9 0/00	1870 +/- 40	AD 50–240
Hammatt et al. 2008	Kūwili Fishpond, Trench 2, Str. III, 255–262 cmbs	Sediment	-	970 +/- 40	-20.8 0/00	1040+/- 40	AD 890–1050 AD 1100–1120
Hammatt et al. 2008	Kūwili Fishpond, Trench 1. Str. IV, 275–285 cmbs	Sediment	-	1040 +/- 40	-17.5 0/00	1160 +/- 40	AD 770–980
Pammer et al. 2011	KS Block 2, Test Trench 65, Feat. A-2, SIHP #50-80-14-7124, 110–160 cmbs	Charcoal	301374	-	-24.6 0/00	10 +/- 30	AD 1960 to beyond 1960
Pammer et al. 2011	KS Block 2, Test Trench 26, Feat. 1, SIHP #50-80-14-7197, 85-120 cmbs	Charcoal	303200	-	-24.1 0/00	230 +/- 30	AD 1640–1950 AD 1735–1805 (44.5% probability for this date range)
Runyon et al. 2011	Waihonua Project, Test Unit 2, Str. II, Feat. 17, SIHP #50-80-14-7115, 137–196 cmbs	Charcoal	275010	-	-25.2 0/00	160+/- 40	AD 1660–1960 AD 1717–1891 (61.3% probability for this date range)

Source	Provenience	Material	Beta #	Measured Radiocarbon Age (BP)	13C/12C Ratio	Conventional Radiocarbon Age (BP)	2 σ Calibration
Runyon et al. 2011	Waihonua Project, Test Unit 2, Str. II, Feat. 21, SIHP #50-80-14-7115, 154–169 cmbs	Charcoal	283708	190 +/- 40	-24.3 0/00	200 +/- 40	AD 1640–1950 AD 1724–1815 (48% probability for this date range)
Runyon et al. 2011	Waihonua Project, Test Unit 12, (SIHP #50-80-14-7115) Str. IIb	Charcoal	286105	-	-11.8 0/00	260 +/- 40	AD 1520–1950 AD 1615–1681 (40.6 % probability for this date range)

* Range reported follows corrections for the marine reservoir effect (McDermott and Mann 2001:58)

[+] The 21 radiocarbon dates in the Lebo 2002 study are each presented in terms of calibration date(s) and four sets of "Range Method" date range. (See Lebo 2002, Chapter 5). "Range Method A: Intercept 2" date(s) are presented here.

8.3 Summary of Radiocarbon Dating Results in the Context of our Knowledge of the Chronology of the City Center Lands

What is most striking from the 28 charcoal samples dated for the HHCTCP City Center is how late the dates are. Only six of the dates are solidly in pre-Contact times; the other date ranges extend into modern times. Given the limitations of the radiocarbon calibration curve for the period between AD 1650 and 1950, uncertainty remains regarding what this clustering of dates truly represents. Samples for carbon dating were deliberately selected from proveniences in which no historic artifacts or western wood (conifer and temperate hard wood) was present. The supposition that the majority of these dates are from the late pre-Contact and/or early post-Contact period is supported by the indicated most probable date ranges.

These relatively late dates are in contrast to the previously reported dates from downtown Honolulu. While any specific date or set of dates may be questioned, several studies suggest significantly earlier settlement in what is now downtown Honolulu (See Section 8.2 and Table 266). Riley et al. (1995) and Lebo (2002) report dates solidly before AD 1100. Several additional studies (Clark 1987, Goodwin 1997, and Goodwin and Allen 2005) suggest dates prior to AD 1400. Portions of downtown Honolulu may have been ideal for relatively early settlement. It may be the case that the present HHCTCP City Center study missed areas of earlier settlement by virtue of being too seaward (much of the present alignment was actually off-shore of this area of particular interest for relatively early settlement).

It seems certain this large number of relatively late carbon dates is at least partly a reflection of the discovery of Honolulu Harbor by foreigners as an ideal location for anchorage and the related movement of Kamehameha I’s center of rule to Kou/Honolulu in 1809 (Lebo and McGuirt 2000b:8). The lure of foreign trade and the primary domain of the ruler of the united Hawaiian Islands would have been major demographic attractions.

This timeframe, however, was one of great demographic movement on the central south shore of O‘ahu. The ruling chief of O‘ahu, Kahahana, would have been concerned to mobilize and mass forces to repel the long anticipated invasion of the Maui chief Kahekili that occurred circa 1783. Kamakau (1992:135) relates that Kahahana was living at Kawananakoa in lower Nu‘uanu at the time of Kahekili’s invasion. Kahekili’s invasion may have placed substantial forces for a prolonged period within the City Center lands. This would be repeated with Kamehameha’s large amphibious landing circa 1795. Kamehameha appears to have maintained substantial Big Island and Maui forces on O‘ahu with an eye toward the conquest of Kaua‘i from circa 1795 to 1810. Kamakau gives us a feeling for the times and the movement of people because of the preparation for war.

> At Oahu the fleet remained for a year, the whole company, including Kamehameha’s sons and daughters with their households and those of his brothers and sisters, his counselors and chiefs, over a hundred in each household, running into a thousand. (Kamakau 1992:189)

This historically documented influx of people could be responsible for the numerous radiocarbon dates spanning the period of initial Western contact. The presence and activities of

Kamehameha’s warriors and family and even those forces who accompanied the ruling chief Kahahana and the invading forces of Kahikili may account for many of these relatively late carbon dates.

8.4 Summary of Radiocarbon Dating Results in Hawaiian Cultural Chronologies

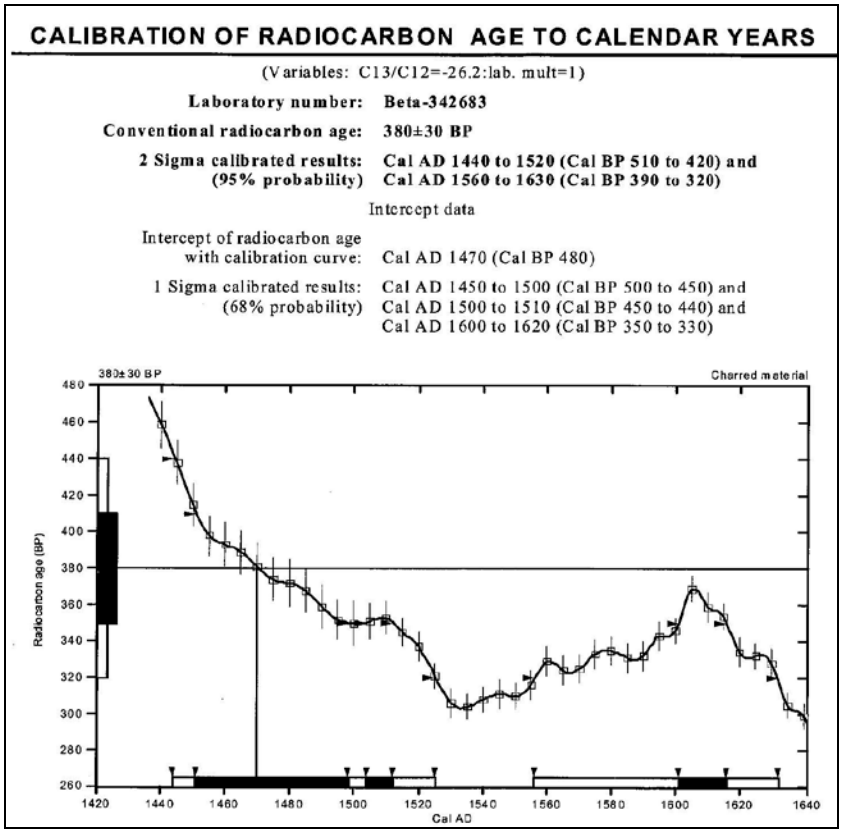
Theories of the chronology of Hawaiian culture have evolved significantly in recent years, based in part on developments in radiocarbon dating methodology, which reduced the standard errors and allowed smaller samples of charcoal to be dated, and in part on the shift to identifying and submitting short-lived species for radiocarbon dating in order to more accurately pinpoint the date of cultural usage (Kirch 2011:15). The re-dating of important sites within Eastern Polynesia such as the Society Islands and the Marquesas, as well as new site dating appears to support dating the settlement of those islands to “no earlier than AD 900–1000” (Kirch 2011:18). The consequent implications for Hawaiian chronology are significant, pushing back the previously widely-accepted arrival date of the Hawaiians from ca. AD 300–750 to a later date of ca. AD 800–1000 (Table 267).

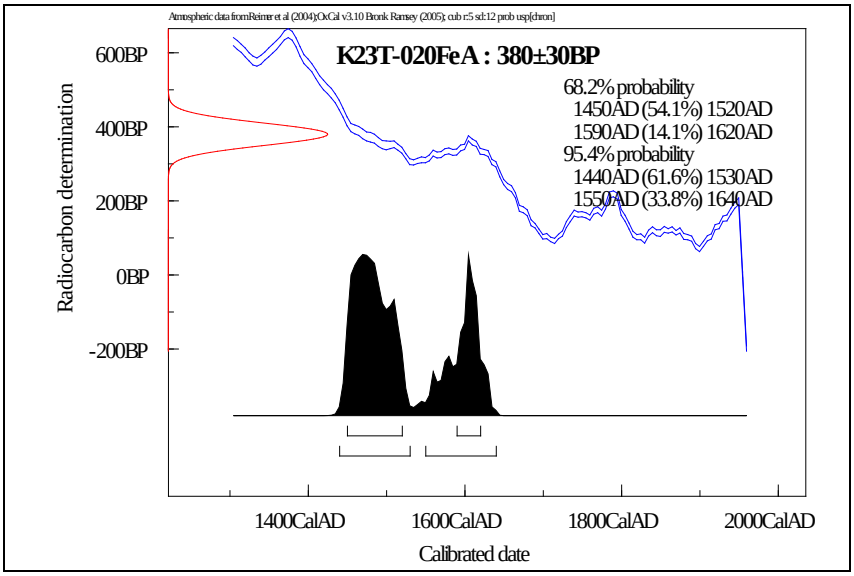
The earliest date range collected in the HHCTCP City Center archaeological investigations of AD 1440–1640 (from T-020) would not fall within any of the two earliest posited time periods as proposed by Kirch and McCoy (2007), but rather within the “Late Expansion Period” (AD 1400-1650). The six dated samples with date ranges that lie entirely before 1680 would also appear to fall best within the “Late Expansion Period.” Expansion into a new area is indeed what we appear to be seeing as a late phase of expansion into areas little utilized previously. The vast majority (17) of the date ranges entirely post-date 1630, and the upper end of almost all of these date ranges runs into modern times. These date ranges would all relate to the last phase of posited cultural development.

Table 267. Chronology of Hawaiian Culture by Kirch and McCoy (2007)

Foundation Period	Early Expansion Period	Late Expansion Period	Proto-Historic Period
AD 800-1200	AD 1200-1400	AD 1400-1650	AD 1650-1795

8.5 Calibration of Radiocarbon Age to Calendar Years presented in Order of Beta Analytic Sample Number





Beta #342683 (T-020, SIHP #-7425, *imu*, 2.35–2.50 mbs; formerly Feature A)

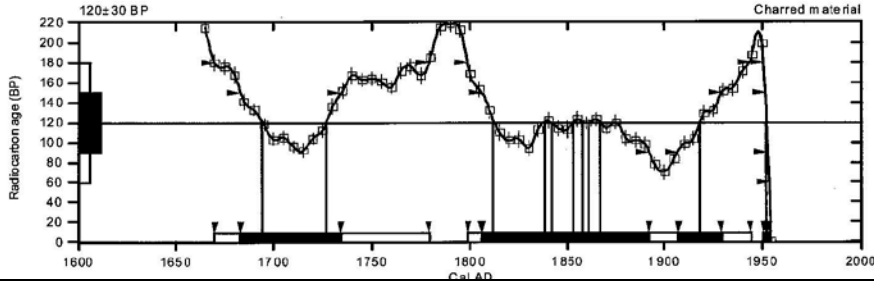
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

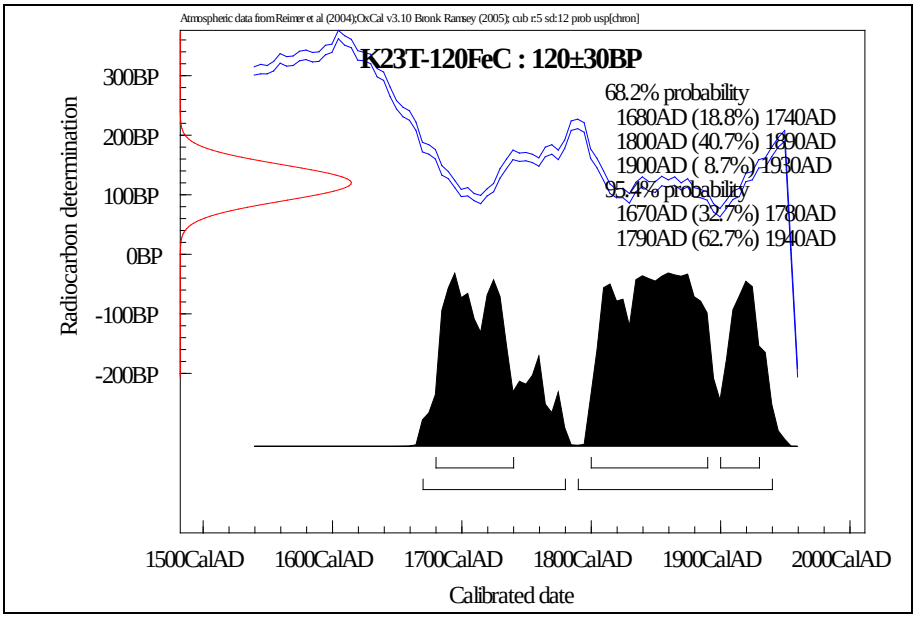
(Variables: C13/C12=-25.5:lab. mult=1)

Laboratory number:	**Beta-342684**
Conventional radiocarbon age:	**120±30 BP**
2 Sigma calibrated results: (95% probability)	**Cal AD 1670 to 1780 (Cal BP 280 to 170) and Cal AD 1800 to 1940 (Cal BP 150 to 10) and Cal AD Post 1950**

