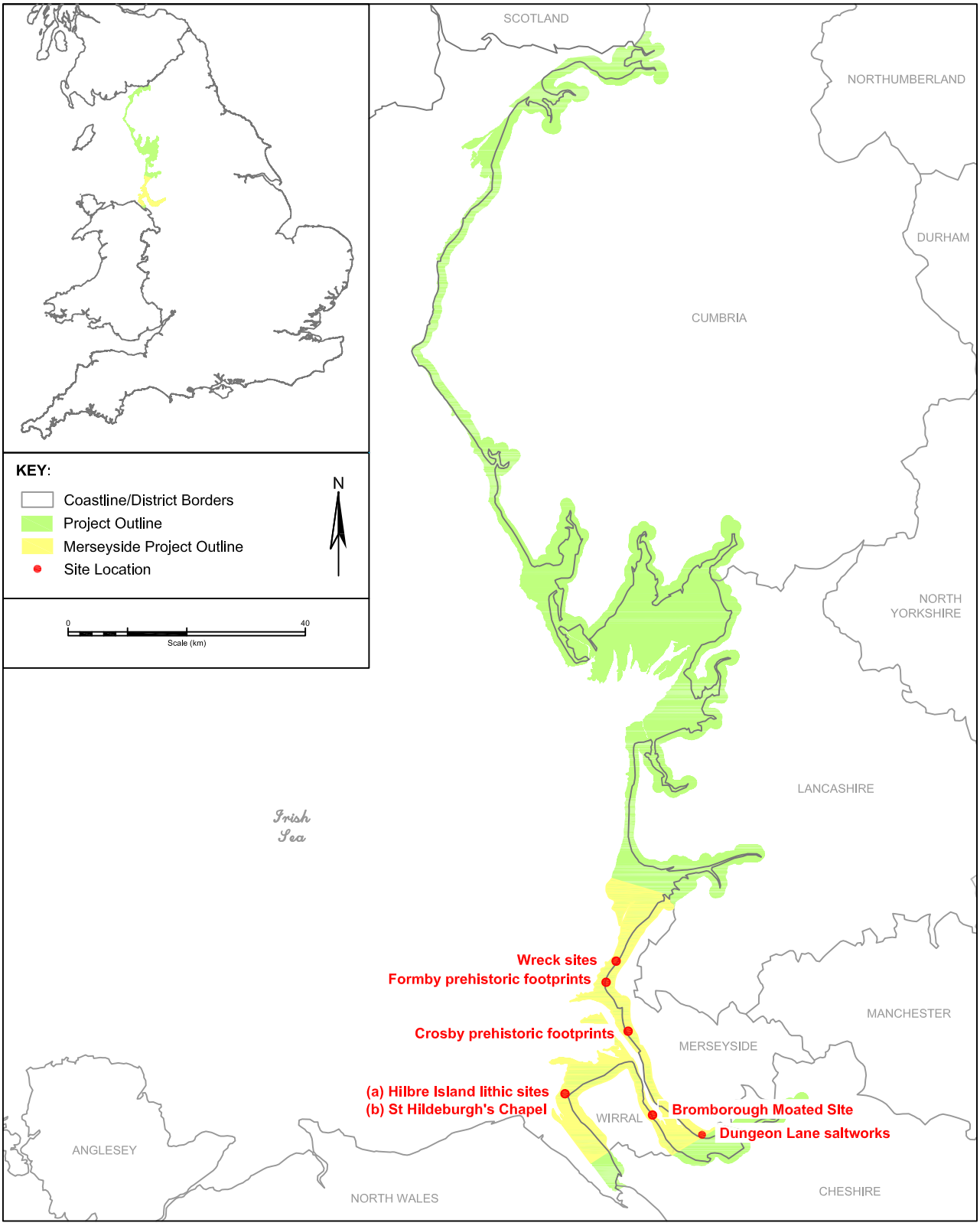

Figure 3.1 Merseyside Site Locations

3. ARCHAEOLOGICAL SURVEY RESULTS: MERSEYSIDE

3.1 Introduction

The Merseyside coast is the second shortest section of coastline in the study area but still amounts to *c.*94km in length. The sites in Table 3.1 were highlighted as 'at risk' in NWRZCA Phase 1 and were selected for further survey during Phase 2. In addition, the scheduled monument of Bromborough moated site was included in Phase 2 as it was considered possible that it could also be at risk from future erosion. A new prehistoric 'footprint' site at Crosby (Sarah-Jane Farr pers comm.) was also discovered whilst the Phase 2 survey was underway and this has been included in the assessment.

County	Site name	SMP 2 policy at this site	Special Interest	Risk
ME	Hilbre Island lithic sites and midden	HTL	High	High
ME	St Hildeburgh's Chapel, Hilbre Island	HTL	High	High
ME	Bromborough Moated Site	HTL	High	High
ME	Dungeon Lane Saltworks	NAL	High	High
ME	Crosby prehistoric footprints	HTL	High	High
ME	Formby Mesolithic and Neolithic footprints	MR	High	High

Table 3.1 Sites identified as potentially under threat from current or future coastal erosion in Merseyside.

The specific aims of the survey at these locations were:

- To provide an up-to-date condition assessment of any surviving remains.
- To assess the risk to Bromborough moated site as a scheduled monument lying within the floodplain and within 750m of the coast.
- To accurately locate the remains of Dungeon Lane Saltworks and assess their special interest. To investigate the extent of erosion, and the risk faced to the remains, with reference to the preferred SMP policy of 'No Active Intervention'.
- To investigate the extent of erosion, and the risks faced by the remains on Hilbre Island, with reference to the preferred SMP policy of 'Hold the Line'.
- To accurately locate the remains at Crosby and assess their special interest. To investigate the extent of erosion, and the risks faced by the remains in the inter-tidal zone with reference to the preferred SMP2 policy of 'Hold the Line'.
- To investigate the extent of erosion, and the risk faced to the remains at Formby, with reference to the preferred SMP2 policy of 'Managed Realignment'.

3.2 Hilbre Island (Map Figure 3.9)

3.2.1 Location and geology

Hilbre Island (SJ 1845 8804) is the largest of a group of three islands situated on the eastern side of the mouth of the Dee Estuary. The islands comprise Hilbre, Middle Eye and Little Eye, all of which are tidal and only accessible at low tide, meaning that technically they are tombolos rather than islands. Hilbre has been inhabited, though it no

longer has any permanent residents. It is owned by Wirral Borough Council and lies *c.*1.6km from the nearest part of the mainland at Red Rocks on the Wirral Peninsula.

