Coastal Change and Early Settlement on the North Wirral – 2

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INTRODUCTION

This paper forms a second part to 'Early Settlement on the North Wirral Coastal Area' which appeared in volume 2 of this Journal (Kenna 1978, 27-34). Additional pollen and diatom analyses have now been carried out, with new radiocarbon assays for samples from the area. The results of this further research are considered with a view to determining the sequence of events affecting the coastal environment and are related to events which affected adjacent coastal areas in Lancashire and north Wales. The implications for human activity and settlement are also considered and a table of radiocarbon dates relating to the area is appended to the paper.

ADDITIONAL DATA AND INTERPRETATION

Pollen and diatom analyses have mainly been carried out on samples from biogenic strata immediately above or below sands, silts and clays of marine, estuarine or terrestrial origin. Radiocarbon dates enable the nature of the environment at a particular time to be determined. While the major vertical changes in lithology reflect major environmental changes, transitional strata (or stages) have rarely been found in the North Wirral (eg the change from marine conditions to saltmarsh conditions). This is because the Flandrian strata of North Wirral originated mainly in the earlier 'perimarine zones' (Tooley 1978, 3) and the transitional strata (or facies), eg from intertidal to perimarine, were mainly seaward of the present coastal area and have since been submerged. The absence of a transitional facies may also be due to a sudden marine incursion caused by surge tide conditions. Where a marine stratum overlies a biogenic stratum and a transition facies is not evident, a radiocarbon date for the immediately subjacent biogenic stratum may in fact antedate the marine event by several hundred years. For example, this would be the case where the upper part of a biogenic stratum had been removed by erosion caused by the subsequent marine incursion. Further sections are shown in figure 1 together with radiocarbon dates. The effects of post depositional consolidation and slumping are evident in these sections.

A) PREHISTORIC

Section C (Kenna 1978, fig 1, 31) is now shown with radiocarbon dates. Although the radiocarbon date for the base of the black peat of 4,700 years BP seems to err slightly on the late side, it substantiates the late Flandrian II pollen assemblage. At the base of the black peat there is slight evidence from the pollen assemblage of the transition from marine to saltmarsh conditions. The radiocarbon date of 2,620 years BP for the top of the eroded brown peat in which the pollen assemblage is typical of an alder fen community increases the possiblity that the tree trunk dated at 3,695 years BP (Godwin and Willis 1964, 116 and Kenna 1978, 29) lay in later peat. If this is the case, the Scrobicularia in the silts and clays (with marine/estuarine diatoms) overlying and channelling into the peat are more likely to be related to the incursion that occurred after 2,620 years BP and not that after 3,695 years BP (Tooley 1978, 136-143 and Kenna 1978, 29). The wood debris at the junction of the black and brown peat may be related to the rising water table (probably contemporaneous with a relative rise in sea level) between c 3,910 and c 3,695 years BP (Kenna 1978, 29). Pollen zones within the brown peat at C and near Leasowe Castle can be correlated with some of those in the brown peat at Bidston Moss 1,200m to the east of C (Innes and Tomlinson 1982).

At P, peat (detrital in appearence) overlying grey silty clay was freshly exposed during ditching operations. A slight variation in the thickness of the brown detrital peat is mainly due to erosion of its upper surface. Here the peat has a puckered appearence where it is channelled into by the overlying silt and clay, which contains a varied assemblage of freshwater diatoms. The pollen assemblage at the very eroded top of the brown peat, dated at 4,315 years BP, point to the local vegetation being an alder fen community, although forest clearence indicators are present, suggesting that the regional picture was that of an open oak woodland. The thin clay parting below the peat sample contains marine/brackish diatoms and pollen from the base of the sample suggests that saltmarsh conditions preceded the alder fen stage. A north west-south east trending channel 14.5m across at its widest point, with an infill of clayey silt and silt, cuts through the full thickness of peat 40m to the south of the sample point. The nature of the channel section suggests that it formed after some consolidation of the peat had already occurred and considerably later than 4,315 years BP. As the sample was from detrital peat this also suggests channelling occurred some time after the period of peat formation and the sample date should be treated with caution. The main thickness of predominantly freshwater silts and clays both in the channel and above the peat has thus been deposited considerably later than 4,315 years BP. The form of the channel is such as to suggest that it was formed by a rapid release of blocked up fresh water. Such an origin