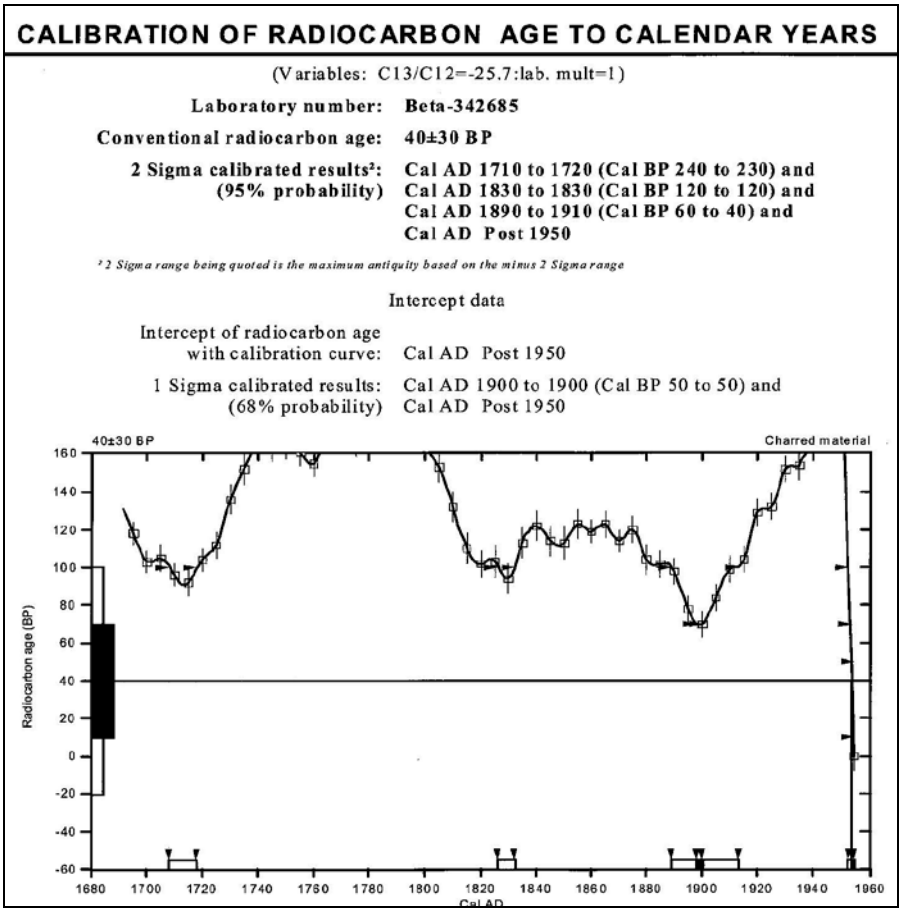
Intercept data

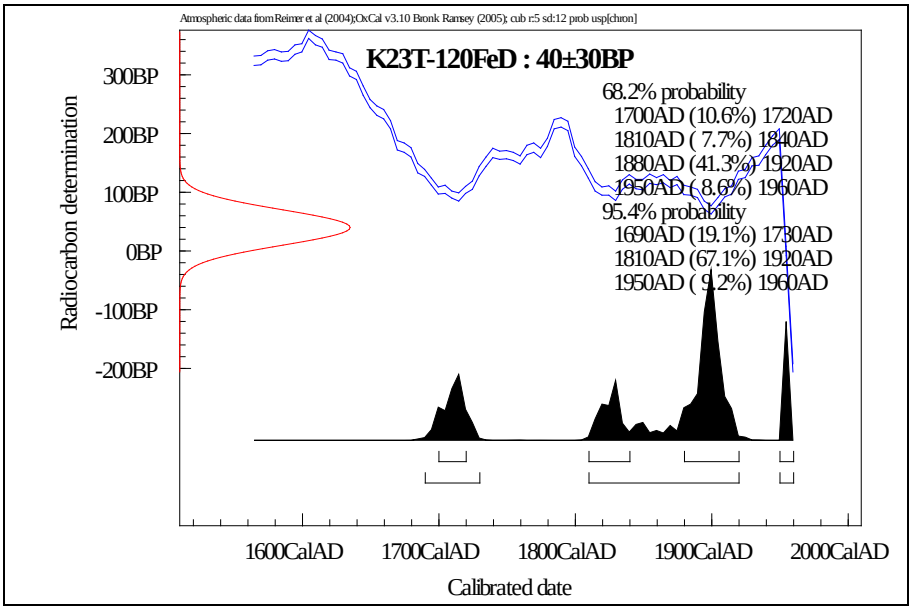
Intercepts of radiocarbon age with calibration curve:	Cal AD 1690 (Cal BP 260) and Cal AD 1730 (Cal BP 220) and Cal AD 1810 (Cal BP 140) and Cal AD 1840 (Cal BP 110) and Cal AD 1840 (Cal BP 110) and Cal AD 1850 (Cal BP 100) and Cal AD 1860 (Cal BP 90) and Cal AD 1860 (Cal BP 90) and Cal AD 1870 (Cal BP 80) and Cal AD 1920 (Cal BP 30) and Cal AD Post 1950
1 Sigma calibrated results: (68% probability)	Cal AD 1680 to 1730 (Cal BP 270 to 220) and Cal AD 1810 to 1890 (Cal BP 140 to 60) and Cal AD 1910 to 1930 (Cal BP 40 to 20) and Cal AD Post 1950





Beta #342684 (T-120, SIHP #-7428 Feature 4, 1.12–1.26 mbs; formerly Feature C)





Beta #342685 (T-120, SIHP #-7428 Feature 5, 1.10–1.18 mbs; formerly Feature D)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.7:lab. mult=1)

Laboratory number: **Beta-342686**

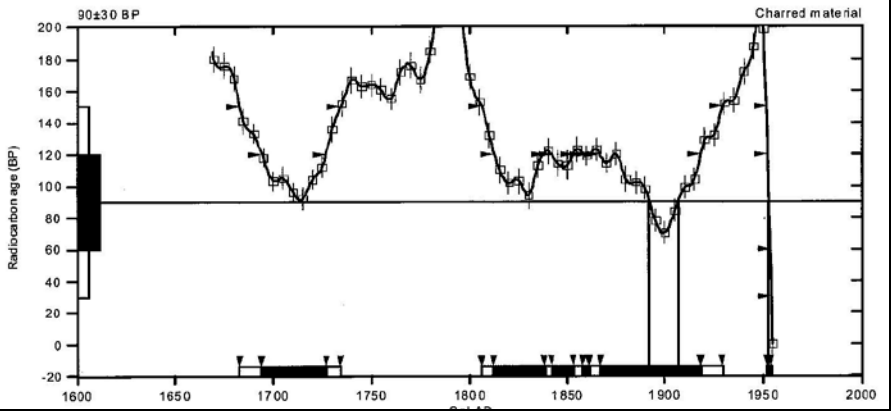
Conventional radiocarbon age: **90±30 BP**

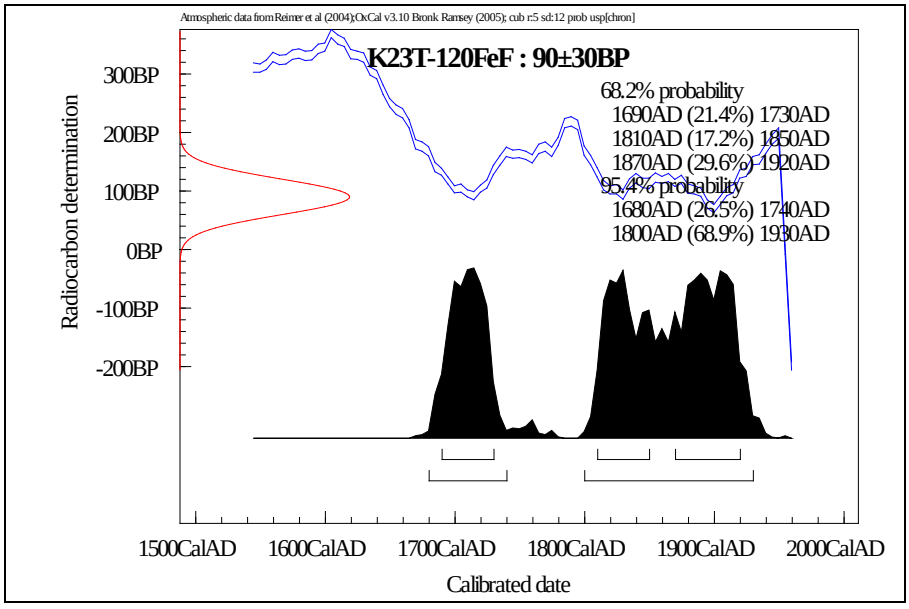
2 Sigma calibrated results: (95% probability) **Cal AD 1680 to 1730 (Cal BP 270 to 220) and Cal AD 1810 to 1930 (Cal BP 140 to 20) and Cal AD Post 1950**

Intercept data

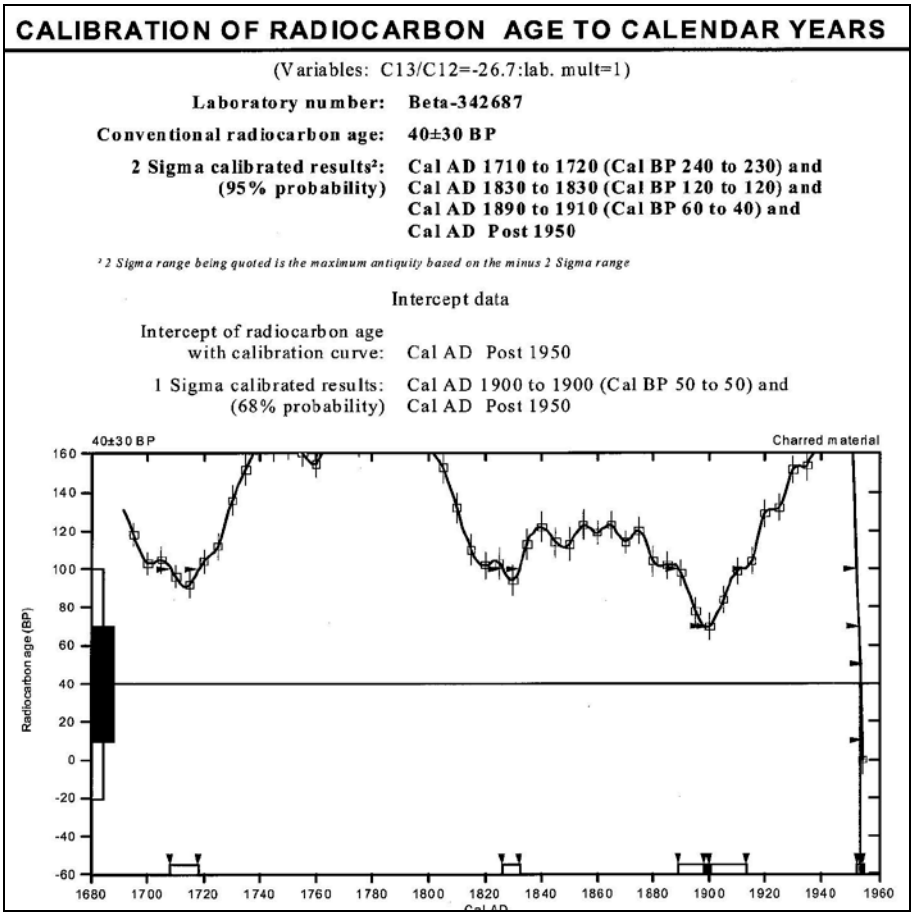
Intercepts of radiocarbon age with calibration curve: Cal AD 1890 (Cal BP 60) and Cal AD 1910 (Cal BP 40) and Cal AD Post 1950

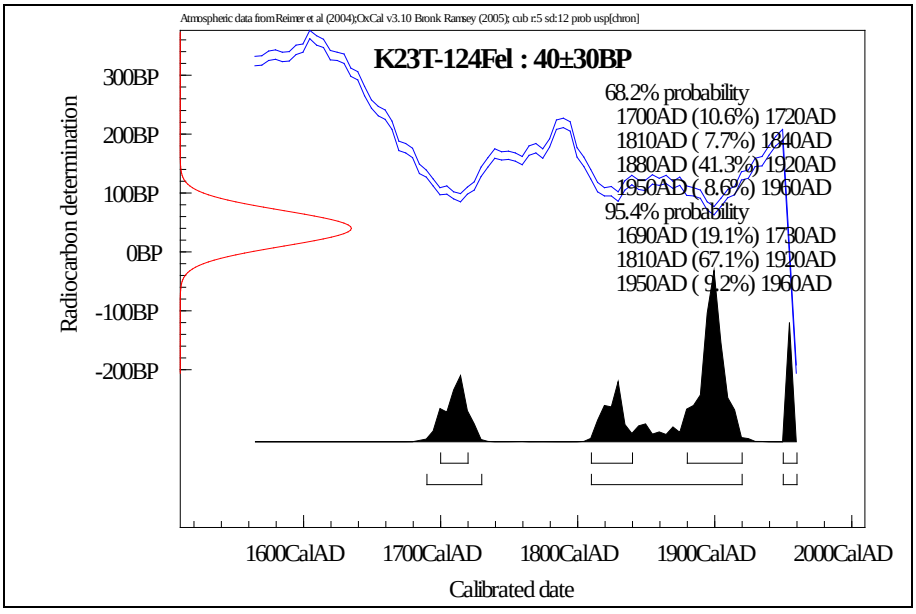
1 Sigma calibrated results: (68% probability) Cal AD 1690 to 1730 (Cal BP 260 to 220) and Cal AD 1810 to 1840 (Cal BP 140 to 110) and Cal AD 1840 to 1850 (Cal BP 110 to 100) and Cal AD 1860 to 1860 (Cal BP 90 to 90) and Cal AD 1870 to 1920 (Cal BP 80 to 30) and Cal AD Post 1950





Beta #342686 (T-120, SIHP #-7428 Feature 7, 1.04–1.07 mbs; formerly Feature F)





Beta #342687 (T-124, SIHP #-2963 Feature 1, 1.16–1.36 mbs)

(Variables: C13/C12=-25.4:lab. mult=1)

Laboratory number: **Beta-342688**

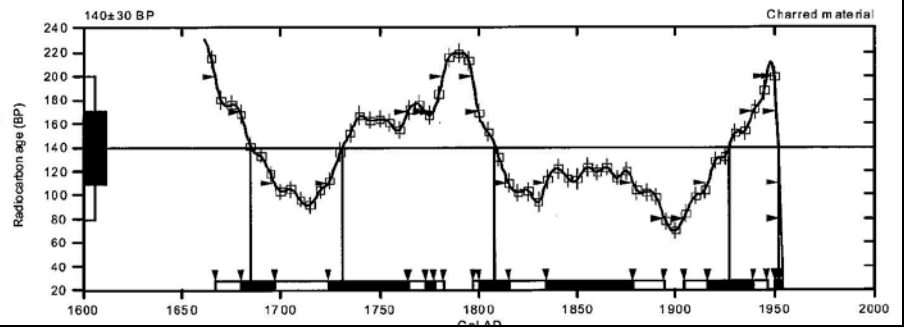
Conventional radiocarbon age: **140±30 BP**

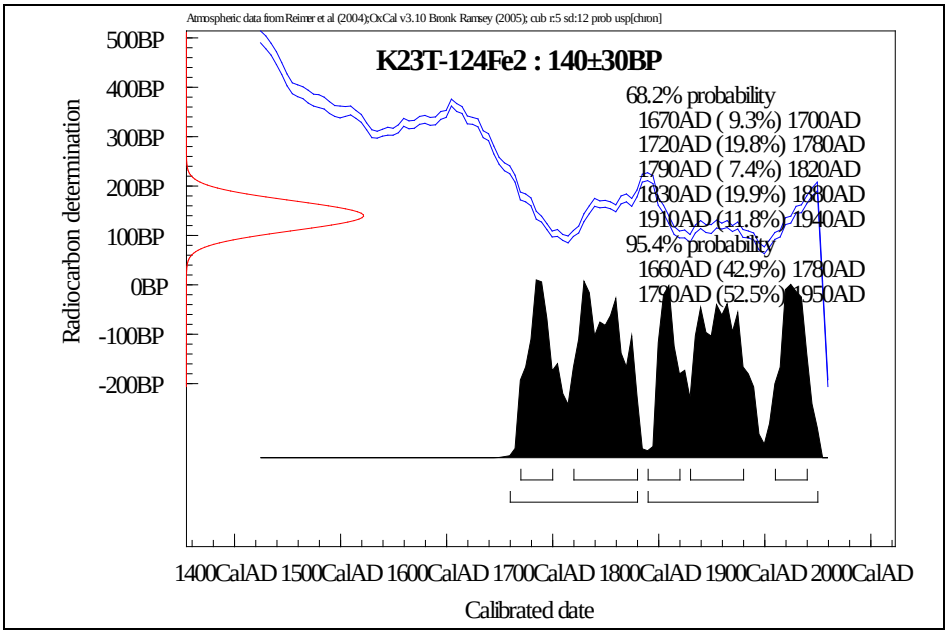
2 Sigma calibrated results: **Cal AD 1670 to 1780 (Cal BP 280 to 170) and**
(95% probability) **Cal AD 1800 to 1890 (Cal BP 150 to 60) and**
Cal AD 1900 to 1950 (Cal BP 50 to 0) and
Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1680 (Cal BP 260) and
Cal AD 1730 (Cal BP 220) and
Cal AD 1810 (Cal BP 140) and
Cal AD 1930 (Cal BP 20) and
Cal AD Post 1950