The Dee Estuary is a drowned valley that formed along a geological fault between Triassic sandstones and Carboniferous coal measures (Halcrow 2011). The bedrock geology of the Wirral Peninsula is predominantly Triassic sandstones, particularly along its northern extent (BGS 2008). The shoreline topography in the area is influenced by shallow waters and a wide inter-tidal zone, characterised by a series of sand banks. The only rock formations are found at Hilbre Point, Hilbre Island and Red Rocks, where outcropping Bunter Sandstone forms these small islands (Figure 3.2). Hilbre currently experiences mean spring and mean neap tidal ranges of 7.6m and 4.1m respectively (Halcrow 2011).

Figure 3.2 View of Hilbre Island (right) and Middle Eye (left) at low tide from the foreshore at West Kirby.

Land use on the island is limited, as the superficial clay and dune sand deposits have limited agricultural potential (Farewell 2007). Much of the island is scrubland interspersed with public footpaths for recreational use, and the island is popular with tourists and bird watchers. The entire shoreline is public access, where accessible, and the islands fall within the Dee Estuary Site of Special Scientific Interest (SSSI).

3.2.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 1 of the study area (Johnson 2011). It highlighted St Hildeburgh's Chapel and the prehistoric midden deposits as being potentially at risk of damage caused by the construction of sea defences under the preferred SMP policy of 'Hold the Line'.

The islands of Hilbre are the focus of The Hilbre Research Project which is an ongoing investigation into the history and archaeology of the islands, run by Christine Longworth, a committee member of the Friends of Hilbre (Sarah Jane Farr *pers. comm.*). The Friends are an active group of local volunteers interested in preserving the island's history and

natural environment. At the time of writing the results of the project have yet to be published or supplied to the Merseyside HER and they were therefore not available for consultation as part of this project. However, descriptions of the Friends' activities are available in their newsletters, containing information on excavations on the island, as well as short histories of prominent landmarks and people (http://www.deeestuary.co.uk/hilbre).

The archaeology and palaeoenvironment of the Merseyside wetlands has been surveyed by Cowell and Innes (1994) as part of the North West Wetlands Survey. This states that the northern shore of the Wirral peninsula and the islands of Hilbre show strong evidence for prehistoric activity with various sites, findspots and middens across this stretch of coastline, dating from the Mesolithic through to the Bronze Age (Johnson 2011, 70-3). Limited survey work was undertaken in 1995 with some photographic recording and section drawings of eroding material. This work was limited in scope, however, and further examination of Hilbre is therefore a priority (Johnson 2011, 70).

There has been no specific research undertaken on the physical remains of St. Hildeburgh's Chapel, no remains were mapped as part of the Phase 1 aerial photography transcription, and the site is not marked on modern Ordnance Survey mapping. Rapid survey is required to ascertain whether any features associated with the chapel survive.

3.2.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area covered the recommended safe route across the tidal sands from West Kirby to all three of the islands of Hilbre. The walkover included the foreshore, cliff edges and interior of each island.

3.2.4 Prehistoric

At Hilbre Island, Cowell and Innes note that in the late 19th century several finds of flints were recorded that can be dated to the Neolithic, late Neolithic and Bronze Age, with one possible Mesolithic microlith (HER: 1887-003) (Cowell and Innes 1994, 220). Evidence has been found for a number of prehistoric shell middens in the eroding cliff sections at Hilbre and this is recorded in the Merseyside HER (HER: 1888-001).

No prehistoric archaeology was identified during the course of the survey, despite this being one of the identified foci for the survey. This suggests that erosion of prehistoric remains may have stabilised for the moment, and no new findspots linked to erosion have been entered into the Merseyside HER since 1998. In saying this, however, there is no clear indication as to when an erosion trend is likely to resume and the construction of sea defences is likely to be invasive and may still damage buried archaeological deposits. Archaeological evaluation work in advance of sea defences would provide a suitable way of managing future impacts and recording remains at risk or impacted upon.

3.2.5 Early Medieval-Medieval

Hilbre Island reputedly gets its name from its association with an Anglo-Saxon holy woman, St. Hildeburgh, and was chosen as the site for an early medieval hermitage thought to have been in existence prior to 1081AD (Johnson 2011, 75). Popularly known as 'St Hildeburgh's Chapel', this is recorded in the Merseyside HER as consisting of a pre-conquest chapel (HER: 1887-001), a cemetery where the remains of four burials were uncovered (HER: 1887-027), a graveslab of *c.*1100 (HER: 1887-017) and an early stone cross shaft head of *c.*1000 (HER: 1887-019). Drawings of the latter two objects are on

display in the interpretive centre on Hilbre, located in the telegraph station lookout building.

Post-conquest, Hilbre was owned by the Benedictine Abbey of St. Evroult in Normandy, until 1138 when it was transferred to the Abbey of St Werburgh's at Chester (Anderson 1962, 12). Deeds pertaining to this transfer refer to Hilbre as the *Capella de Hildburgheye,* the chapel of Hilbre (Griffeths 1923, 18). The island was maintained as a monastic cell or grange until the dissolution in 1538/9 and generally had a quota of two monks, charged with maintaining a small chapel dedicated to St Mary (Anderson 1962, 12-14). This chapel was likely to have been built in the same location as any pre-conquest structure.

No upstanding remains associated with the pre-conquest or medieval chapel were identified during the course of the survey. The popular notion held on the island is that the ecclesiastical remains are buried under housing and if this is the case, it would suggest that the chapel sat on the eastern side of the island, rather than the west where the Merseyside HER point is located. The HER grid co-ordinates match exactly to the grid co-ordinates of the findspot of the early medieval tombstone (HER: 1887-017) and may not accurately locate the chapel. The locations of St. Hildeburgh's Chapel, and its successor, the Chapel of St Mary remain unknown. Geophysical survey across the island could prove useful in identifying any remains associated with this significant early Christian foundation which provides comparanda on the west side of Anglo-Saxon Northumbria for the well known coastal hermitages on the eastern seaboard of Northumbria, at places such as the Farne Islands, Lindisfarne and St Cuthbert's Isle.