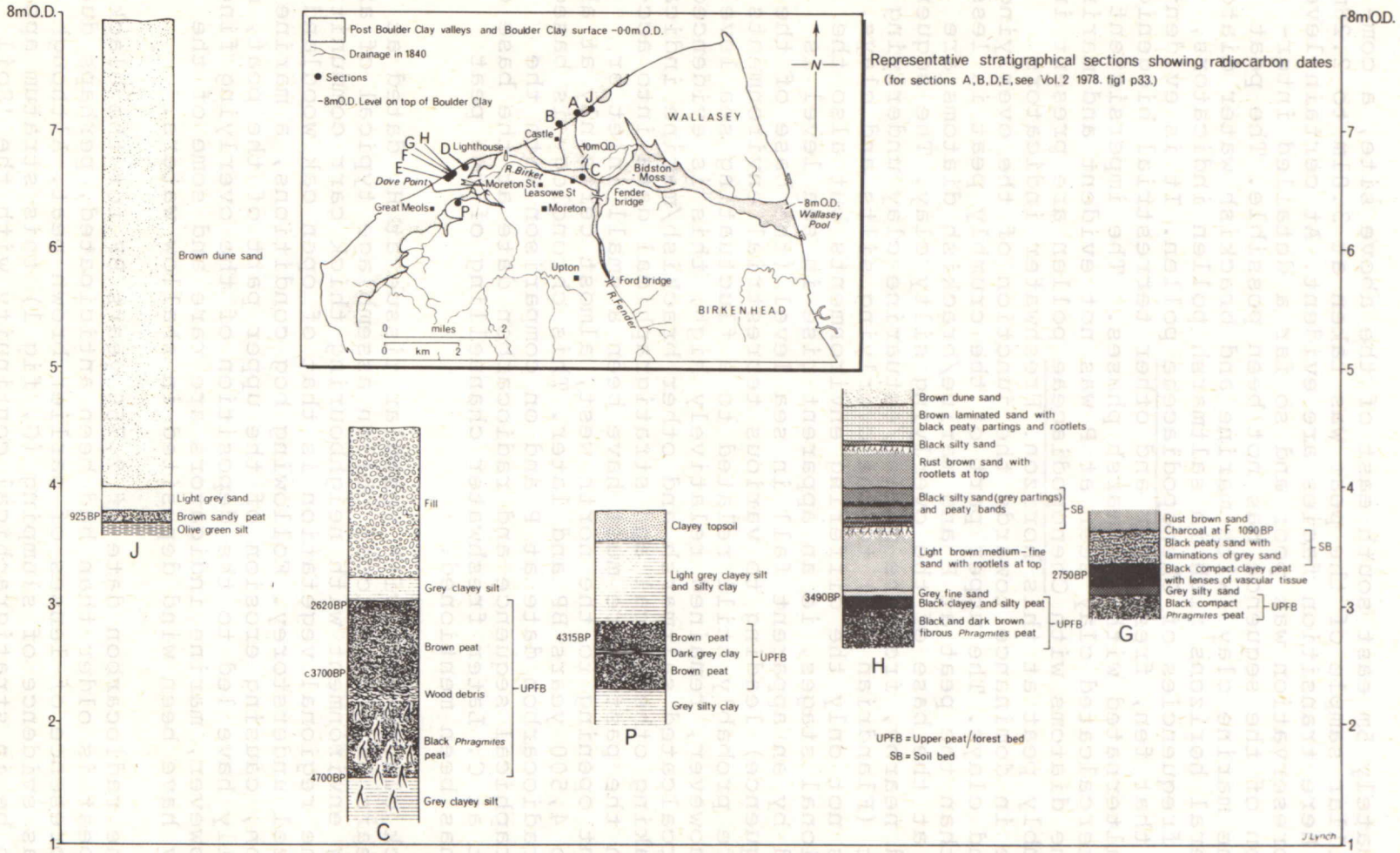
8m O.D.
7
6
5
4
3
2
1
Post Boulder Clay valleys and Boulder Clay surface -0·0m O.D.
Drainage in 1840
Sections
-8m O.D. Level on top of Boulder Clay
N
WALLASEY
BIRKENHEAD
Dove Point
Great Meols
Lighthouse
Castle
Moreton St
Leasowe St
Moreton
R. Birket
Bidston Moss
Fender bridge
Upton
Ford bridge
R. Fender
10m O.D.
-8m O.D.
Wallasey Pool
miles
km
Representative stratigraphical sections showing radiocarbon dates
(for sections A, B, D, E, see Vol. 2 1978. fig1 p33.)
Brown dune sand
Light grey sand
925BP
Brown sandy peat
Olive green silt
J
Fill
Grey clayey silt
2620BP
Brown peat
c3700BP
Wood debris
Black Phragmites peat
4700BP
Grey clayey silt
UPFB
C
Clayey topsoil
Light grey clayey silt and silty clay
4315BP
Brown peat
Dark grey clay
Brown peat
Grey silty clay
UPFB
P
Brown dune sand
Brown laminated sand with black peaty partings and rootlets
Black silty sand
Rust brown sand with rootlets at top
Black silty sand (grey partings) and peaty bands
SB
Light brown medium-fine sand with rootlets at top
3490BP
Grey fine sand
Black clayey and silty peat
Black and dark brown fibrous Phragmites peat
UPFB
H
Rust brown sand
Charcoal at F 1090BP
Black peaty sand with laminations of grey sand
SB
Black compact clayey peat with lenses of vascular tissue
2750BP
Grey silty sand
Black compact Phragmites peat
UPFB
G
UPFB = Upper peat/forest bed
SB = Soil bed
J Lynch