1 Sigma calibrated results: (68% probability) Cal AD 1680 to 1700 (Cal BP 270 to 250) and
Cal AD 1720 to 1760 (Cal BP 230 to 190) and
Cal AD 1770 to 1780 (Cal BP 180 to 170) and
Cal AD 1800 to 1820 (Cal BP 150 to 140) and
Cal AD 1830 to 1880 (Cal BP 120 to 70) and
Cal AD 1920 to 1940 (Cal BP 30 to 10) and
Cal AD Post 1950





Beta #342688 (T-124, SIHP #-2963 Feature 2, 1.16–1.25 mbs)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.9:lab. mult=1)

Laboratory number: **Beta-342689**

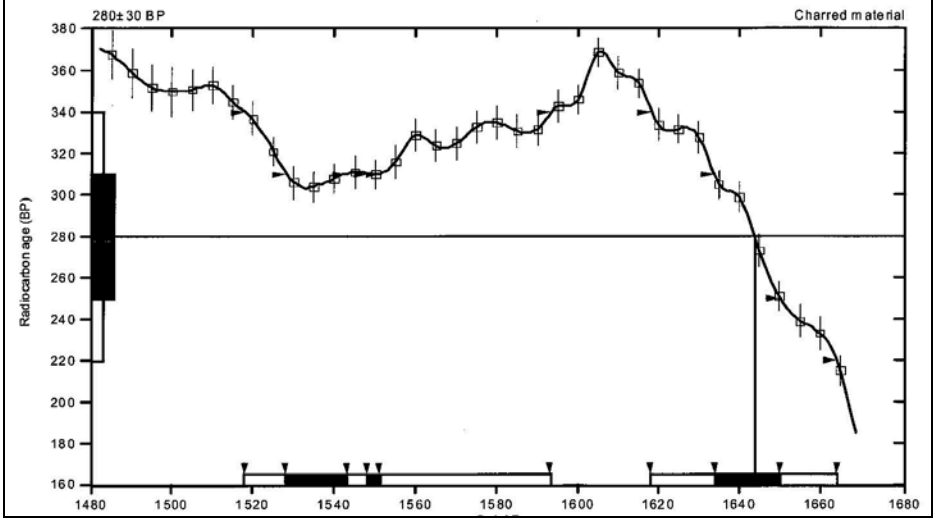
Conventional radiocarbon age: **280±30 BP**

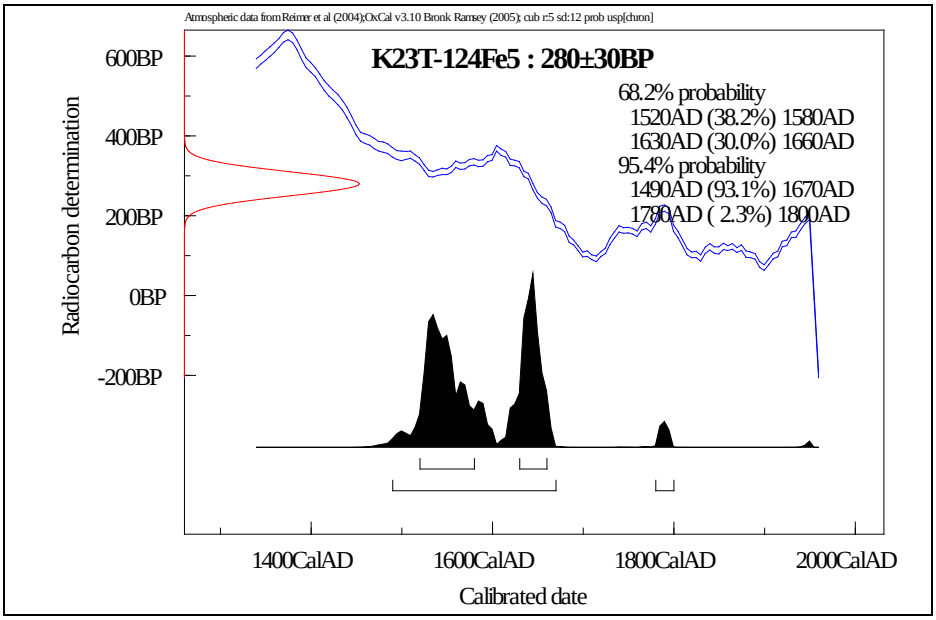
2 Sigma calibrated results: **Cal AD 1520 to 1590 (Cal BP 430 to 360) and**
(95% probability) **Cal AD 1620 to 1660 (Cal BP 330 to 290)**

Intercept data

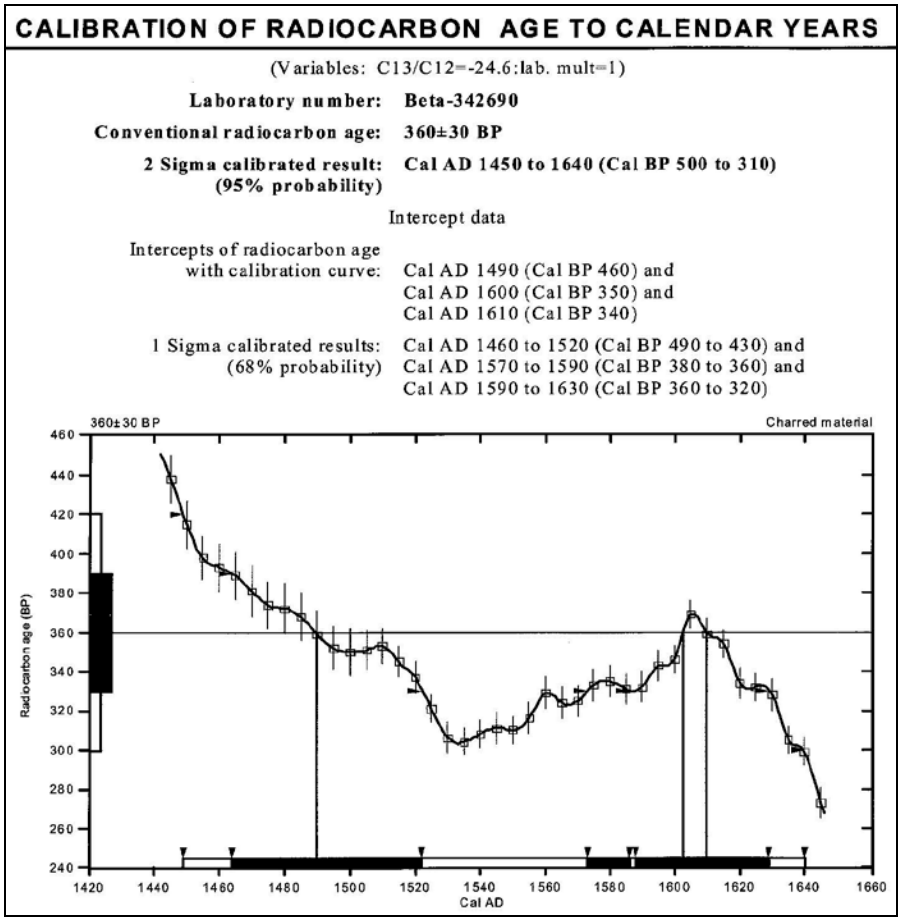
Intercept of radiocarbon age with calibration curve: Cal AD 1640 (Cal BP 310)

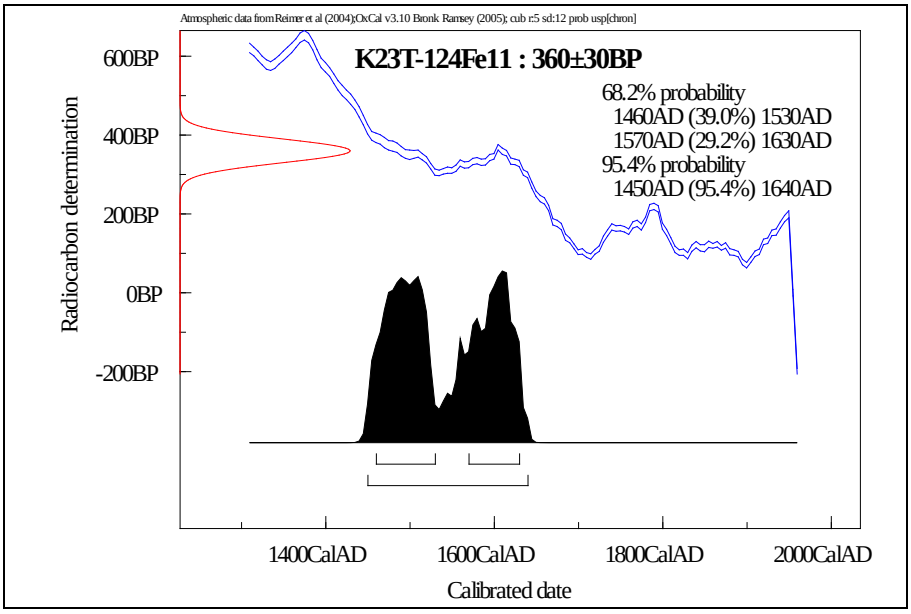
1 Sigma calibrated results: Cal AD 1530 to 1540 (Cal BP 420 to 410) and
(68% probability) Cal AD 1550 to 1550 (Cal BP 400 to 400) and
Cal AD 1630 to 1650 (Cal BP 320 to 300)





Beta #342689 (T-124, SIHP #-2963 Feature 5, 1.40–1.63 mbs)





Beta #342690 (T-124, SIHP #-2963 Feature 11, 1.23–1.32 mbs)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.8:lab. mult=1)

Laboratory number: **Beta-342691**

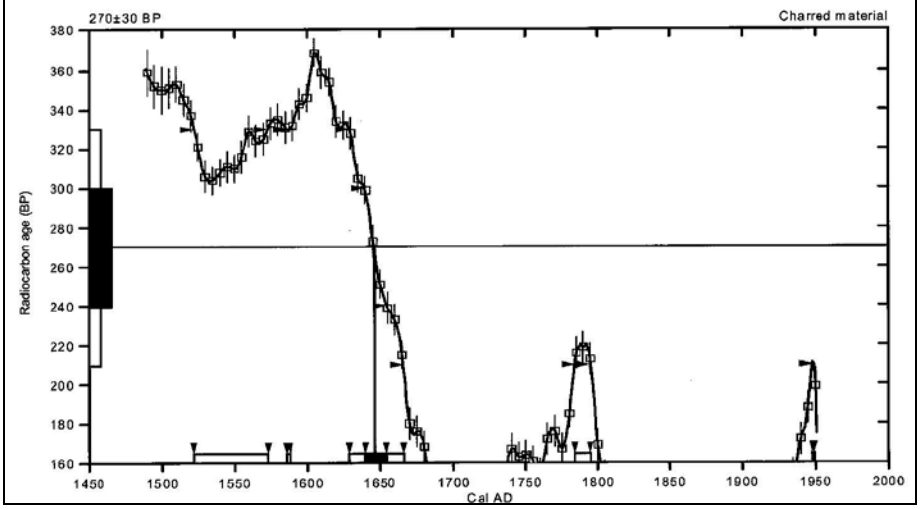
Conventional radiocarbon age: **270±30 BP**

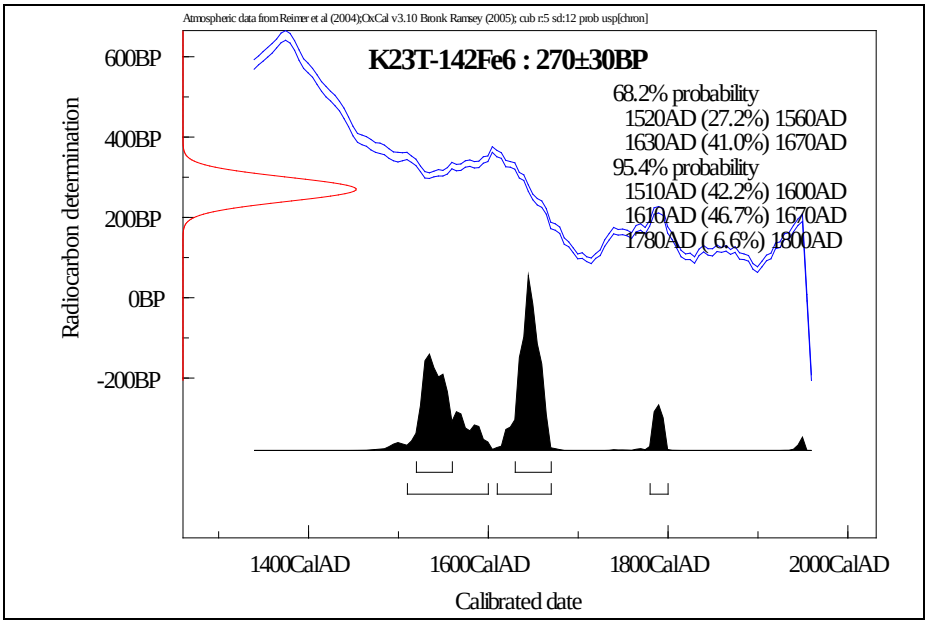
2 Sigma calibrated results: (95% probability) **Cal AD 1520 to 1570 (Cal BP 430 to 380) and Cal AD 1590 to 1590 (Cal BP 360 to 360) and Cal AD 1630 to 1670 (Cal BP 320 to 280) and Cal AD 1780 to 1800 (Cal BP 170 to 160) and Cal AD 1950 to 1950 (Cal BP 0 to 0)**

Intercept data

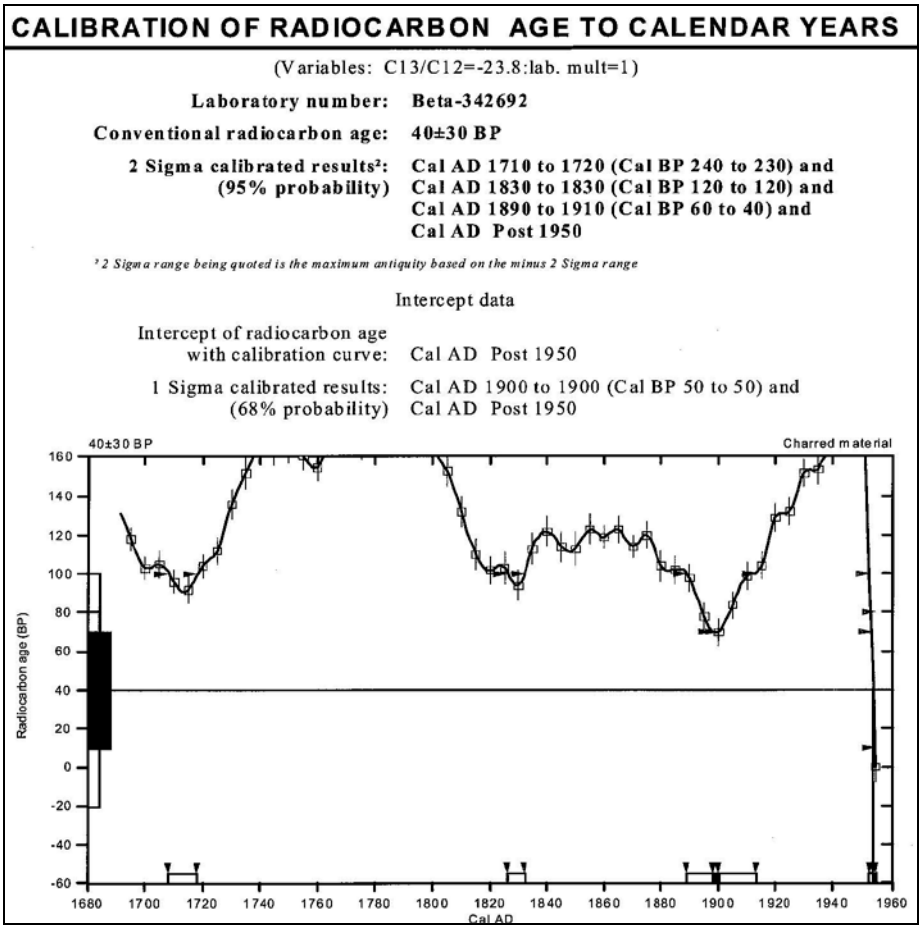
Intercept of radiocarbon age with calibration curve: Cal AD 1650 (Cal BP 300)