A series of re-used cut sandstone blocks (146) forming edges to footpaths and land bridges were recorded to the north of the supposed site of St Hildeburgh's Chapel. These appear to be parts of a door jamb and punch-dressed window sills (Figure 3.2). The masonry is not diagnostic in terms of date, however the blocks are mostly hand-crafted and differ from the sandstone blocks used in the construction of the nearby 19th century lifeboat station (see Section 3.2.8). It is possible therefore that they relate to an early medieval or medieval site on the Island and could be re-used remains of the aforementioned chapels, though such an association remains only speculative.

Figure 3.3 Re-used punched-dressed sandstone masonry with part of a door jamb in the foreground. (scale=1m).

3.2.7 Post-medieval

After the dissolution, ownership of Hilbre Island was transferred to the newly established Chester Cathedral, which leased it to successive tenants including the Stanleys of Hooton, army commanders who held the island for *c.*100 years (Craggs 2004). After the Cromwellian period it was tenanted to local businessman, most likely involved in salt production and a salt working site is included in the Merseyside HER (HER: 1888-004). No remains associated with the saltworking site were recorded during the course of the survey.

Little is known of the intervening period, until 1827 when a telegraph station was built on the island by Liverpool Docks. They established a chain of telegraph stations from Holyhead on Anglesey to Liverpool, for the purposes of reporting ships, weather and navigational issues (Burnett 2007). In 1841 they also built dwellings and stations for the signallers and their families and the telegraph keeper's cottage survives on Hilbre next to the Buoy Master's house (Craggs 2009). The telegraph station is included on the Merseyside HER (HER: 1888-014), but is not at risk of coastal erosion.

The maritime history continues with the erection of a lifeboat station on the island in 1848, as a secondary station for the Royal National Lifeboat Institute's site at Hoylake (http://www.rnli.org.uk/rnli_near_you/north/stations/HoylakeMerseyside/history). The station remained in operation until 1939 when services were again concentrated on the Hoylake station. Upon its closure the lifeboat then stationed at Hilbre, the Chapman, was removed and has recently been restored. It was built in 1901 by Thomas Ironworks for the Groomsport lifeboat station in Northern Ireland and served Hilbre between 1924 and 1939 (Friends of Hilbre 2006). The lifeboat station is recorded in the Merseyside HER (HER: 1888-002).

The field survey recorded the remains of the station as consisting of the main red-sandstone station building, a slipway, a tide gauge and set of iron steps (145). The station building is constructed of well-coursed red sandstone and is currently derelict and unroofed, though a bird hide has been established above one section of the station at first-floor level (Figure 3.4). This is for the exclusive use of members of the Hilbre Bird Observatory. The condition of the building is generally satisfactory, with localised weathering of the sandstone, but it is maintained as much as possible by the Friends of Hilbre who carry out re-pointing work when necessary (Friends of Hilbre 2007). Roofing the structure would probably be the next necessary step in its preservation for the future.

The slipway associated with the station runs for 116m north-east of the station down to the shore and is constructed of large sandstone blocks. The Friends of Hilbre newsletter in 2006 reports that stormy conditions over the previous few winters had dislodged several stones on the slipway outside the station. This damage is evident at the site today (Figure 3.5), however, the Friends of Hilbre carried out temporary repair works (funded by Wirral Borough Council) in 2004 to help counteract further erosion (Burnett 2006; Burton 2009). This provided a concrete capping, but, as yet, a more permanent solution has not been put in place.

The tide gauge and iron steps are located to the west of the station and are attractive features in the red sandstone cliffs and shelves that dominate this side of the island. The iron steps are recessed into the rock face and consist of a series of half-moon shaped foot and hand holes (Figure 3.6). They are constructed of jointed iron panels, each containing three sets of foot holes and two sets of hand holes. The steps are generally in very good condition maintained by the Friends of Hilbre (Friends of Hilbre 2009), though some rust is evident. It does not appear that they are or were ever partially submerged.

Figure 3.4 Remains of red sandstone, 19th-century lifeboat station.

Figure 3.5 Slipway running north-east of the lifeboat station. Showing damage caused by storm action in the early 2000s.

Figure 3.6 Iron steps recessed into the cliff-face to the east of the lifeboat station (scale = 1m).

3.2.8 20th Century

The Phase 1 aerial photography transcription recorded the location of a Second World War air-raid shelter on the south-west of Hilbre Island (NRHE: 1469503) and this feature is recorded in the Merseyside HER (HER: 1887-044). The field survey recorded the remains (147) as consisting of a red brick building with a flat concrete roof, partially sunken within earthen embankments (Figure 3.7). The embanked area measures *c.*15m x 11m and is partially covered in bracken. The entrance is located on the east side where there is a break in the embankments marked by two parallel stepped brick walls projecting from the east face of the building (Figure 3.8). This is now blocked. The emergency exit is a hatch in the roof located on the south side of the structure with a short, brick-built surrounding wall (Figure 3.7). The remains are in reasonably good condition and the Friends of Hilbre manage the bracken problem on the island by hosting regular 'bracken-pulling' events (Friends of Hilbre 2007)

The shelter is located at SJ 18516 87096, an amendment to the recorded location in the Merseyside HER which lies *c.*17m south-east of its actual position.

Figure 3.7 View of Second World War, partially sunken, air-raid shelter, looking north.

Figure 3.8 Blocked entrance into Second World War air-raid shelter (scale = 1m).

3.2.9 Threat from erosion

The islands of Hilbre lie within the outer zone of the Dee Estuary, however each of the three islands lies within a different SMP2 policy unit. Little Eye lies in policy unit 11a 5.9 and Hilbre Island lies in policy unit 11a 5.11, both of which recommend 'Hold the Line' for the next 100 years. Middle Eye lays in policy unit 11a 5.10 which recommends 'No Active Intervention' for the next 100 years.