Figure 1

would account for the eroded and slightly feathered surface of the peat adjacent to the channel.

Approximately 5m east south east of the above site, a complete pillar sample of the peat was taken at 3.01m to 2.28m OD, and here transition facies are evident. At certain levels pollen preservation was poor and so far a detailed interpretation of the sequence has not been possible. The peat above the marine clay (with marine and brackish water diatoms) has several horizons rich in saltmarsh pollen indicators, eg high frequencies of Chenopodiaceae pollen. It is evident, however, that fen, freshwater and other terrestrial biogenic phases alternated with saltmarsh phases. The impersistent thin intercalcated clay seen at P was not evident and marine/estuarine diatoms with Chenopodiaceae pollen are present in the crumbly peat at this horizon. Freshwater indicators increase in dominance towards the junction of the overlying silts and clays. The upper part of the crumbly peat is less eroded than the peat at P and marine/brackish diatoms are present at the base of the overlying silty clay. The sequence at P and nearby, from the marine/estuarine clay underlying the peat (Flandrian III) to the overlying silts and clays, reflects not only the differing environments but also the transitional stages, ie an apparent rise in sea level is followed by an apparent fall in sea level (the base of the peat sequence) leading to various terrestrial environments that were probably still related to a fluctuating sea level which, however, remained relatively high; this is evidenced by intercalcated saltmarsh and other brackish/marine indicators. Taking other local and stratigraphical data into account, in the past there must have been a small inlet or embayment opening to the north west, almost certainly at about 4,700 to 4,500 years BP and later. This chronology is based on the radiocarbon date at P and on comparison with the stratigraphical sequence and radiocarbon date at the base of the peat at C. Later freshwater channelling of the peat nearby has been mentioned.