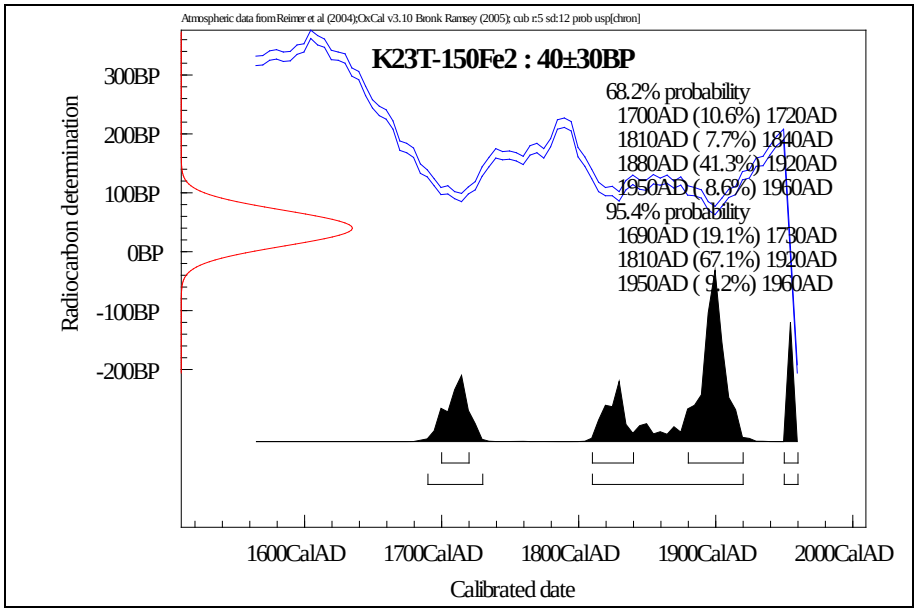
1 Sigma calibrated result: (68% probability) Cal AD 1640 to 1650 (Cal BP 310 to 300)



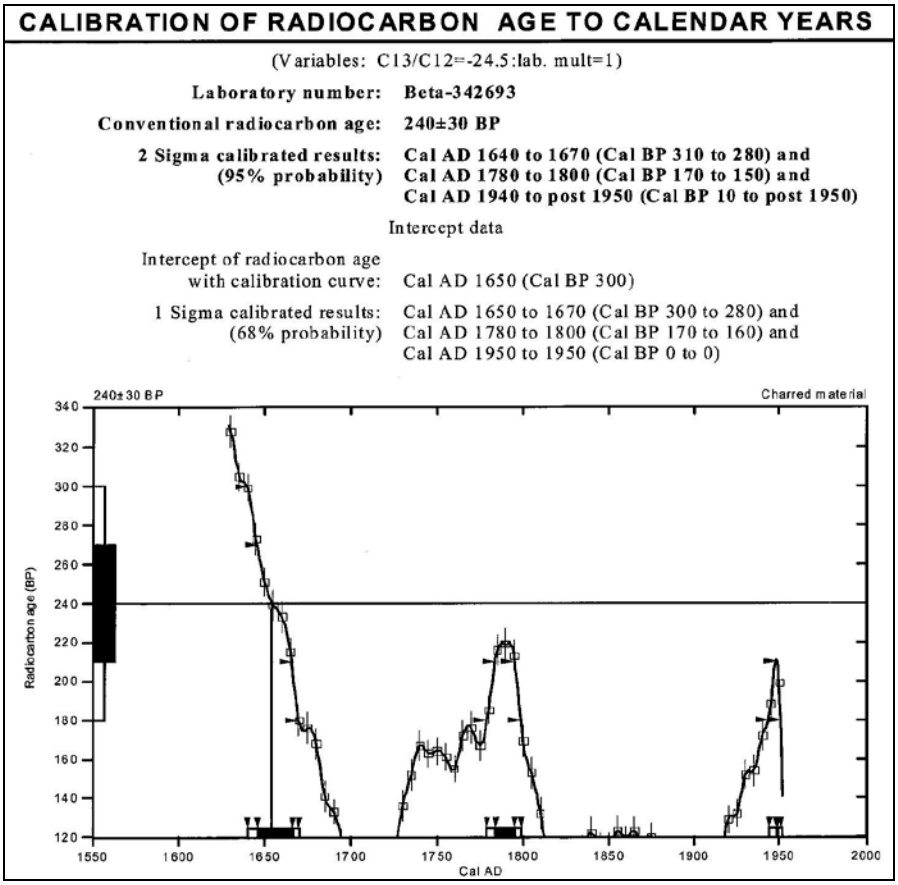


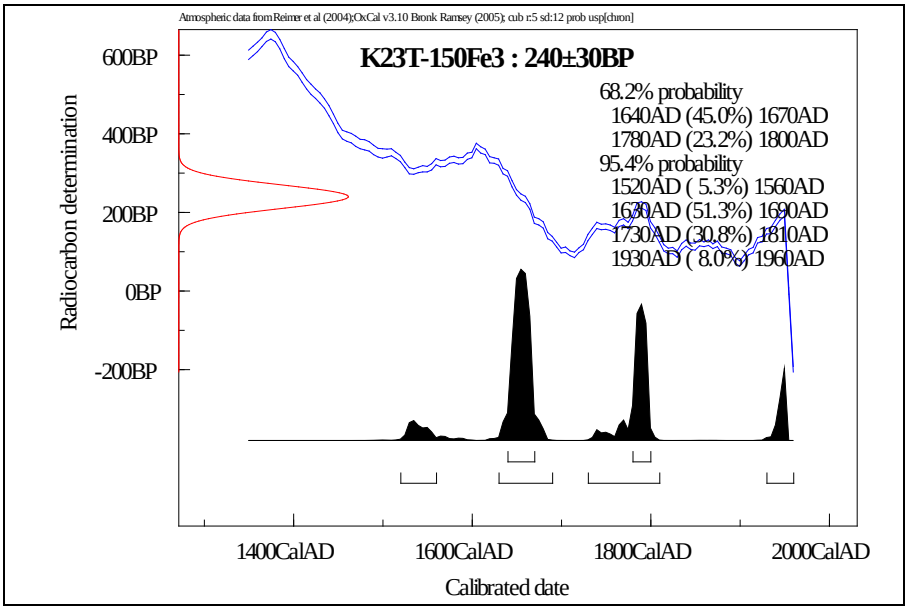
Beta #342691 (T-142, SIHP #-5820 Feature 8, 0.55–0.70 mbs; formerly Feature 6)





Beta #342692 (T-150, SIHP #-5820 Feature 19, 0.70–0.95 mbs; formerly Feature 2)





Beta #342693 (T-150, SIHP #-5820 Feature 20, 0.90–1.30 mbs; formerly Feature 3)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.5:lab. mult=1)

Laboratory number: **Beta-342694**

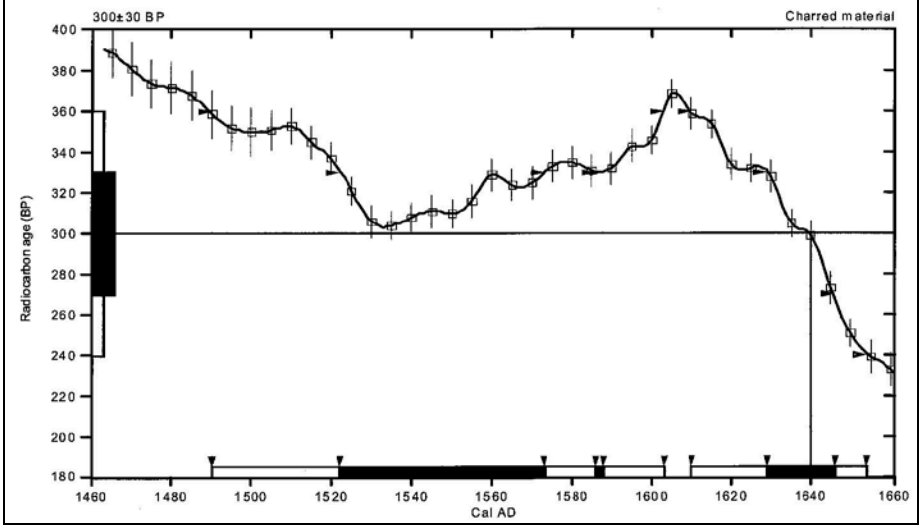
Conventional radiocarbon age: **300±30 BP**

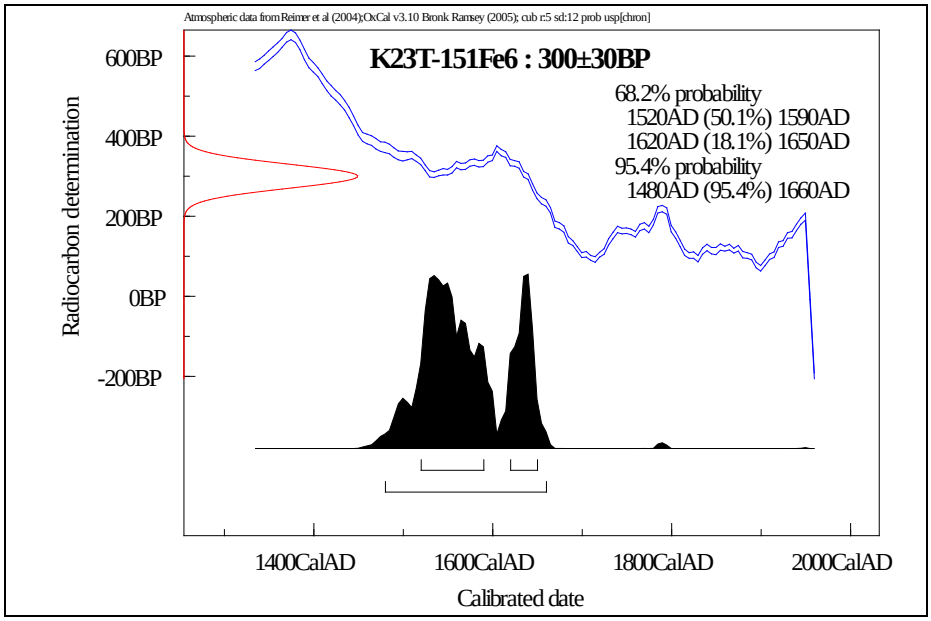
2 Sigma calibrated results: **Cal AD 1490 to 1600 (Cal BP 460 to 350) and**
(95% probability) **Cal AD 1610 to 1650 (Cal BP 340 to 300)**

Intercept data

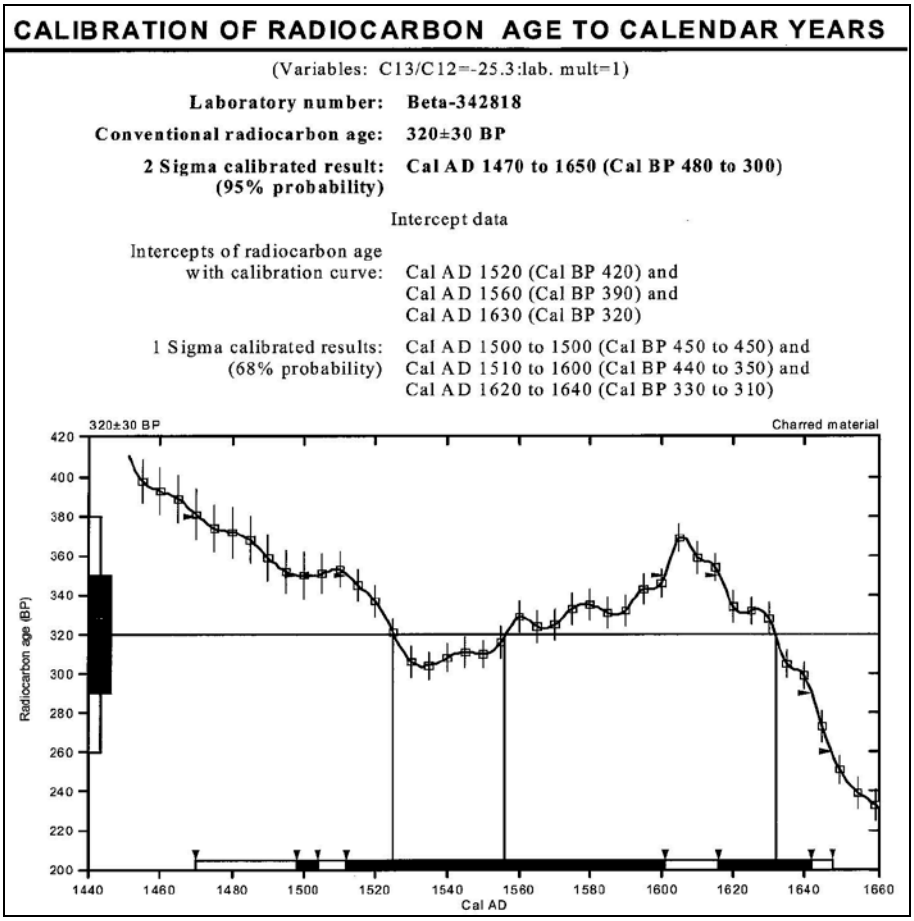
Intercept of radiocarbon age with calibration curve: Cal AD 1640 (Cal BP 310)

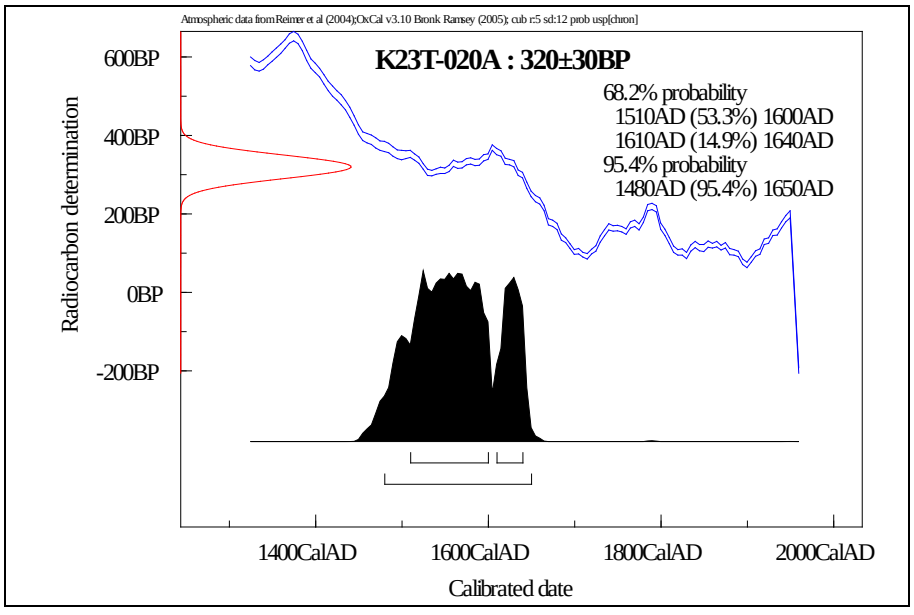
1 Sigma calibrated results: Cal AD 1520 to 1570 (Cal BP 430 to 380) and
(68% probability) Cal AD 1590 to 1590 (Cal BP 360 to 360) and
Cal AD 1630 to 1650 (Cal BP 320 to 300)





Beta #342694 (T-151, SIHP #-5820 Feature 25, 0.90–1.07 mbs; formerly Feature 6)





Beta #342818 (T-020A, Stratum II, 2.30–2.34 mbs)