The Dee Estuary has been infilling since the end of the last glacial advance and it was originally over 30km long and 8km wide, extending as far as Chester. The estuary ceased to be navigable up to Chester by the middle of the 15th century and siltation has continued to this day. On the eastern side of the estuary mouth, Red Rocks, Hilbre Point and the islands of Hilbre represent the English boundary to the estuary. The islands have influenced tidal propagation in the local area by restricting the easterly migration of the Hilbre Channel. This channel developed in the 18th century following works to divert the main river away from the north side of the estuary to the Welsh Bank (Pye 2006). Increased flows through the newly trained main channel resulted in a new natural channel, the Hilbre Channel, being cut through the middle of Hoyle Bank. The training of the navigation channel to the River Mersey in the first half of the 20th century also meant that flows entering and leaving the estuary preferentially used the Hilbre Channel. In more recent times, however, the development of the channel has been hindered by the presence of the islands of Hilbre on its eastern side and flows are now directed to a newly formed channel at West Hoyle. The result is increased accretion on inter-tidal sands between the islands and the foreshore which provide increased wave protection to the leeward inshore area from the predominantly westerly waves (Barber 2006).

The islands of Hilbre are therefore currently protecting the north-eastern side of the Wirral peninsula from the potentially damaging effects of the Hilbre Channel which will

experience higher flows due to sea level rise in the next 100 years (Halcrow 2011) The maintenance and construction of sea defences at Hilbre is therefore a necessity in order to restrict the eastward migration of the Hilbre Channel. Under the preferred policy of 'Hold the Line', it is predicted that the inter-tidal sands between the islands and Hoylake and West Kirby will continue to accrete (Halcrow 2011).

Based on these predictions (Figure 3.9) two of the sites recorded at Hilbre Island (the re-used cut sandstone masonry (146) and the World War II air-raid shelter (147)) are not considered to be at immediate, or longer term, threat from coastal erosion. This is due to the proposed construction of new seaward defences and/or the maintenance of older defences which should mitigate against erosion without causing damage to the monuments themselves. The lifeboat station (145), however, is considered to be at risk of coastal erosion, since its slipway lies in the inter-tidal zone where it will not be afforded the protection of the aforementioned defences. Stormy conditions in the early 2000s have already caused major structural damage to this feature (Figure 3.5) and only temporary repair works have been conducted. No remains of the prehistoric midden sites (HER: 1888-001), or St. Hildeburgh's Chapel (HER 1887-001), were recorded during the Phase 2 survey, however, unknown buried remains of theses features may still be at risk of damage during the construction of sea defences or through coastal erosion.

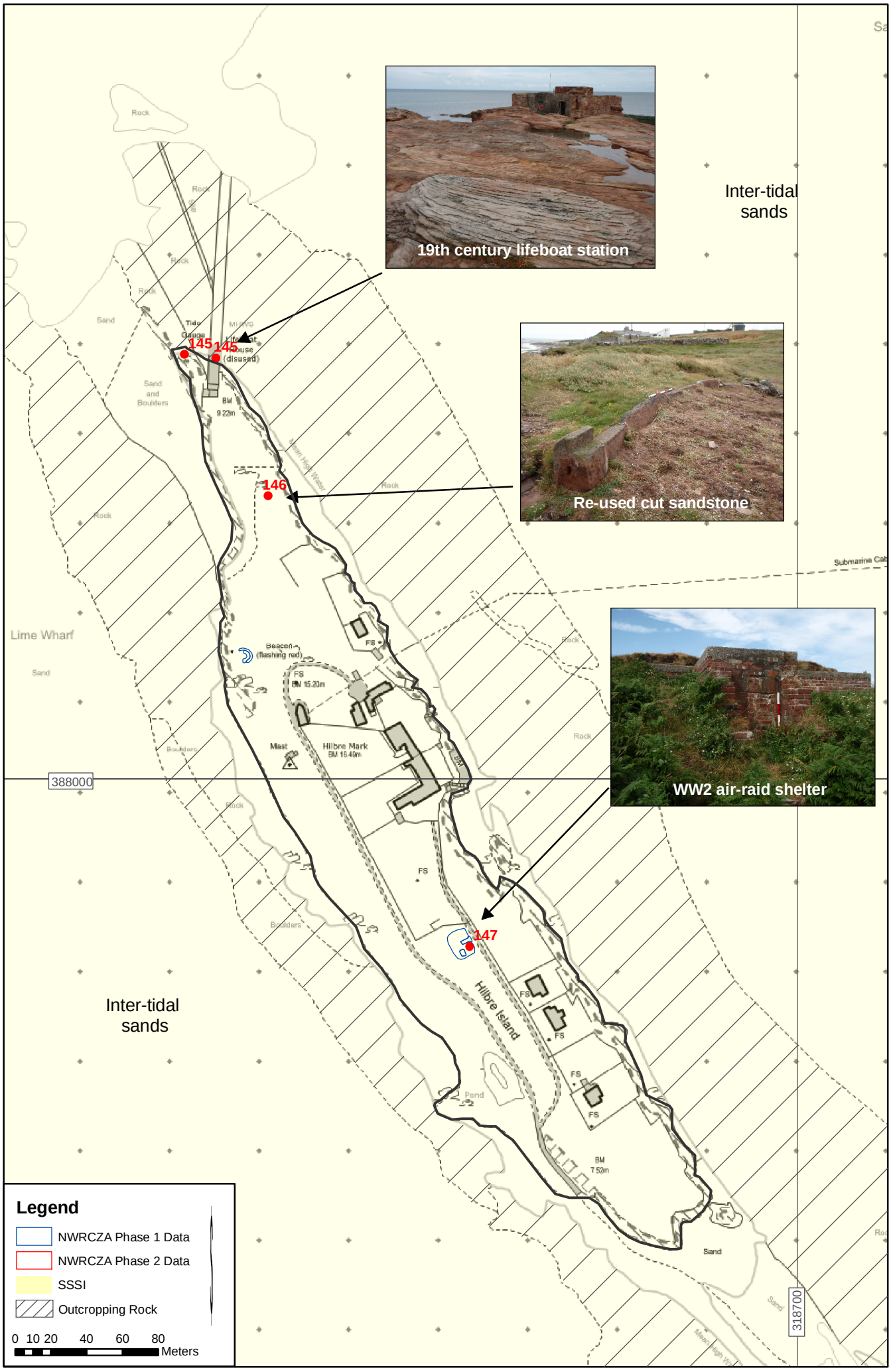

Figure 3.9 Location of sites surveyed on Hilbre Island.