The black clayey peat with vascular tissue at H, dated at 3,490 years BP, has a local pollen assemblage typical of an acid bog environment with neighbouring thick carr communities, while the regional vegetation is that of open oak woodland with hazel understorey. Following bog conditions, a marine incursion, causing erosion of the upper part of the peat, may eventually have led to the deposition of the overlying fine sand. However, marine indicators are rare and some of the sand may have been wind deposited in shallow waters.

At G, the radiocarbon date of 2,750 years BP for the black clayey peat is older than had been anticipated, perhaps due to the presence of lenses of earlier brown peat. Although there was evidence of slumping (G, fig 1) this stratum appeared to be in stratigraphical continuity with the 'Soil Bed' nearby, (Kenna 1978, 29, fig 1, 31); the sample was taken with a view to dating the lower level of the 'Soil Bed'.

This may be an ancient soil or disturbed stratum, which here underlies the 'Soil Bed' already referred to. (Pollen data relating to the sample and indicative of varying environments tend to support this view, hence the radiocarbon date should be treated with caution). With improved drainage poor soils overlying peat would, if cultivated, be expected to contain lumps and lenses of the subjacent peat. This clayey peat is succeeded by black peaty sand, a lateral variant of the 'Soil Bed'. As this stratum was not observed in other sections its stratigraphical significance is unclear.

B) HISTORIC

At J, a hole 4.3m deep was excavated by contractors' machinery in a low area of the Wallasey sandhills. Here, 0.10m of sandy peat is overlain by 0.23m of grey sand which is succeeded by 3.92m of brown dune sand with a marked absence of shells. It was not possible to determine the thickness of the olive green silt underlying the peat for which a radiocarbon date of 925 years BP has been obtained. This peaty band is the highest organic bed under the dune sand in this area and, although the pollen is poorly preserved, the assemblage suggests that it formed under damp dune slack conditions (although not necessarily in a dune slack) before being covered by existing dune sand. Thin, more recent black organic bands are present in the higher parts of the sand hills.

A peaty band recorded in this area by Travis (1922, 207), is equated by him with the 'Soil Bed' at Meols (Travis 1922, 213). To avoid contamination, the central part of the peat was used for radiocarbon dating. The date is earlier than that indicated for the 'Soil Bed' at Meols (Kenna 1978, 29 and fig 1, 31). However, a radiocarbon date on charcoal humics of 1,090 ± 120 years BP from the 'Soil Bed' at Meols, originally disregarded, is now considered to be significant. The charcoal was removed from the top of a sea-washed bench of the 'Soil Bed' at 3.75m OD near F on the map (fig 1). A date of 550 years BP from the upper part of the 'Soil Bed' at E is considered to err on the late side (Kenna 1978, 29); however, a soil layer subject to cultivation and tillage, together with natural plant colonisation could well span 500 years. The presence of medieval objects in the 'Soil Bed' at Meols (Smith 1865, pl II and 214 and Chitty and Warhurst 1977, 21) is compatible with the radiocarbon date limits, and in the subjacent silts, clays and sands, Saxon and Norman objects would be in their correct stratigraphical position (Smith 1865, pl II and 215-226). A radiocarbon date on the base of the 'Soil Bed' at a lower level may extend the age of the 'Soil Bed' beyond 1,090 years BP.

Artifacts would be expected to occur in greater abundance to the north (Kenna 1978, 30-32) and further comment is made below. Near Meols, the nature of the 'Soil Bed' varies; in places it is silty or sandy (eg near G and H, fig 1) and in

others clayey. Its thickness varies, and in places it is absent due to channelling or lensing; this is also the case in respect of the immediately subjacent strata. Slumping at G may have been caused by the sea washing out the underlying sands and silts immediately before the embankment was built.

There are apparent chronological gaps between the top of the Upper Peat/Forest Bed and the 'Soil Bed' (Kenna 1978, 27), and the intervening strata in places (eg at G) seems to be condensed in thickness. This may in part have been caused by a sand trap such as a lagoon, to the north of the present coastline, or blown sand may have been deposited further to the east. Where sand is replaced by silts or clays, once again sediment supply must have been limited. Subsequent erosion of strata could also have contributed to the attenuated thickness. Plastic flow of silts and clays caused by hydraulic gradients is still occurring in certain areas, but more so in the lower silts and clays of the buried channel of the early Fender drainage system.