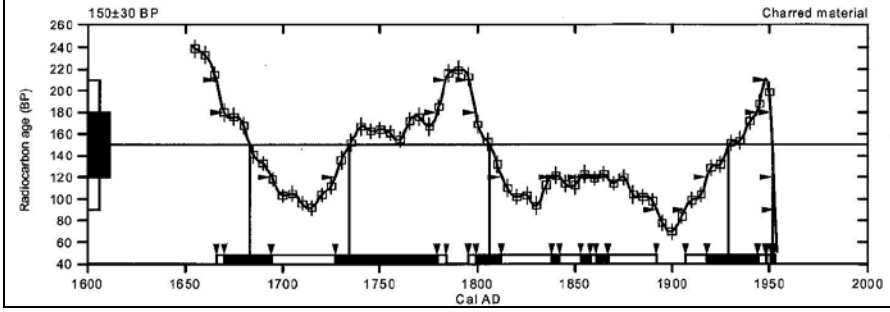
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

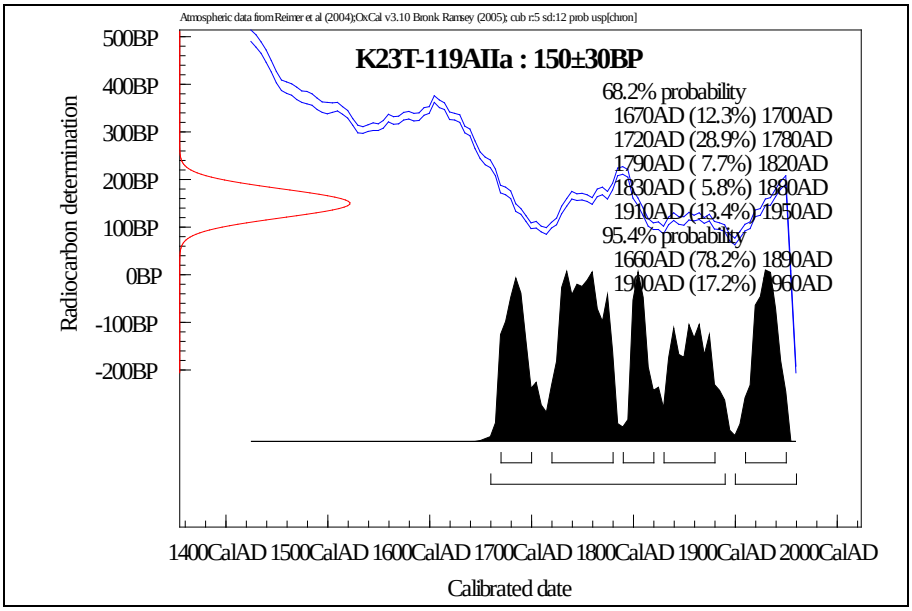
(Variables: C13/C12=-22.8:lab. mult=1)

Laboratory number:	**Beta-342819**
Conventional radiocarbon age:	**150±30 BP**
2 Sigma calibrated results: (95% probability)	**Cal AD 1670 to 1780 (Cal BP 280 to 170) and Cal AD 1800 to 1890 (Cal BP 160 to 60) and Cal AD 1910 to 1950 (Cal BP 40 to 0) and Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 1680 (Cal BP 270) and Cal AD 1730 (Cal BP 220) and Cal AD 1810 (Cal BP 140) and Cal AD 1930 (Cal BP 20) and Cal AD Post 1950
1 Sigma calibrated results: (68% probability)	Cal AD 1670 to 1690 (Cal BP 280 to 260) and Cal AD 1730 to 1780 (Cal BP 220 to 170) and Cal AD 1800 to 1810 (Cal BP 150 to 140) and Cal AD 1840 to 1840 (Cal BP 110 to 110) and Cal AD 1850 to 1860 (Cal BP 100 to 90) and Cal AD 1860 to 1870 (Cal BP 90 to 80) and Cal AD 1920 to 1940 (Cal BP 30 to 10) and Cal AD Post 1950





Beta #342819 (T-119A, SIHP #-7428 Feature 1a, 0.80–0.93 mbs; formerly Stratum IIa)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-342820**

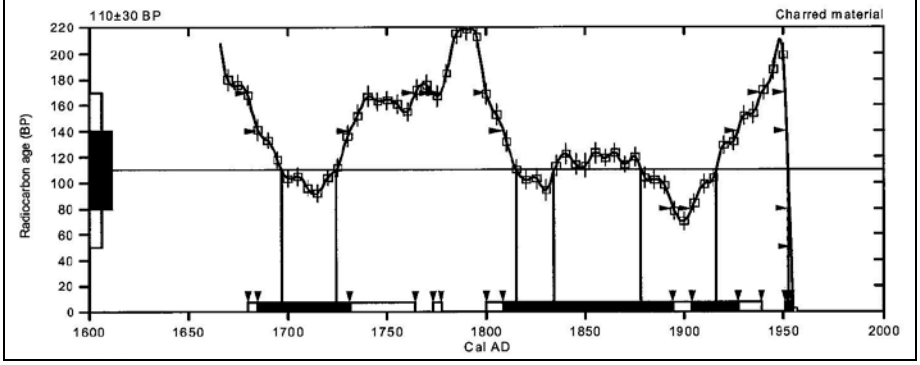
Conventional radiocarbon age: **110±30 BP**

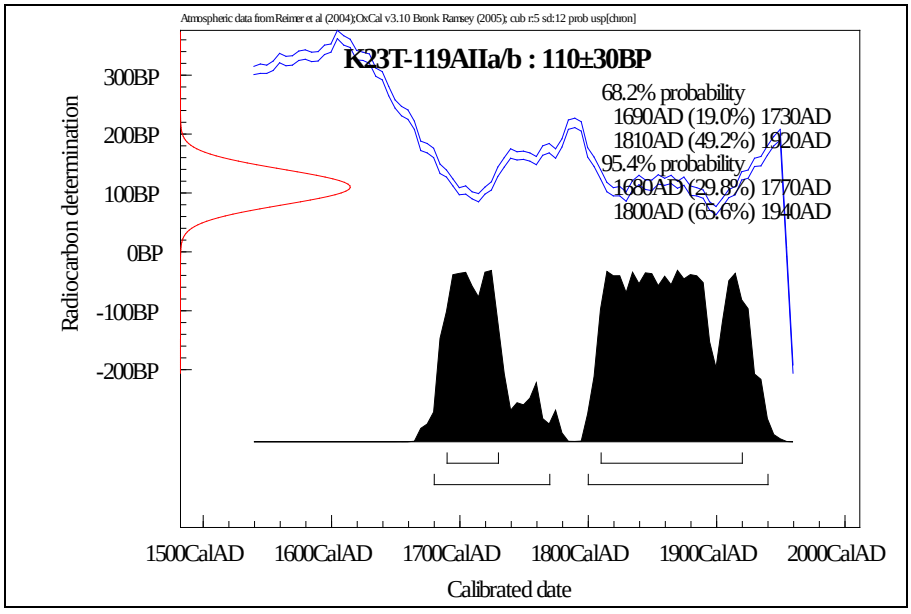
2 Sigma calibrated results: (95% probability)
Cal AD 1680 to 1760 (Cal BP 270 to 190) and
Cal AD 1770 to 1780 (Cal BP 180 to 170) and
Cal AD 1800 to 1940 (Cal BP 150 to 10) and
Cal AD Post 1950

Intercept data

Intercepts of radiocarbon age with calibration curve:
Cal AD 1700 (Cal BP 250) and
Cal AD 1720 (Cal BP 230) and
Cal AD 1820 (Cal BP 140) and
Cal AD 1830 (Cal BP 120) and
Cal AD 1880 (Cal BP 70) and
Cal AD 1920 (Cal BP 30) and
Cal AD Post 1950

1 Sigma calibrated results: (68% probability)
Cal AD 1680 to 1730 (Cal BP 260 to 220) and
Cal AD 1810 to 1890 (Cal BP 140 to 60) and
Cal AD 1900 to 1930 (Cal BP 50 to 20) and
Cal AD Post 1950



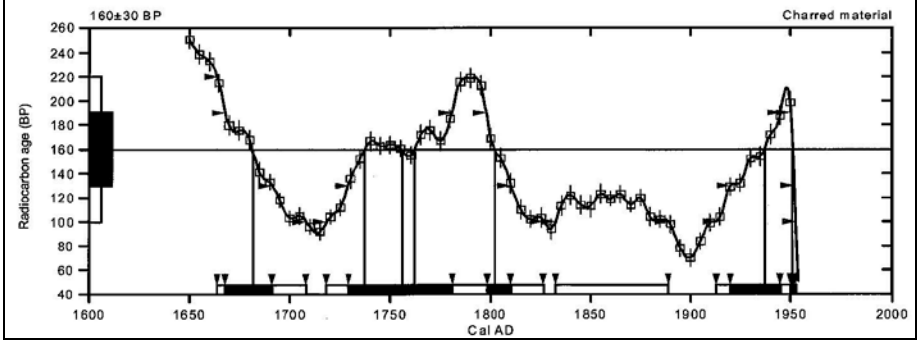


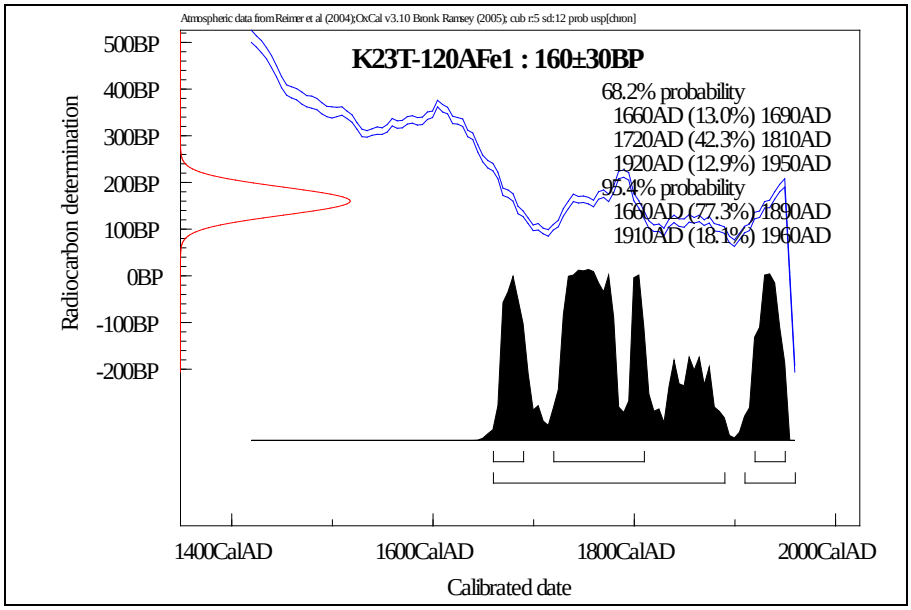
Beta #342820 (T-119A, SIHP #-7428 Feature 1a, 1.25–1.50 mbs; formerly Strata IIa/IIb)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.4:lab. mult=1)

Laboratory number:	**Beta-342821**
Conventional radiocarbon age:	**160±30 BP**
2 Sigma calibrated results: (95% probability)	**Cal AD 1660 to 1710 (Cal BP 290 to 240) and Cal AD 1720 to 1830 (Cal BP 230 to 120) and Cal AD 1830 to 1890 (Cal BP 120 to 60) and Cal AD 1910 to post 1950 (Cal BP 40 to post 1950)**
	Intercept data
Intercepts of radiocarbon age with calibration curve:	Cal AD 1680 (Cal BP 270) and Cal AD 1740 (Cal BP 210) and Cal AD 1760 (Cal BP 190) and Cal AD 1760 (Cal BP 190) and Cal AD 1800 (Cal BP 150) and Cal AD 1940 (Cal BP 10) and Cal AD Post 1950
1 Sigma calibrated results: (68% probability)	Cal AD 1670 to 1690 (Cal BP 280 to 260) and Cal AD 1730 to 1780 (Cal BP 220 to 170) and Cal AD 1800 to 1810 (Cal BP 150 to 140) and Cal AD 1920 to 1940 (Cal BP 30 to 0) and Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)





Beta #342821 (T-120A, SIHP #-7428 Feature 9, 1.28–1.36 mbs; formerly Feature 1)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.5:lab. mult=1)

Laboratory number: **Beta-342822**

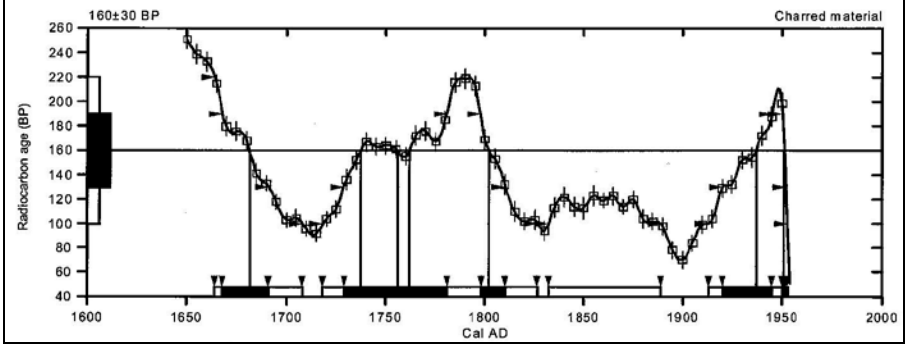
Conventional radiocarbon age: **160±30 BP**

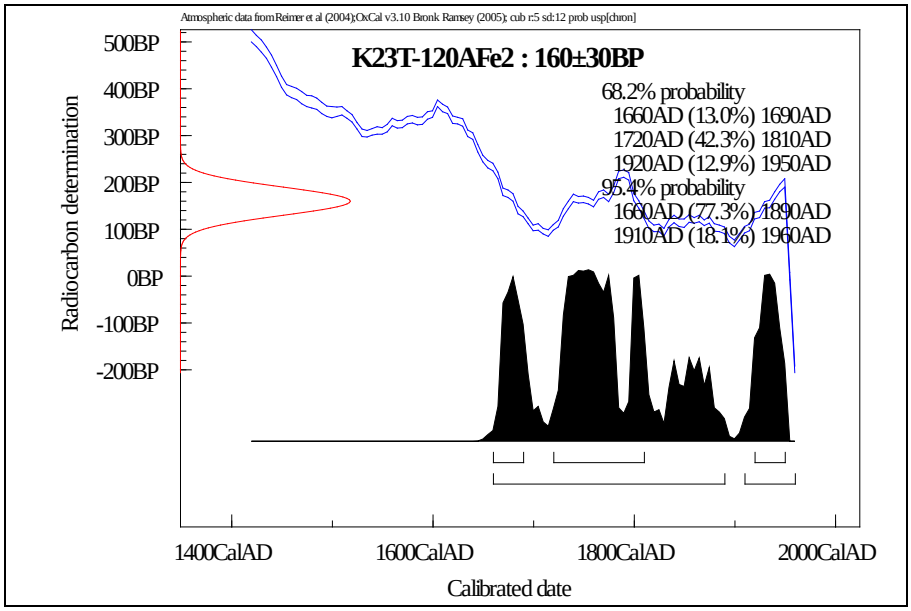
2 Sigma calibrated results: **Cal AD 1660 to 1710 (Cal BP 290 to 240) and**
(95% probability) **Cal AD 1720 to 1830 (Cal BP 230 to 120) and**
Cal AD 1830 to 1890 (Cal BP 120 to 60) and
Cal AD 1910 to post 1950 (Cal BP 40 to post 1950)

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1680 (Cal BP 270) and
Cal AD 1740 (Cal BP 210) and
Cal AD 1760 (Cal BP 190) and
Cal AD 1760 (Cal BP 190) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1940 (Cal BP 10) and
Cal AD Post 1950

1 Sigma calibrated results: (68% probability) Cal AD 1670 to 1690 (Cal BP 280 to 260) and
Cal AD 1730 to 1780 (Cal BP 220 to 170) and
Cal AD 1800 to 1810 (Cal BP 150 to 140) and
Cal AD 1920 to 1940 (Cal BP 30 to 0) and
Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)





Beta #342822 (T-120A, SIHP #-7428 Feature 10, 1.25–1.37 mbs; formerly Feature 2)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-10.8:lab. mult=1)