3.3 Bromborough (Map Figure 3.16)

3.3.1 Location and geology

Bromborough Pool village (SJ 3449 8418) lies on the eastern side of the Wirral Peninsula, close to the banks of the River Mersey and south-west of the port town of Liverpool which lies on the opposite side of the river. It is *c.*4.8km south of Birkenhead and takes its name from the medieval village of Bromborough situated *c.*2km to the south.

The Mersey Estuary is a drowned valley that formed along a geological fault which has been modified by sub-glacial meltwaters infilling after the last glacial re-advance (Halcrow 2002). The bedrock geology of the Wirral predominantly consists of Triassic sandstones, with Pebble sandstones in the upper reaches of the estuary around Runcorn and Widnes. The superficial geology is dominated by Devensian Till deposits with a complex sequence of coastal deposits (BGS 2008). Within the River Mersey, there are extensive Holocene tidal flat deposits (Figure 3.10). The principal soil in the Bromborough area is Seasonally Wet Red Loam, which is suited to cereal production and grassland (Farewell 2007).

Figure 3.10 View of the Mersey Estuary at Bromborough Pool © Peter Craine.

Land use in Bromborough Pool is predominantly industrial as the village was created as a model village associated with industrial activity in the 19th century (Donald Insall Associates 2009, 9). Port Sunlight, a well known industrial centre, lies only a short distance to the north and large commercial properties, such as the Volkswagen showroom also characterise the area. Bromborough Pool village is a designated conservation area and the Mersey foreshore at this point lies within the New Ferry SSSI.

3.3.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 1 of the study area (Johnson 2011). It did not highlight Bromborough Court House and

Moated Site as being potentially at risk of coastal erosion as the preferred SMP2 policy for this area is 'Hold the Line' for the next 100 years. The site lies over 700m inland from the shore and is therefore also not at risk of damage during the construction of seaward defences. Nevertheless, the SMP2 documentation highlighted this site as potentially at risk of increased flooding and possible loss. This is largely due to the close proximity of the tidal inlet of Bromborough Pool which skirts the northern boundary of the site. It has therefore been included in the Phase 2 survey to assess this risk.

Named as 'Bromborough Court House, Moated Site and Fish Ponds', this site is a Scheduled Monument (SAM: 1012503), designated because it is a particularly large example of a medieval moated site and is associated with the 11th century manor and court house of St Werbugh's Abbey. The site has been entered on to the Scheduled Monuments at Risk Register with its principal vulnerability being vandalism.

The site was recorded through the Phase 1 aerial photography transcription as two ditch sections on the west and south, forming an L-shaped enclosure, and two ponds; one outside the enclosed area and one within (NRHE: 67341). Post-medieval ridge and furrow was also noted within the enclosure (NRHE: 1475256).

Trial excavations were conducted immediately outside the south-west corner of the site in 1979 by D. J. Freke for Liverpool University Rescue Archaeology Unit. The excavation did not uncover any evidence of medieval occupation, except as pasture in the area outside of the enclosure and it also showed that the moat had been thoroughly re-cut, probably in the 18th century based on pottery evidence (Freke 1980, 47-50). Spoil from the original excavation of the moat had been thrown up onto the outer bank, however the excavation could not determine whether this was the original arrangement or whether it was done as part of the modifications to the ditch in the 18th century (Freke 1980, 47-50).

3.3.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area covered the scheduled area and immediate vicinity, as well as the banks of the tidal inlet at Bromborough Pool identified as the principal threat to this site.

3.3.4 Prehistoric and Romano-British

No Prehistoric or Romano-British archaeology was identified during the course of the survey.

3.3.5 Medieval

Bromborough village, to the south of Bromborough Pool, has recently been put forward as the possible location of the Battle of 'Brunanburh' in *c.*937 in which Hiberno-Norse, Scots and British forces were defeated by the Anglo-Saxon King Æthelstan and his brother Edmund (Donald Insall Associates 2009, 12). The tidal inlet at Bromborough Pool, to the north, has therefore been linked with the battle as the possible landing site of the northern lords. This remains highly speculative as it has long been thought that the battle was fought in other locations including modern day South Yorkshire (Vickers 1971, 11-12).

Bromborough Pool moated site is thought to be the location of the 11th century manor and court house of the monks of the Benedictine St Werburgh's Abbey in Chester, now

Chester Cathedral (Jones 1979, 35). Buildings which may have been the manor and court house are mentioned in documentary sources dating to 1284, but no remains survive at the site, save for a possible building platform in the centre (Freke 1980, 50). In 1676 a new court house was erected by the Hardwares who retained it until *c.*1900. It was then split in two and tenanted, possibly to workers of the nearby Prices Candle Factory that was established as a factory and model town in 1854. The earliest reference to a moat at the site is a map of *c.*1750 (Freke 1980, 50).

The survey recorded the remains as consisting of three sides of a rectilinear ditched enclosure (217). The moat, if complete, would enclose an area of *c.*3ha making it a very large example of this type of monument. It is currently *c.*3m in depth for most of its length and has slight internal and external banks (Figure 3.11). The northern stretch of the moat was shallower and less substantial, at *c.*1.8m in depth, and this perhaps explains why it was not recorded in the Phase 1 aerial photography transcription. Although the moat was dry at the time of the survey, it is known to fill with water at certain periods throughout the year (Figure 3.12). A water-filled pond was also noted to the west of the enclosure, together with a dry pond inside the enclosure on the north-west corner.

The site is significantly overgrown (Figure 3.13), preventing a detailed analysis of remains within the enclosed area. Several patches of ruined masonry were noted, however, possibly marking the remains of the post-medieval court house known to have occupied the site. No evidence of a building platform associated with the medieval manorial building was noted during the survey, though this is described in the scheduling information.

Several concrete blocks associated with an over-ground pipe network were noted during the course of the survey, though the pipework has now been removed (Figure 3.14). These are partially buried and may have disturbed buried archaeological deposits. They are spread over a large area of the north and east of the site.

Figure 3.11 Western stretch of the moat at Bromborough (scale = 1m)

Figure 3.12 Southern section of the moat filled with water.

Figure 3.13 Interior of Bromborough Moated Site showing the level of tree cover.

Figure 3.14 Example of a concrete footing for the (now removed) over-ground pipe network. These are located throughout the north and east of the enclosure.