CORRELATION WITH THE LANCASHIRE AND NORTH WALES COASTAL AREAS

The stratigraphical data with pollen and diatom assemblages, particularly near junctions exhibiting obvious lithological changes, can be used together with some of the radiocarbon dates to relate the coastal events that have affected the North Wirral Coastal Area to those of adjoining areas. These additional data, together with that of Kenna (1978) indicate that the main North Wirral Marine episodes (or associated evidence of rising water tables) after 7,000 years BP fall within or close to the time limits of the 'marine transgressions' recognised by Tooley (1978, 113) in respect of the Lancashire Coast. Two of the marine 'transgressive episodes' recorded in North Wales (Bowen 1977, 250-253 after Tooley unpublished and Tooley, written communication) can also be associated with marine events that affected the North Wirral. Not all the biogenic or 'regressive phases' which separate the 'transgressive phases' elsewhere are evident on the North Wirral. This could be due to local conditions, subsequent erosion and the relationships of present coastlines to those of an earlier period. As stated earlier, on the North Wirral the pollen record has not so far indicated such obvious periods of saltmarsh formation (except at or near P) as those recognised by Tooley (1978) in many of his sections relating to the North West Coast. These areas may, in some cases, have been further seaward in North Wirral, and lack of evidence may be due to the subsequent erosion of the coast. From the pollen assemblages of the peats, together with diatom assemblages reflecting prevalent high water tables, contemporaneous rising sea levels can be inferred: however, high water tables are not necessarily directly related to high or rising sea levels and 'raised bog' peats are found in hollows on the coastal plain.

One of the more obvious regional correlations is shown by the horizon indicating the end of marine conditions and onset of biogenic conditions recorded at Lytham Common (Tooley 1978, 135) with a radiocarbon date of 4,895 years BP, and at Rhyl Beach with a radiocarbon date of 4,725 years BP (Tooley 1978, 135). These dates correlate with that of 4,700 years BP at the marine/biogenic junction at C and also with this horizon recorded elsewhere on the Wirral coast. The levels of these junctions for correlation purposes require adjustment to allow for different tidal ranges, different levels of MHWS, the relative positions of the sites to the palaeo-coastal area and subsequent consolidation. Bowen (1977, 252 after Tooley, unpublished and Tooley, written communication) cites evidence for the commencement of biogenic conditions at the end of North Wales Transgressive Phase V at 4,725 years BP at Rhyl Beach at 1.76m OD and for the same event at Abergele at 2.42m OD: the former level is close to that at C in the valley area and the latter level is close to that at E (Kenna 1978, fig 1, 31) and the section near P.

Although no direct evidence has been observed in the Wirral for a 'Romano-British transgression', when sea level (MHWS) is purported to have been at 5.44m OD in West Lancashire (Tooley 1978, 137), the evidence does indicate a considerable loss of land to the sea about this time and later, and as a consequence the Mean High Water Mark would have 'retreated' to the south. Evidence for the 'migration' or 'retreat' of Mean High Water Marks related to sand dune erosion, surge tides and related coastal phenomena is referred to in detail by Parker (1971) in respect of Formby Point on the Lancashire Coast.