Laboratory number: **Beta-342823**

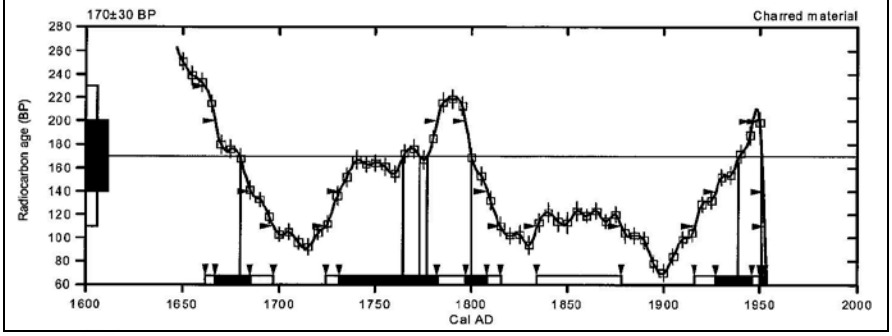
Conventional radiocarbon age: **170±30 BP**

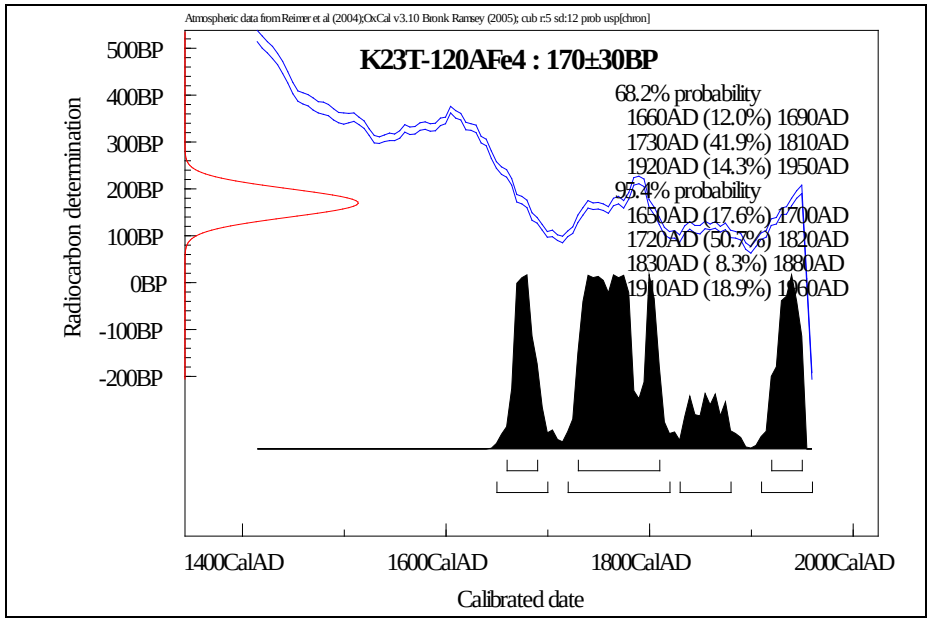
2 Sigma calibrated results: **Cal AD 1660 to 1700 (Cal BP 290 to 250) and**
(95% probability) **Cal AD 1720 to 1820 (Cal BP 230 to 140) and**
Cal AD 1830 to 1880 (Cal BP 120 to 70) and
Cal AD 1920 to post 1950 (Cal BP 30 to post 1950)

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1680 (Cal BP 270) and
Cal AD 1760 (Cal BP 190) and
Cal AD 1770 (Cal BP 180) and
Cal AD 1780 (Cal BP 170) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1940 (Cal BP 10) and
Cal AD Post 1950

1 Sigma calibrated results: (68% probability) Cal AD 1670 to 1680 (Cal BP 280 to 260) and
Cal AD 1730 to 1780 (Cal BP 220 to 170) and
Cal AD 1800 to 1810 (Cal BP 150 to 140) and
Cal AD 1930 to 1950 (Cal BP 20 to 0) and
Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)





Beta #342823 (T-120A, SIHP #-7428 Feature 12, 1.28–1.32 mbs; formerly Feature 4)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.3:lab. mult=1)

Laboratory number: **Beta-342824**

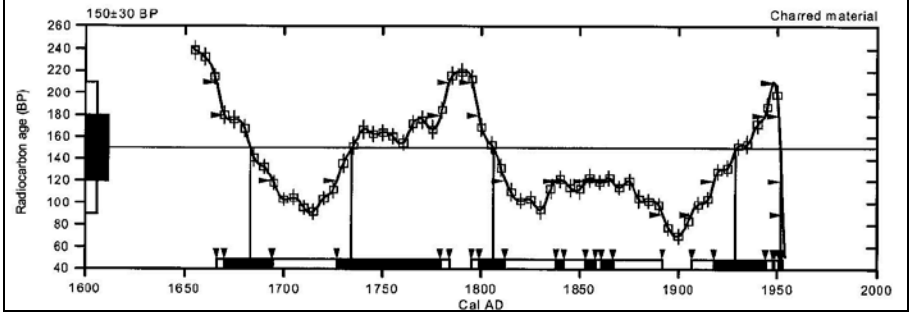
Conventional radiocarbon age: **150±30 BP**

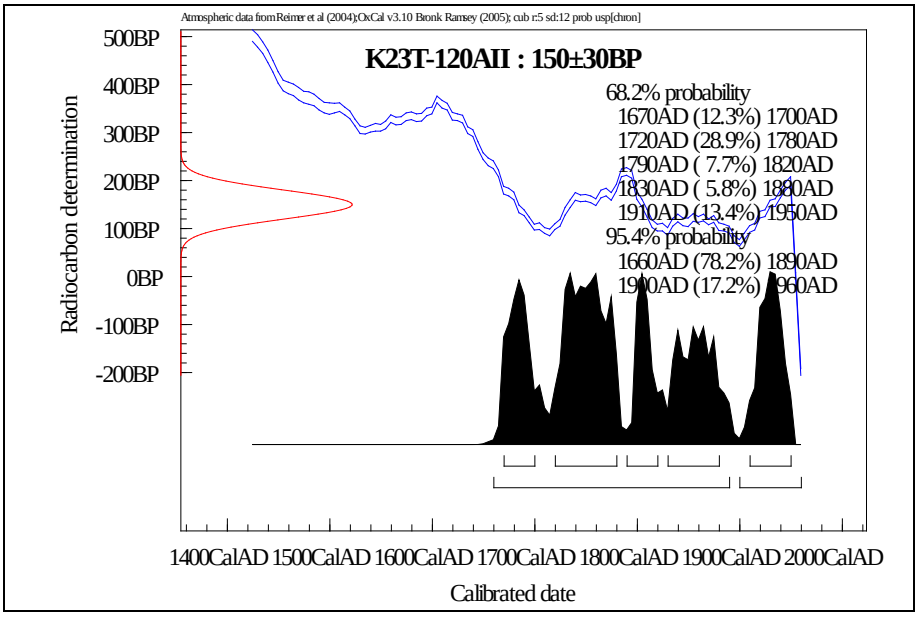
2 Sigma calibrated results: (95% probability)
Cal AD 1670 to 1780 (Cal BP 280 to 170) and
Cal AD 1800 to 1890 (Cal BP 160 to 60) and
Cal AD 1910 to 1950 (Cal BP 40 to 0) and
Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)

Intercept data

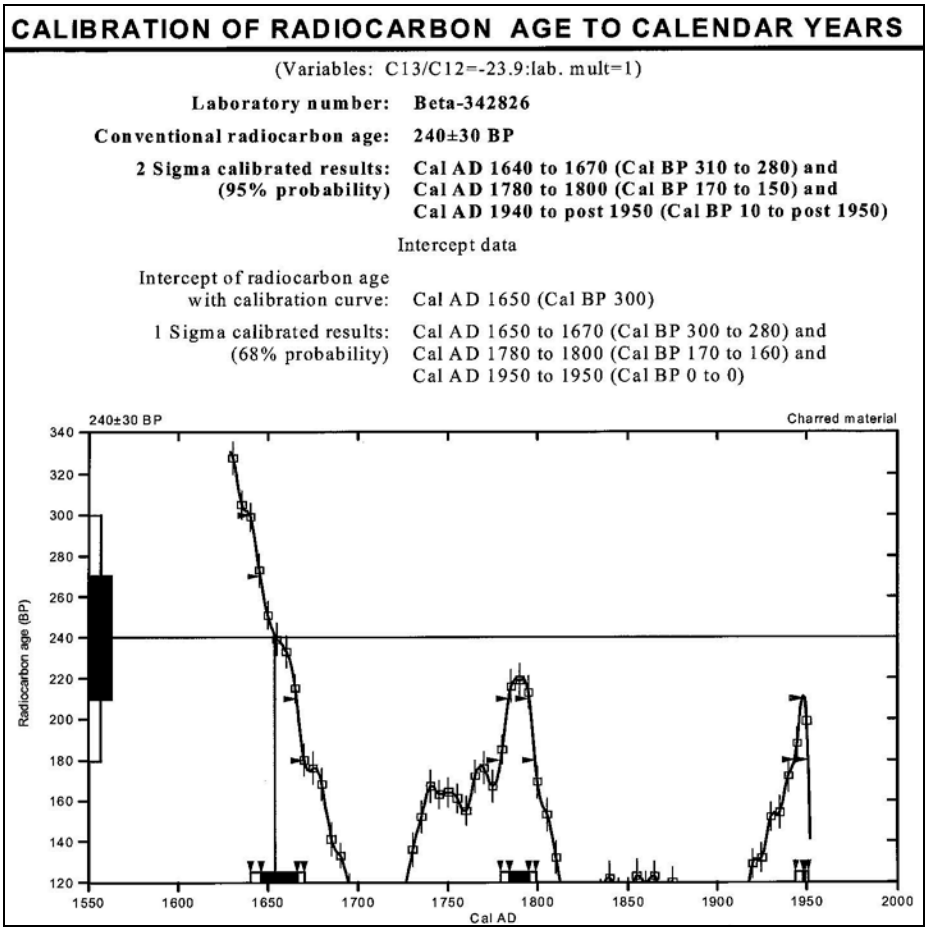
Intercepts of radiocarbon age with calibration curve:
Cal AD 1680 (Cal BP 270) and
Cal AD 1730 (Cal BP 220) and
Cal AD 1810 (Cal BP 140) and
Cal AD 1930 (Cal BP 20) and
Cal AD Post 1950

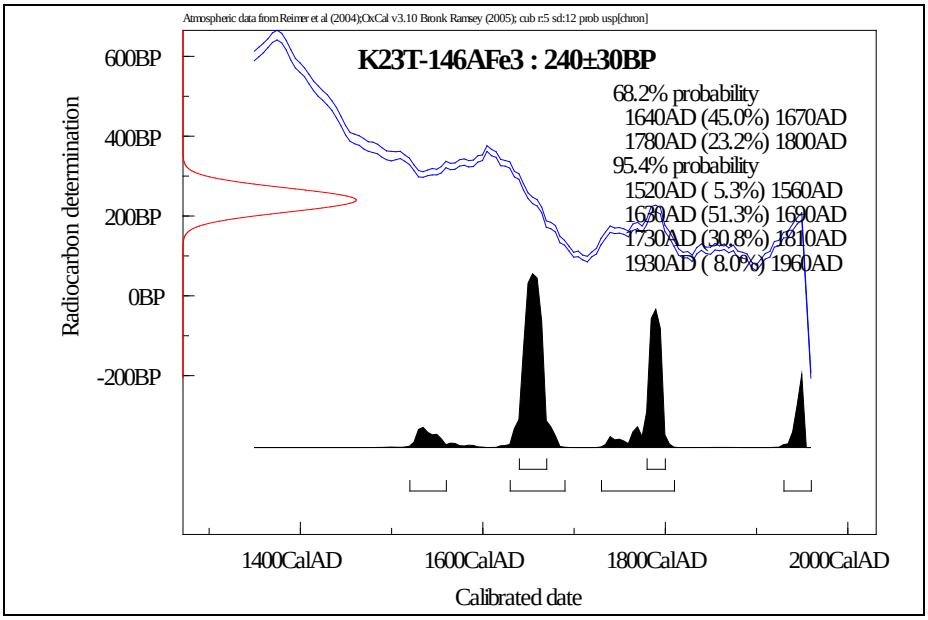
1 Sigma calibrated results: (68% probability)
Cal AD 1670 to 1690 (Cal BP 280 to 260) and
Cal AD 1730 to 1780 (Cal BP 220 to 170) and
Cal AD 1800 to 1810 (Cal BP 150 to 140) and
Cal AD 1840 to 1840 (Cal BP 110 to 110) and
Cal AD 1850 to 1860 (Cal BP 100 to 90) and
Cal AD 1860 to 1870 (Cal BP 90 to 80) and
Cal AD 1920 to 1940 (Cal BP 30 to 10) and
Cal AD Post 1950





Beta #342824 (T-120A, Str. II, SIHP #-7428, 1.10-1.18 mbs)





Beta # 42826 (T-146A, SIHP #-5820 Feature 13, 0.83–0.94 mbs; formerly Feature 3)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.4:lab. mult=1)

Laboratory number: **Beta-342827**

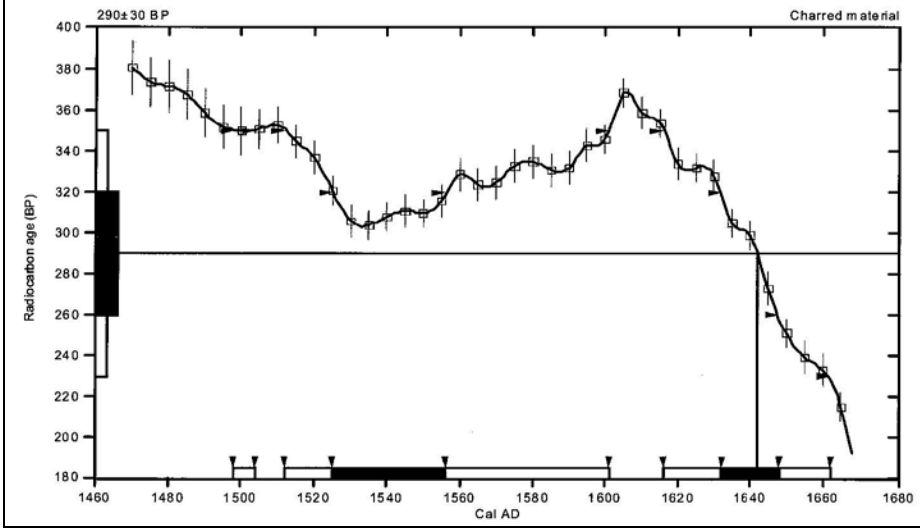
Conventional radiocarbon age: **290±30 BP**

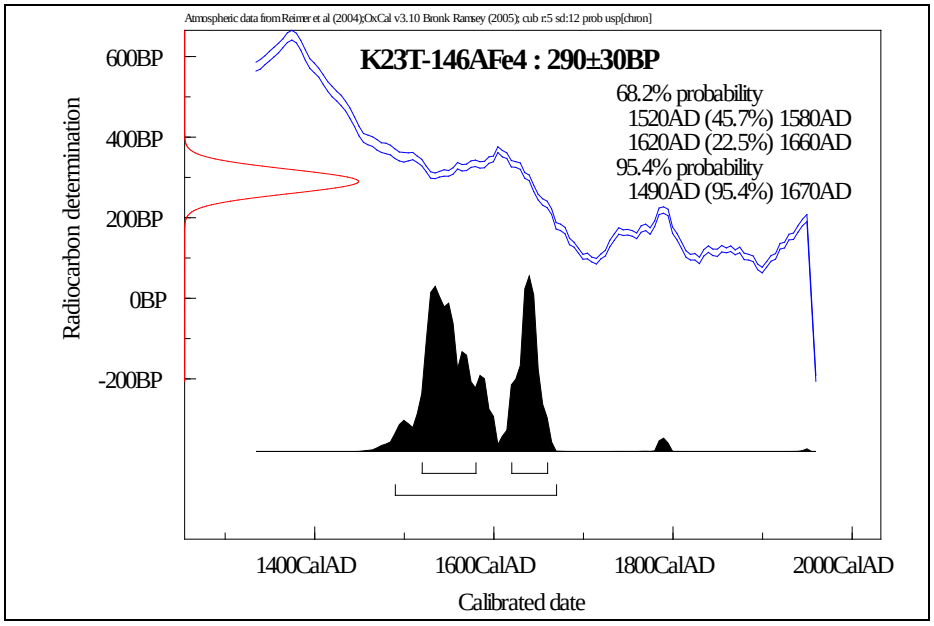
2 Sigma calibrated results: **Cal AD 1500 to 1500 (Cal BP 450 to 450) and**
(95% probability) **Cal AD 1510 to 1600 (Cal BP 440 to 350) and**
Cal AD 1620 to 1660 (Cal BP 330 to 290)