3.3.6 20th Century

As an industrial centre, Bromborough Pool and the surrounding area was a notable target during the Second World War. The Phase 1 aerial photography transcription mapped extensive Second World War features such as air-raid shelters, road blocks, pill boxes and bomb craters in the vicinity of Brombough Moated Site. The majority of these sites have since been demolished.

The survey recorded two pill boxes on either side of the A41 to the west of Bromborough Pool (218). This stretch of the A41 (New Chester Road) was completed in 1833 by Thomas Brassey and is still an important routeway from Birkenhead to Chester (Haynes 2005, 58). The Second World War pill boxes recorded were placed to protect this routeway and were associated with a road block to the south. The road block was mapped in the Phase 1 aerial photography transcription (NRHE: 1475251), however no remains were identified during the course of the Phase 2 survey.

The pill boxes are Type 22 or FW3/22 which was the most common form of pill box in the country consisting of a regular hexagon with gun ports on each side except for the one that had the entrance (Lowry 1996, 82). The examples recorded at Bromborough Pool are constructed of concrete with brick-lined gun ports and are *c.*20m² in area (Figure 3.15).

Figure 3.15 Pill boxes either side of the A41 at Bromborough Pool.

3.4.7 Threat from erosion

Bromborough Pool lies within the inner zone of the Mersey Estuary in policy unit 11a 7.1, which recommends 'Hold the Line' for the next 100 years.

The Mersey Estuary extends from the mouth at Liverpool to the tidal limit at Warrington. It is bottle-shaped in plan with a narrow deep entrance channel and a wide inner basin leading to the meandering channel. The inner zone is 5.5km wide and extends for *c.*20km (Halcrow 2011). The strong tidal currents in the Narrows reduce upstream as the estuary widens, leading to deposition of sand and mud, which form extensive inter-tidal banks at low tide (Blott *et al.* 2006). There is a mean spring tidal range of *c.*9m and this large range results in the estuary almost completely drying out at low tide.

Up until *c.*1842 the estuary had only two main channels, where it now has three, and until the Manchester Ship Canal was constructed in 1894 the channels oscillated over the whole width of the estuary (Halcrow 2011). By 1936 all three channels had become more defined and the main channel had moved significantly northwards, resulting in erosion along Dungeon Bank to the north and accretion along Stanlow and Ince Banks to the south. By 1977, this situation had reversed as the channel shifted southwards, resulting in accretion along Dungeon Bank and erosion in the south. Between 1906 and 1977, the sediment levels in the estuary generally increased and mapping evidence shows that in the Bromborugh Pool area *c.*400m of land has been reclaimed since the Ordnance Survey 1st Edition map (Figure 3.16).

The overall response of the Mersey Estuary to sea level rise is uncertain and the Shoreline Management Plan does not provide erosion estimates for the coastline at Bromborough (Halcrow 2011). The principal threat to features recorded at

Bromborough is increased flood risk caused by rising sea levels and increasingly chaotic weather systems. The moated site (217) lies within the EA flood risk zone (2008) and although the SMP2 policy of 'Hold the Line' will maintain flood defences at the mouth of the tidal inlet, this could have the adverse effect of forcing storm surges inland up the river channel, thereby increasing the likelihood of flooding. The tidal inlet has steep-sided banks that appear to have been artificially modified and the high-tide mark at the time of the Phase 2 survey was *c.*3m below present ground level (Figure 3.17). Whilst flooding and erosion are not currently causing a problem at Bromborough Pool Moated Site, there is increased likelihood for flooding and damage in the future and it is considered that the site will be at risk of flooding in the long term, i.e. within the next 100 years.

The Second World War pill boxes recorded (218) are not considered to be at immediate or longer term threat of coastal erosion or flooding.

Figure 3.17 Tidal inlet at Bromborough Pool adjacent to Bromborough Pool Moated Site.