Direct evidence for the period of sand dune building proposed by Tooley (1978, 148) from 4,000 and 2,400 years BP in respect of the Lancashire Coast is lacking on the Wirral Coast. However, the later dune building period for the Lancashire Coast (Tooley 1978, 145, 148) can be correlated using the thin peat band dated at 805 ± 70 years BP and 830 ± 50 years BP in the south west Fylde dunes (Tooley 1978, 148) with the peat band at J in the Wallasey Sandhills which has a radiocarbon date of 925 ± 50 years BP. In places west of J and in the channel area near Leasowe Castle, a thin black laminated sandy peat is evident overlying grey silt and clay at levels similar to J, and this may represent the lateral continuation of the thin peat at J. Although Tooley (1978, 144) rightly states 'there is no evidence from the dune systems either for dune building or for dune instability', for two millenia after c 4,000 years BP in respect of the Lancashire Coast, this by no means proves that other dune systems were not present further to the west and to the north in respect of the Wirral Coast. Conditions similar to those leading to the formation of the coastal dunes of the Western Netherlands may have persisted (Jelgersma *et al* 1969, 335-342) and the accumulated sands and sandbanks in the Liverpool Bay Coastal Area could, in part, be the remnants of old

coastal sand barriers and dune systems. From c 4,000 years BP many of the conditions for dune building could have been satisfied, for example sand supply (Kenna 1978, 32), longshore drifting and prevailing westerly winds. Indeed, periods of dune stability could have occurred in the Bay area up to recent times and dune building could occur on parts of the North Wirral Coast today were it not for the presence of concrete sea defences. Sandbanks at Meols are rapidly narrowing the easterly migrating remanants of the Old Hoyle Lake channel and without the scouring effects partly caused by the presence of the sea wall, the channel entrance would already have been sealed off by the sandbanks.

SETTLEMENT

The presence of man in the area from c 5,000 years BP is evident from the pollen record and this is substantiated by other indicators after c 4,000 years BP (Kenna 1978, 30). Pollen and other data indicate that after a rise in the water table (in most instances probably the result of a relative rise in sea level) between 3,910 years BP and 3,695 years BP, the water table of the hinterland remained high. The pollen record indicates that between c 4,000 years BP and at least 2,620 years BP there was a persistence of alder fen, swamp, raised bog and open water in the hinterland and this is further substantiated by detailed pollen data from a peat section on Bidston Moss (Innes and Tomlinson 1982). During these times, the hinterland with its high water tables would not have been attractive for continuous settlement, except on the rocky promontories of Wallasey, Bidston and Caldy and the knolls of boulder clay which may have supported woodland and, at times, 'soils' suitable for cultivation and settlement (Kenna 1978, 30). Settlement associated with pile dwellings may have occurred. Had sand dunes formed periodically from 4,000 years BP, they would have attracted settlement as they apparently did from Roman times onwards (Kenna 1978, 32). The ecosystem of such dune areas, particularly the dune slacks and adjacent sand filled lagoonal areas, would have provided soil and vegetation suited to arable and pastoral farming. However, whether or not sand dunes were in existence at other times, perhaps the most influential single factor controlling settlement was the relative position of the water table which would have been governed primarily by sea level, drainage and indeed climate.

CONCLUSION

The sediments of the North Wirral Coastal Area reflect the eustatic Flandrian (Post Glacial) rise in sea level, but shortly after 3,500 years BP the rate of the rise seems to have decreased and local factors may have been more influential in affecting coastal and environmental changes. Additional pollen analyses and radiocarbon dates have helped to clarify the sequence of events and changing environments after c 3,800 years BP, but where direct evidence is lacking,