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1640 (Cal BP 310)

1 Sigma calibrated results: Cal AD 1520 to 1560 (Cal BP 420 to 390) and
(68% probability) Cal AD 1630 to 1650 (Cal BP 320 to 300)





Beta #342827 (T-146A, SIHP #-5820 Feature 14, 0.84–0.95 mbs; formerly Feature 4)

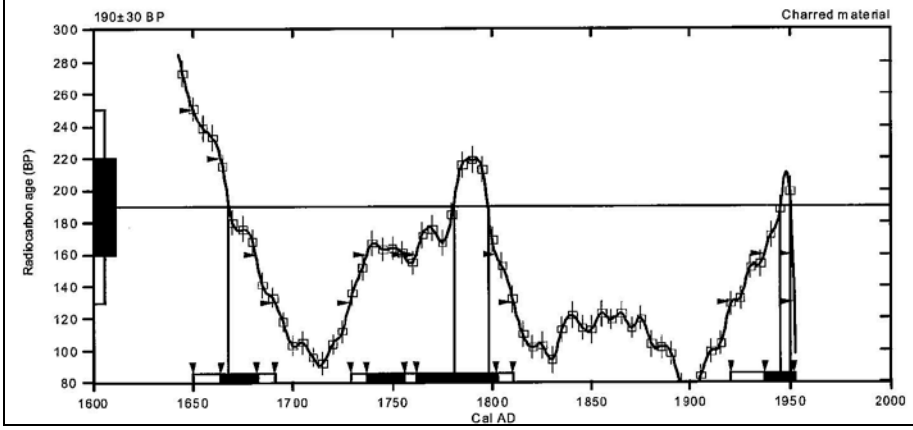
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

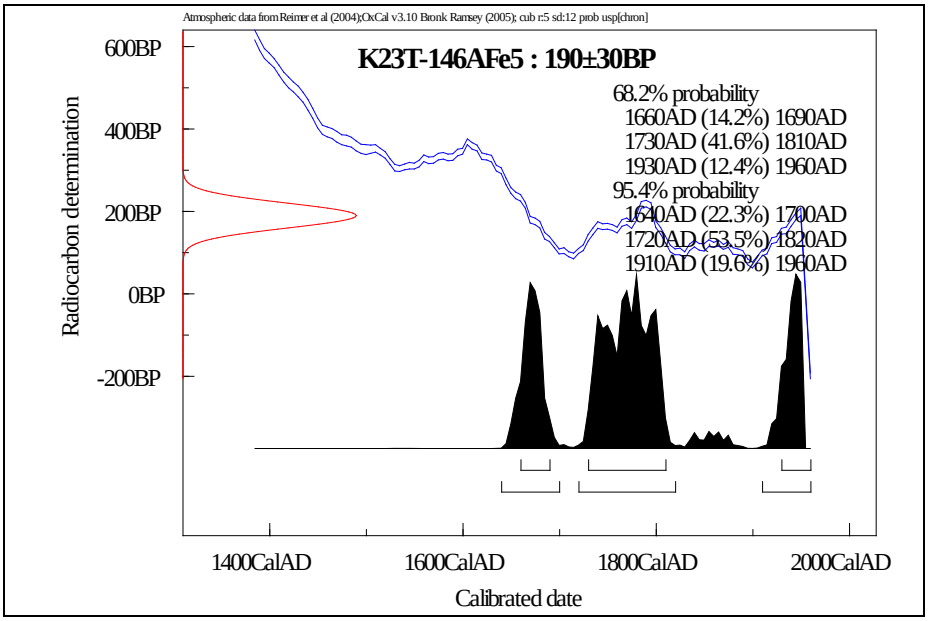
(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number:	**Beta-342828**
Conventional radiocarbon age:	**190±30 BP**
2 Sigma calibrated results: (95% probability)	**Cal AD 1650 to 1690 (Cal BP 300 to 260) and Cal AD 1730 to 1810 (Cal BP 220 to 140) and Cal AD 1920 to post 1950 (Cal BP 30 to post 1950)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 1670 (Cal BP 280) and Cal AD 1780 (Cal BP 170) and Cal AD 1800 (Cal BP 150) and Cal AD 1940 (Cal BP 0) and Cal AD 1950 (Cal BP 0)
1 Sigma calibrated results: (68% probability)	Cal AD 1660 to 1680 (Cal BP 290 to 270) and Cal AD 1740 to 1760 (Cal BP 210 to 190) and Cal AD 1760 to 1800 (Cal BP 190 to 150) and Cal AD 1940 to post 1950 (Cal BP 10 to post 1950)





Beta #342828 (T-146A, SIHP #-5820 Feature 15, 0.84–0.92 mbs; formerly Feature 5)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.6:lab. mult=1)

Laboratory number: **Beta-342829**

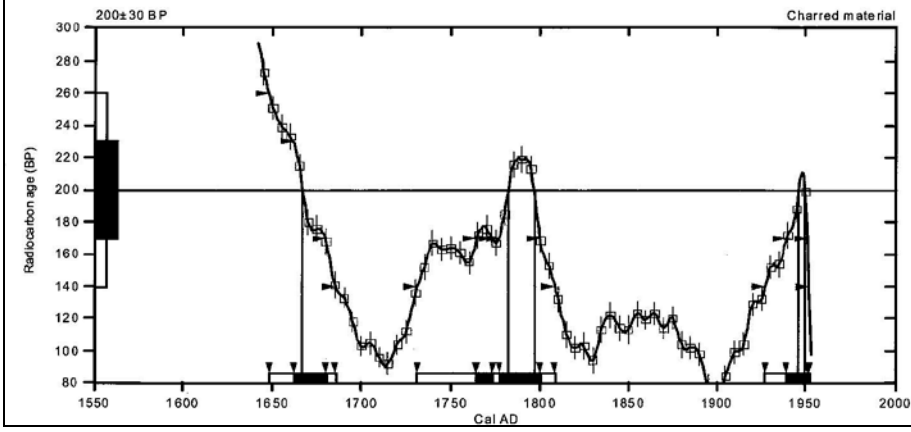
Conventional radiocarbon age: **200±30 BP**

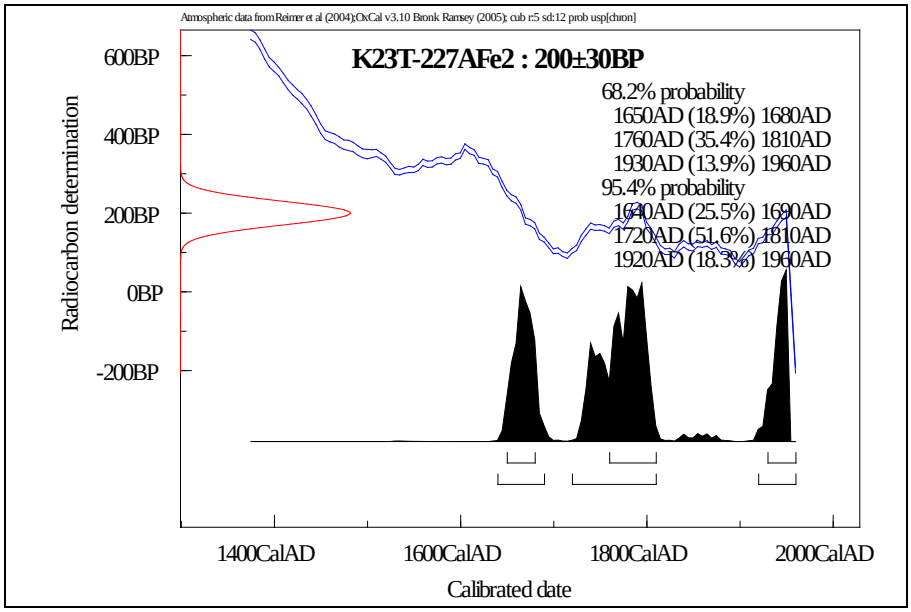
2 Sigma calibrated results: **Cal AD 1650 to 1680 (Cal BP 300 to 260) and**
(95% probability) **Cal AD 1730 to 1810 (Cal BP 220 to 140) and**
Cal AD 1930 to post 1950 (Cal BP 20 to post 1950)

Intercept data

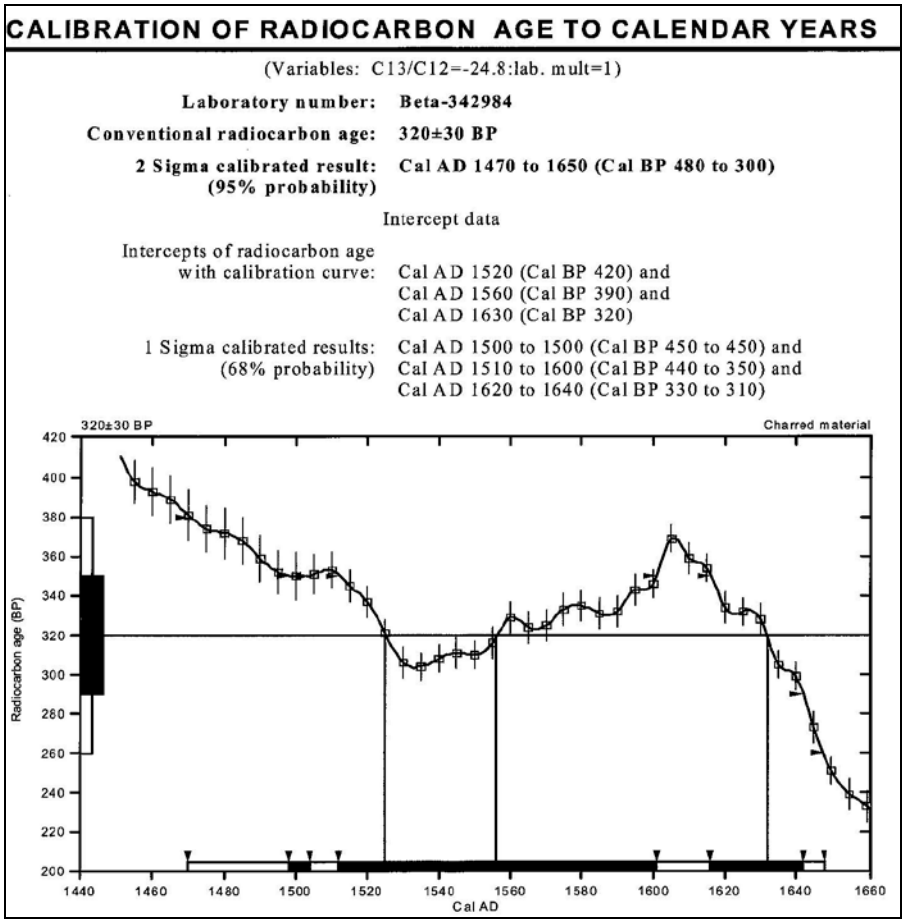
Intercepts of radiocarbon age with calibration curve: Cal AD 1670 (Cal BP 280) and
Cal AD 1780 (Cal BP 170) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1950 (Cal BP 0) and
Cal AD 1950 (Cal BP 0)

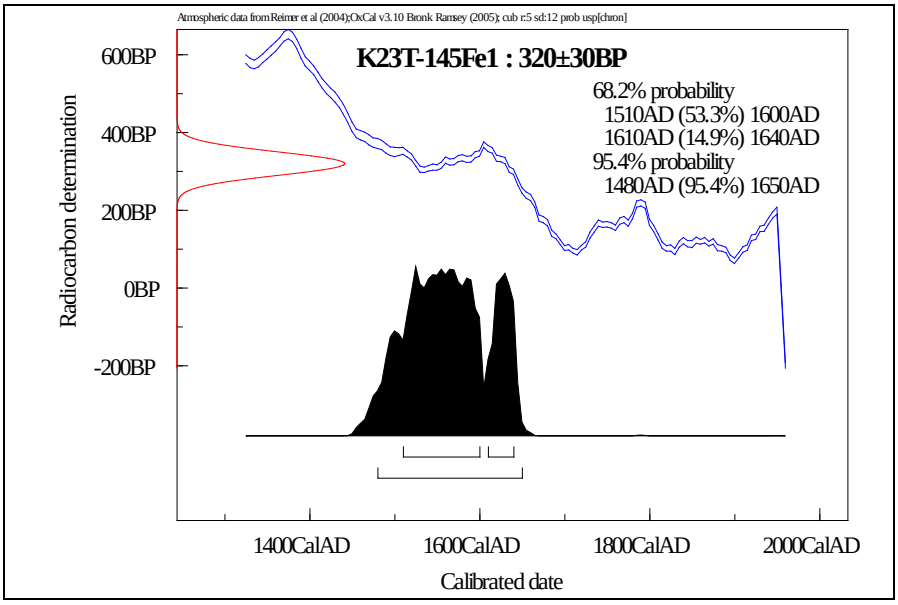
1 Sigma calibrated results: Cal AD 1660 to 1680 (Cal BP 290 to 270) and
(68% probability) Cal AD 1760 to 1770 (Cal BP 190 to 180) and
Cal AD 1780 to 1800 (Cal BP 170 to 150) and
Cal AD 1940 to post 1950 (Cal BP 10 to post 1950)