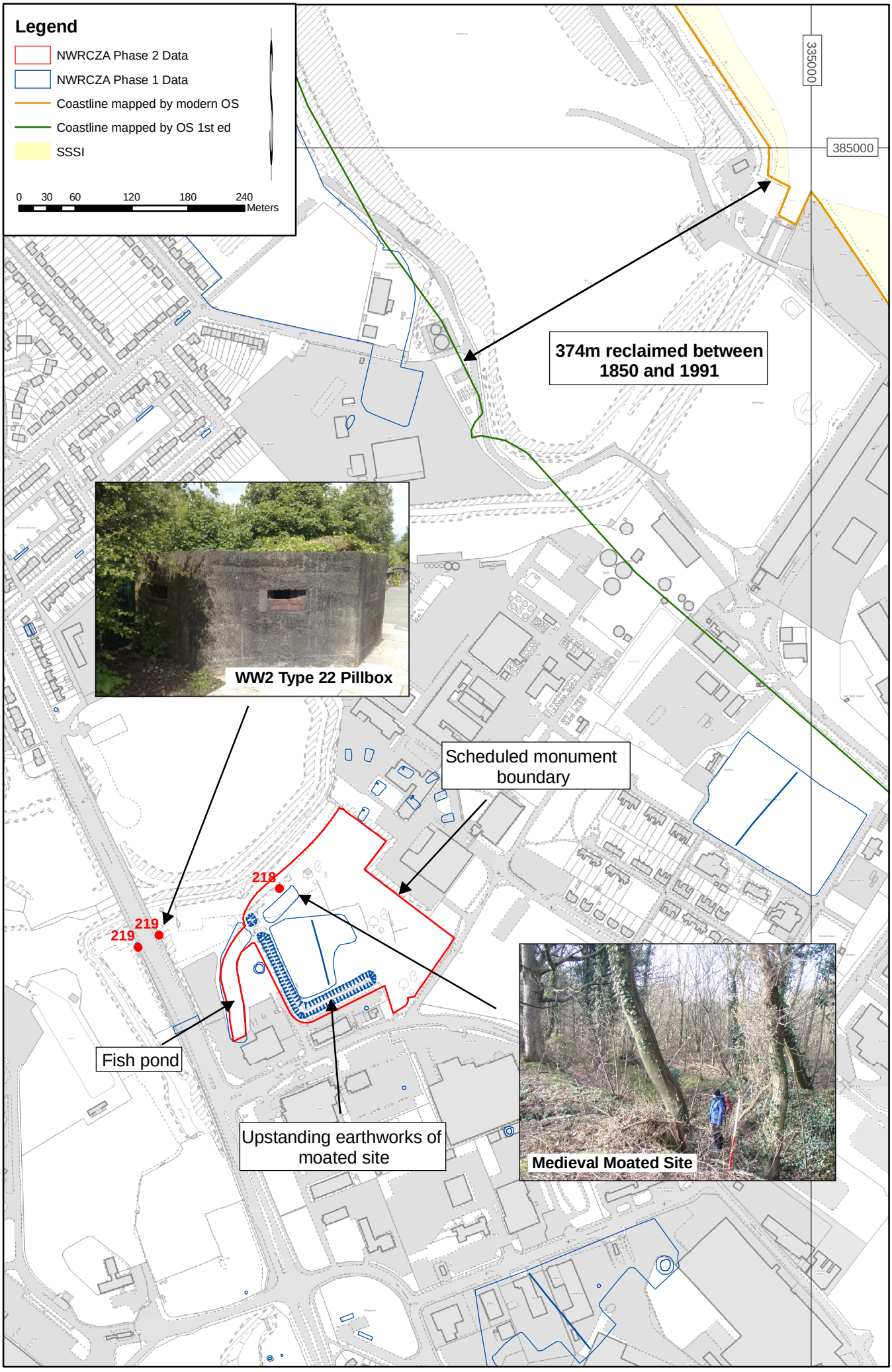

Figure 3.16 Location of sites surveyed at Bromborough Pool.

3.4 Dungeon (Map Figure 3.22)

3.4.1 Location and geology

Dungeon lies in a small bay on the banks of the River Mersey between Oglet and Hale Head (SJ 4501 8201), *c.*14km south of Liverpool's Pier Head. It began as a small fishing hamlet and probably takes its name from the Old English Dunge or Denge, meaning land of, or next to, the marsh (Royden 1992). On the foreshore Dungeon lies at 12m AOD rising to 22m AOD further inland.

The Mersey Estuary is a drowned valley that formed along a geological fault which has been modified by sub-glacial meltwaters infilling after the last glacial re-advance (Halcrow 2002). The bedrock geology of the Wirral and Liverpool area predominantly consists of Triassic sandstones, with Pebble sandstones in the upper reaches of the estuary around Runcorn and Widnes. The superficial geology is dominated by Devensian Till deposits with a complex sequence of coastal deposits (BGS 2008). Within the River Mersey, there are extensive Holocene tidal flat deposits and in the area of Dungeon, between Hale and Garston, the Shirdley Hill Sand Formation is predominant (Figure 3.18). The principal soil in the Dungeon area is Seasonally Wet Deep Sandy, which is suited to cereal production and grassland (Farewell 2007).

Figure 3.18 The River Mersey at Dungeon Point looking west towards Hale Head. ©Sue Adair.

Land use in the Dungeon area is limited as it now sits in a relatively isolated location owing to the development of Liverpool John Lennon Airport on its east side and the encroachment of the River Mersey to the south. The area is publicly accessible and forms part of the Mersey Way which runs from Rixton in the east to Garston in the west. It is in recreational use, frequented by walkers, plane spotters, off-roaders and quad-bike riders. The Mersey Estuary is a designated SSSI.

3.4.2 Previous research
The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 1 of the study area (Johnson 2011). It highlighted Dungeon Lane Saltworks as being potentially at risk of erosion under the preferred SMP policy of 'No Active Intervention'. It also highlighted the potential damage caused by off-road vehicles using the area for recreational purposes (Johnson 2011, 80).

Dungeon Lane saltworks was surveyed and partially excavated by the Merseyside Industrial Heritage Society (M.I.H.S) in the late 1980s after the society became aware of the site following storm action that revealed a chamber below river level. This chamber and the associated Hale Cliff Wharf were the focus of the investigation, which also included a short map regression and a survey of erosion characteristics on the wharf (Forshaw 1998). Since this work, the underground chamber has been made safe by the insertion of a man-hole cover over the entrance, but no further research work or mitigation has been undertaken at the site.

3.4.3 NWRCZA Phase 2 Archaeological Investigation
The archaeological survey of this area covered the remains of Dungeon Lane Saltworks and Hale Cliff Wharf, together with a walkover survey of the immediate vicinity.

3.4.4 Prehistoric, Romano-British and Medieval
No Prehistoric, Romano-British or medieval archaeology was identified during the course of the survey.

3.4.5 Post-medieval
Until the Industrial Revolution, Dungeon had been a small fishing hamlet consisting of a series of fishermans' cottages (demolished in the early 1990s), Dungeon Marsh and surrounding fields (Royston 1992). In 1670 rock salt was discovered in Marbury, whilst prospecting for coal, and this led to the exploitation of the Cheshire saltfield (Barker and Harris 1954, 5). The Mersey Estuary was ideally located for salt production due to its proximity to both the Cheshire saltfield and the coalfields at nearby St Helens (Barker and Harris 1954, 5).

The earliest surviving reference to salt production at Dungeon is in 1692 when it was described as 'in production' (Forshaw 1998, 2) and in 1694, Thomas Johnson, the founder of the Dungeon Saltworks, is named in a document concerning the newly imposed Customs Duty (Royden 1992). By 1733 a salt collectors report stated that Dungeon had '2 panns [sic] 12 feet long, 9 feet broad and 1 foot deep which are filled and drawn generally thirteen times a week and each pann produces about 25 bushels every drawing' (Forshaw 1998, 2). This had expanded to 'four pans' by the time of its sale to John Ashton in 1746, who then improved navigation routes from Dungeon to the St Helens coalfields with the construction of the Sankey Canal (Barker and Harris 1954, 20).

The saltworks appear to have stayed in production until the 1840s when Dungeon once again became a fishing enclave (Royden 1992). The reasons behind its closure are unclear although the silting up of the River Mersey may have been a factor, along with degradation of the canalised transport routes. By the end of the 19th century the associated wharf was used as a ship-breakers yard. This closed in 1912 as the channels leading to Dungeon were no longer navigable by large ships (Royden 1992).

The post-medieval saltworks is recorded in the Merseyside HER (HER: 4582-001).