Map Location Figure 1	Laboratory Reference	Conventional Radiocarbon Date Years BP (+1ø)	Level Metres OD	Converted Calendar Date AD-BC	Material	Site Location and Reference	National Grid Reference
F	SRR 1404(a)	'Modern'	+3.75	1598 AD	Charcoal	Wallasey Embankment (RK4)	SJ 2373 9085
D	SRR 1403	540±40	+2.98	1404	Peat	Wallasey Embankment (RK2A)	SJ 2410 9104
E	SRR 1402	550±40	+3.66	1400	Peaty 'soil' and sand	Wallasey Embankment (RK4BU)	SJ 2367 9083
J	GU 1311	925±50	+3.79	1050	Peaty sand	Leasowe Sand Dunes (WR/1T)	SJ 2754 9261
F	SRR 1404(b)	1090±120	+3.75	894 AD	Charcoal (Humics)	Wallasey Embankment (RK4)	SJ 2373 9085
C	SRR 1574	2620±40	+3.02	856 BC	Peat	Reeds Lane, Moreton (SRL/1A)	SJ 2710 9086
G	GU 1270	2750±55	+3.18	975	Peat	Wallasey Embankment (RK550)	SJ 2375 9086
H	GU 1271	3490±60	+3.08	1887	Peat	Wallasey Embankment (RK5/U)	SJ 2378 9088
*	Q 620	3695±110	+3.05	2154	Wood	Reeds Lane, Moreton	SJ 268 909
E	SRR 1495	3800±40	+3.0 (+2.30)	2305	*Pinus* wood	Wallasey Embankment (RK4BP)	SJ 2368 9082
E	SRR 1493	3910±100	+2.7 (+2.27)	2468	*Quercus* wood	Wallasey Embankment (RK4Q)	SJ 2368 9082
A	Birm 1013	3980±70	+1.82	2565	Bone (*Bos*)	Mockbeggar Wharf (lb/M67)	SJ 2722 9284
P	GU 1312	4315±70	+2.86	3050	Peat	Park Road, Meols (PR1/U)	SJ 2383 9015
C	SRR 1575	4700±70	+1.50	3530	Peat	Reeds Lane, Moreton (SRL/2A)	SJ 2710 9086
D	SRR 1494	6420±60	+0.41	5320	Peat	Wallasey Embankment (RK20)	SJ 2410 9104
B	SRR 1496	6460±40	+0.38 (-0.18)	5363 BC	*Quercus* wood	Mockbeggar Wharf (LB/B)	SJ 2665 9218

(C^{14} half-life = 5,570 years)

* (Godwin and Willis, 1964, 116) - near C.

Converted Calendar Dates (without limits of error) after Clark 1975.

Levels shown for peat are actual strata contact levels except for SRR 1404(a) and (b) and GU 1270. Samples submitted for radiocarbon dating were trimmed to reduce contamination. For *in situ* tree stumps the sampled level is shown and the level at the base of the roots in brackets.

due mainly to recent severe marine erosion, the interpretation remains somewhat conjectural. The need to treat certain radiocarbon dates with caution has been referred to, especially those related to peat immediately subjacent to a marine/estuarine stratum and where transitional facies are absent. An age range for the 'Soil Bed', the remnants of which are under the dune sand of the embankment, has been established and this is compatible with the evidence based on artifacts found in and below the stratum (Smith 1865, pl II, 214 and Chitty and Warhurst 1977, 20). Future evidence may allow the age for the 'Soil Bed' to be extended retrogressively. Correlations can be made with some of the contemporaneous events that have affected adjacent coastal areas. The main exceptions are the early period of sand dune building and events apparently occurring elsewhere during the Romano-British period. Settlement in sand dune areas before Roman times may have occurred and the level of the water table seems to have been the most influential factor affecting settlement.

It is evident then that pollen analyses and radiocarbon dates (even though the samples have been submitted to rigorous decontamination processes) should be interpreted with caution, and that consolidation and other post-depositional processes should be taken into account when interpreting the Flandrian environments and chronology of the North Wirral. When considering coastal processes, it should be emphasised that their results can trigger off new processes, particularly in localised areas. The factors affecting the rates of accretion also require consideration.

FOOTNOTE

In 1980, several excellent sections were visited in excavated parts of the projected course of the early river Fender channel (Kenna 1978, 27), and in these places its early course can be defined with greater precision. The extent of landward penetration of marine incursions at various horizons is being determined from diatom assemblages in the silts and clays. Movement of sandbanks and channels near Meols is being monitored to provide examples of the rapidity of coastal changes and geophysical work is continuing. It is hoped that more detailed analyses of the peat near P can be carried out.

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ABBREVIATIONS

BP Before Present
OD Ordnance Datum
MHWS Mean High Water Springs

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