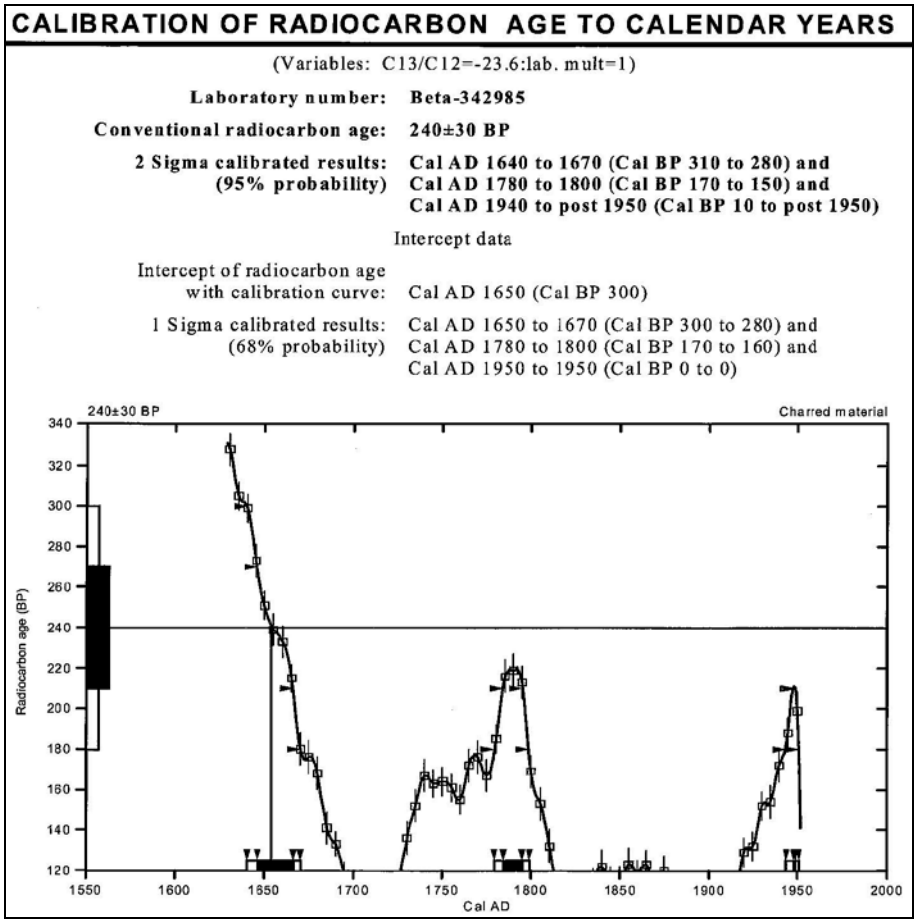


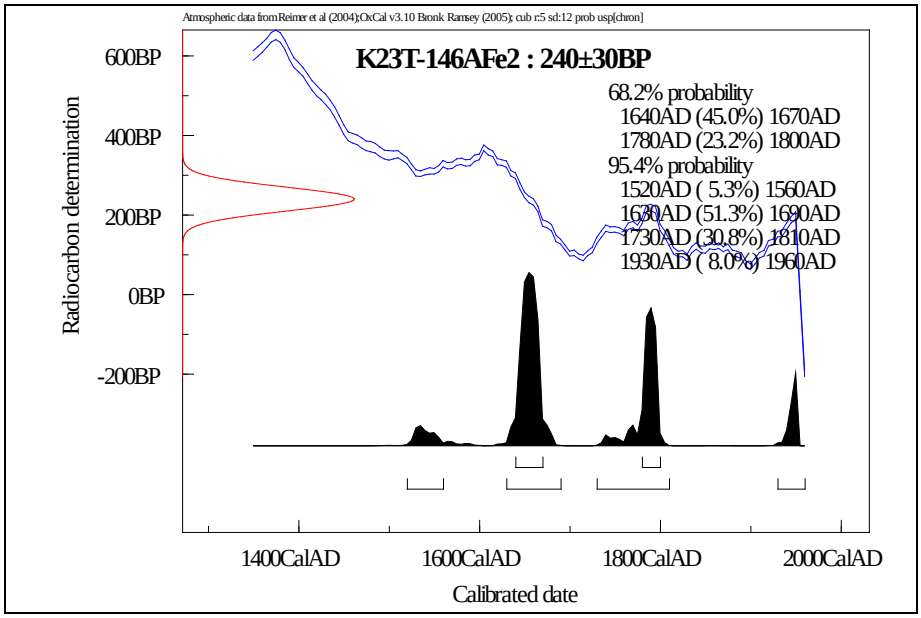
Beta #342829 (T-227A, SIHP #-2918 Feature 23, 1.08–1.31 mbs; formerly Feature 2)





Beta #342984 (T-145, SIHP #-5820 Feature 9, 0.81–0.95 mbs; formerly Feature 1)





Beta #342985 (T-146A, SIHP #-5820 Feature 12, 0.75–0.90 mbs; formerly Feature 2)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.4:lab. mult=1)

Laboratory number: **Beta-343422**

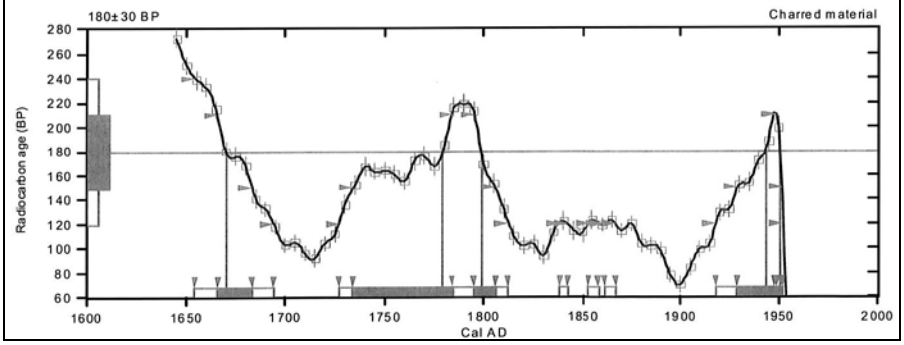
Conventional radiocarbon age: **180±30 BP**

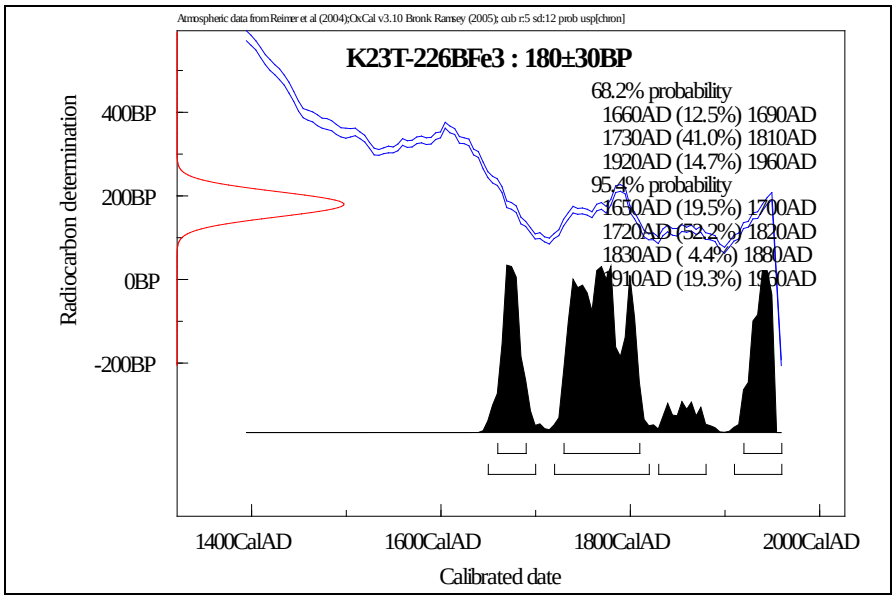
2 Sigma calibrated results: **Cal AD 1650 to 1690 (Cal BP 300 to 260) and**
(95% probability) **Cal AD 1730 to 1810 (Cal BP 220 to 140) and**
Cal AD 1840 to 1840 (Cal BP 110 to 110) and
Cal AD 1850 to 1860 (Cal BP 100 to 90) and
Cal AD 1860 to 1870 (Cal BP 90 to 80) and
Cal AD 1920 to post 1950 (Cal BP 30 to post 1950)

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1670 (Cal BP 280) and
Cal AD 1780 (Cal BP 170) and
Cal AD 1800 (Cal BP 150) and
Cal AD 1940 (Cal BP 10) and
Cal AD Post 1950

1 Sigma calibrated results: Cal AD 1670 to 1680 (Cal BP 280 to 270) and
(68% probability) Cal AD 1730 to 1780 (Cal BP 220 to 170) and
Cal AD 1800 to 1810 (Cal BP 160 to 140) and
Cal AD 1930 to 1950 (Cal BP 20 to 0) and
Cal AD 1950 to post 1950 (Cal BP 0 to post 1950)





Beta #343422 (T-226B, SIHP #-2918 Feature 6, 0.82–0.93 mbs; formerly Feature 3)

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23:lab. mult=1)

Laboratory number: **Beta-343423**

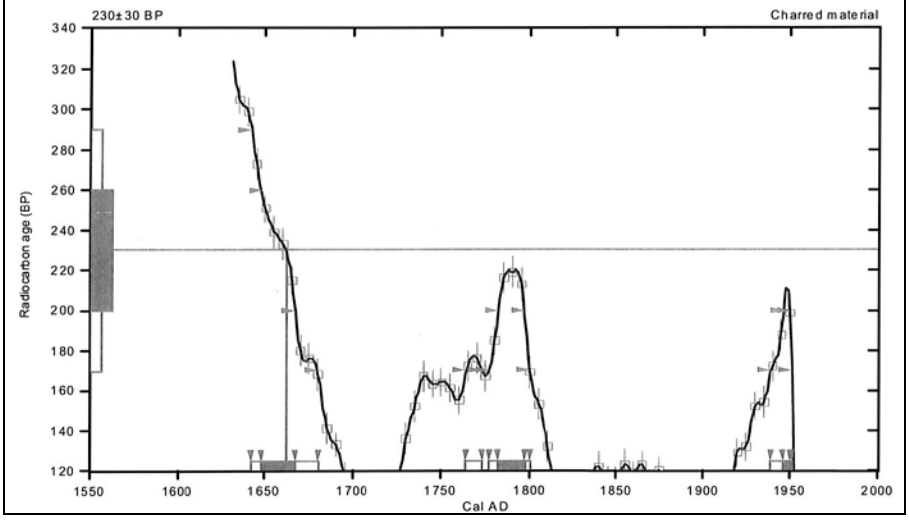
Conventional radiocarbon age: **230±30 BP**

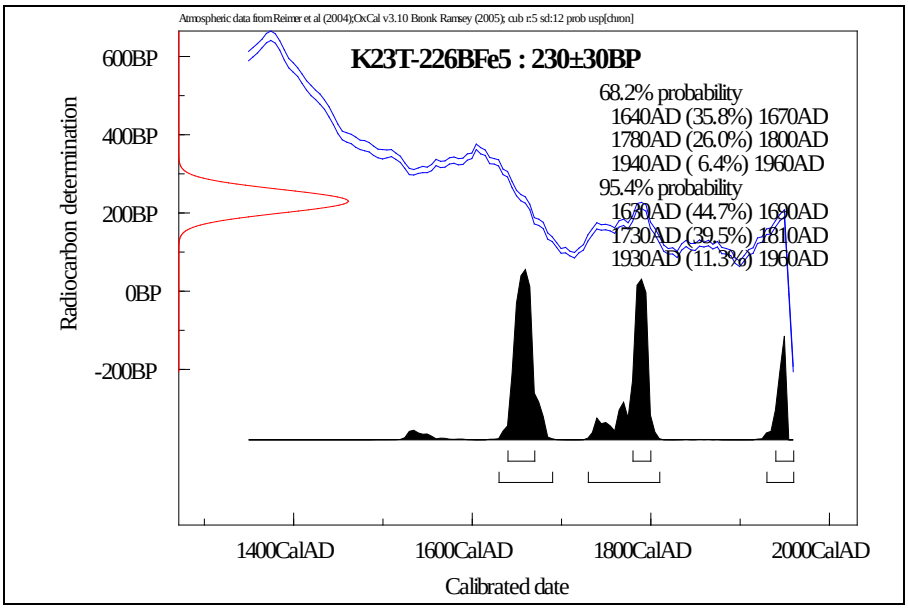
2 Sigma calibrated results: **Cal AD 1640 to 1680 (Cal BP 310 to 270) and**
(95% probability) **Cal AD 1760 to 1770 (Cal BP 190 to 180) and**
Cal AD 1780 to 1800 (Cal BP 170 to 150) and
Cal AD 1940 to post 1950 (Cal BP 10 to post 1950)

Intercept data

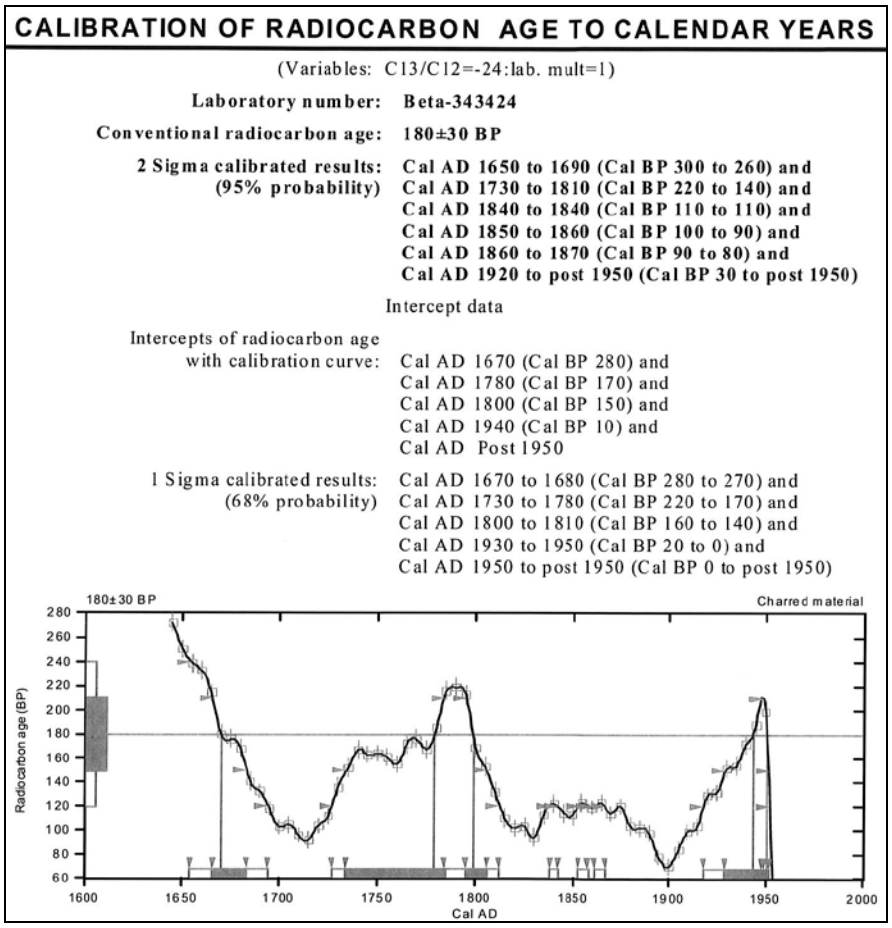
Intercept of radiocarbon age with calibration curve: Cal AD 1660 (Cal BP 290)

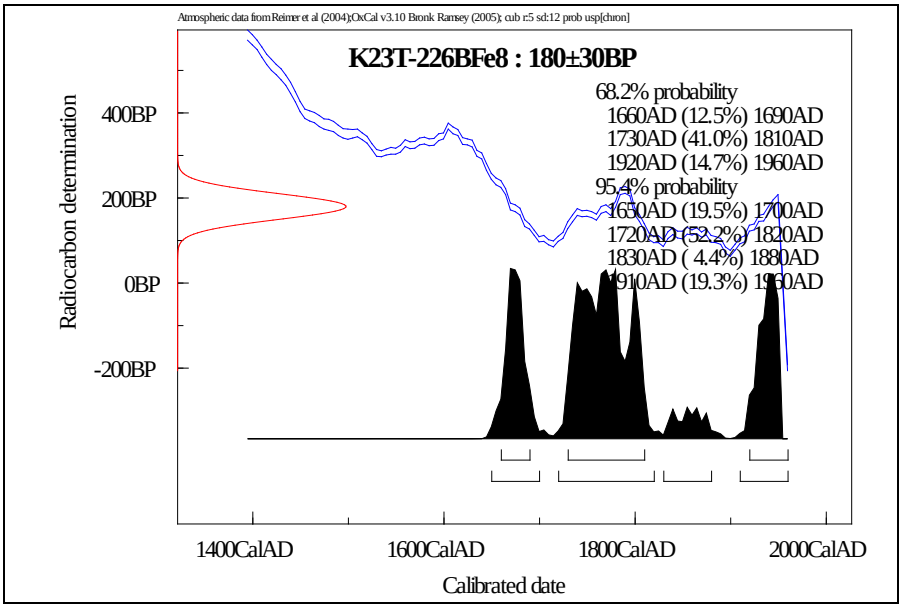
1 Sigma calibrated results: Cal AD 1650 to 1670 (Cal BP 300 to 280) and
(68% probability) Cal AD 1780 to 1800 (Cal BP 170 to 150) and
Cal AD 1950 to 1950 (Cal BP 0 to 0)





Beta #343423 (T-226B, SIHP #-2918 Feature 8, 0.76–0.90 mbs; formerly Feature 5)





Beta #343424 (T-226B, SIHP #-2918 Feature 11, 0.78–0.94 mbs; formerly Feature 8)