The field survey recorded the remains of the saltworks as consisting of a small quayside or wharf (148), with a salt chamber and various eroding sections of buildings (198). The wharf (148) is constructed of well-coursed dressed red sandstone blocks (*c.*0.8m x 0.2m x 0.4m) and runs for a length of *c.*65m with a slight dogleg at *c.*25m (Figs 3.19 and 3.20). It stands to a height of *c.*1.8m at its eastern extent rising to *c.*2.25m to the west. Forshaw suggests that the dogleg may mark the location of a juncture between two phases of the quay, one pre-dating the saltworks and one established to suit the needs of the industry (Forshaw 1998, 4). A large portion of the wharf wall has been reconstructed using bricks laid to English garden bond indicating that the wharf went through several phases of modification and repair. The bricks are handmade and measure 9"x3½"x2¼", and therefore pre-date 1803 when a standardised brick size of 9"x4½"x3" was introduced following the brick tax (Cunnington 2002, 147; Iredale and Barrett 2002, 22). Assuming the bricks have not been reused, this modification therefore pre-dates 1803. Forshaw states that this brick walling is associated with the erection of warehousing at the site (Forshaw 1998, 4).

The survey of the wharf conducted by the MIHS provides a stone-by-stone record of the structure and also a detailed assessment of its erosion characteristics. This uses the following headings 'dressing still on stone face', 'slight erosion to stone face', 'considerable erosion with even wearing', 'erosion resulting in change of shape of the stone', 'missing pointing leaving voids' and 'uneven erosion', and as such it provides a basis by which future erosion of the wharf can be measured. Forshaw also draws attention to the sites of old navigational aids along the wharf and various iron fittings (Forshaw 1998, 4).

Figure 3.19 Remains of red sandstone and brick wharf looking west (scale = 1m).

Figure 3.20 Dogleg in the course of the wharf, possibly indicating the juncture between two phases of construction. Looking west

The MIHS excavation also revealed a section wharf running on a different alignment to the upstanding remains. This was thought to date to the 18th century and abruptly abutted the salt chamber, suggesting that the chamber was inserted into it and therefore post-dates the wharf (Forshaw 1998, 5). Post excavation, the remains were subsequently re-buried and no evidence of the second section of wharf was identified during the course of the survey.

The circular underground saltchamber (198) is only partially exposed and its original lower portions are constructed of handmade bricks laid to English bond (Figure 3.21). Again these bricks can be said to pre-date the brick tax of 1803 (see above). More modern repair work is evident in the upper courses, probably attributable to the MIHS who consolidated the chamber against further erosion in 1991 (Forshaw 1998, 1). The remainder of the chamber is grassed over and a man-hole cover protects the entrance.

The excavation of this feature, conducted by the MIHS, revealed a brick-built chamber below river level, permitting river water to enter the chamber at Spring Tide. Openings in the roof of the structure were used to load in rock salt, which would form a saturated brine solution when mixed with the sea water. This would be drawn out of the chamber to be heated to refine the salt (Forshaw 1998, 6; Royden 1998). The wall of a second chamber was also identified during the MIHS survey, though this was not excavated. No evidence of the second chamber was recorded during the Phase 2 survey.

Further remains of eroding sections of brick walls, possibly associated with the saltworks, were recorded as points during the Phase 2 survey (198). These may be the remains of industrial buildings or warehousing.

Figure 3.21 Partially exposed, circular brick-built salt chamber on the left of the photograph with World War II anti-tank blocks ('dragon's teeth') re-deposited in front to protect it from erosion. Looking east (scale = 1m).

3.4.6 20th Century

Adjacent to the remains of Dungeon saltworks, a series of Second World War anti-tank blocks, not present in the Merseyside HER, were recorded as part of the survey (197). These would have been placed across the foreshore to hinder the movements of invading forces and have been moved to their current location at an unspecified date. They currently provide the saltchamber and a short stretch of the coast with some protection from erosion (Figure 3.21).

3.4.7 Threat from erosion

Dungeon lies within the inner zone of the Mersey Estuary in policy unit 11a 7.8, which recommends 'No Active Intervention' for the next 100 years.

The inner zone of the Mersey estuary is 5.5km wide and extends for *c.*20km (Halcrow 2011). The strong tidal currents in the Narrows reduce upstream as the estuary widens, leading to deposition of sand and mud, which form extensive inter-tidal banks at low tide (Blott *et al* 2006). There is a mean spring tidal range of *c.*9m and this large range results in the estuary almost completely drying out at low tide.

By 1936 all three channels in the estuary had become more defined and the main channel had moved significantly northwards, resulting in erosion along Dungeon Bank to the north and accretion along Stanlow and Ince Banks to the south. By 1977, this situation had reversed as the channel shifted southwards, resulting in accretion along Dungeon Bank and erosion in the south. Between 1906 and 1977, the sediment levels in the estuary generally increased, however recent studies suggest that the rate of infilling has slowed and erosion is now evident (Pye *et al* 2002; Blott *et al* 2006). Mapping evidence

shows a retreat of *c.*10m from the shoreline depicted in the 1st edition Ordnance Survey and the modern shoreline (Figure 3.22).

The overall response of the Mersey Estuary to sea level rise is uncertain. A cliff erosion study commissioned by Speke Garston Coastal Reserve Steering Group (Pye and Blott 2004) quantified historical erosion rates between Garston and Dungeon Lane and showed that over the past century, the soft cliffs have eroded by 10m. However, work by Pye and Blott (2004) suggests that over the next 50 years, the continued northerly migration of the main channel, as well as increases in mean sea level, tidal surges and wave activity, may increase cliff recession rates at Speke Garston Coastal reserve by 50%. This means that cliff recession could be in the order *c.*0.15m per year. Predictions currently sit at erosion of 1m-1.5m in 0-20 years; 2.5m-3.75m in 20-50 years and 5m-7.5m in 50-100 years (Halcrow 2011).

Coastal erosion has already caused heavy damage to the remains at Dungeon Saltworks and the associated Hale Cliff Wharf, as shown in Figure 3.23. Based on the predicted levels of future erosion (Figure 3.22), the wharf (148) and anti-tank blocks (197) are considered to be at immediate threat from coastal erosion, whilst the salt chamber (198) and building remains (198) are considered to be under long-term threat (i.e. damage will occur within the next 100 years). The preferred policy of No Active Intervention will see further erosion of these features.

Figure 3.23 Eroding remains of sandstone quay and brick buildings, looking north-west (scale = 1m).

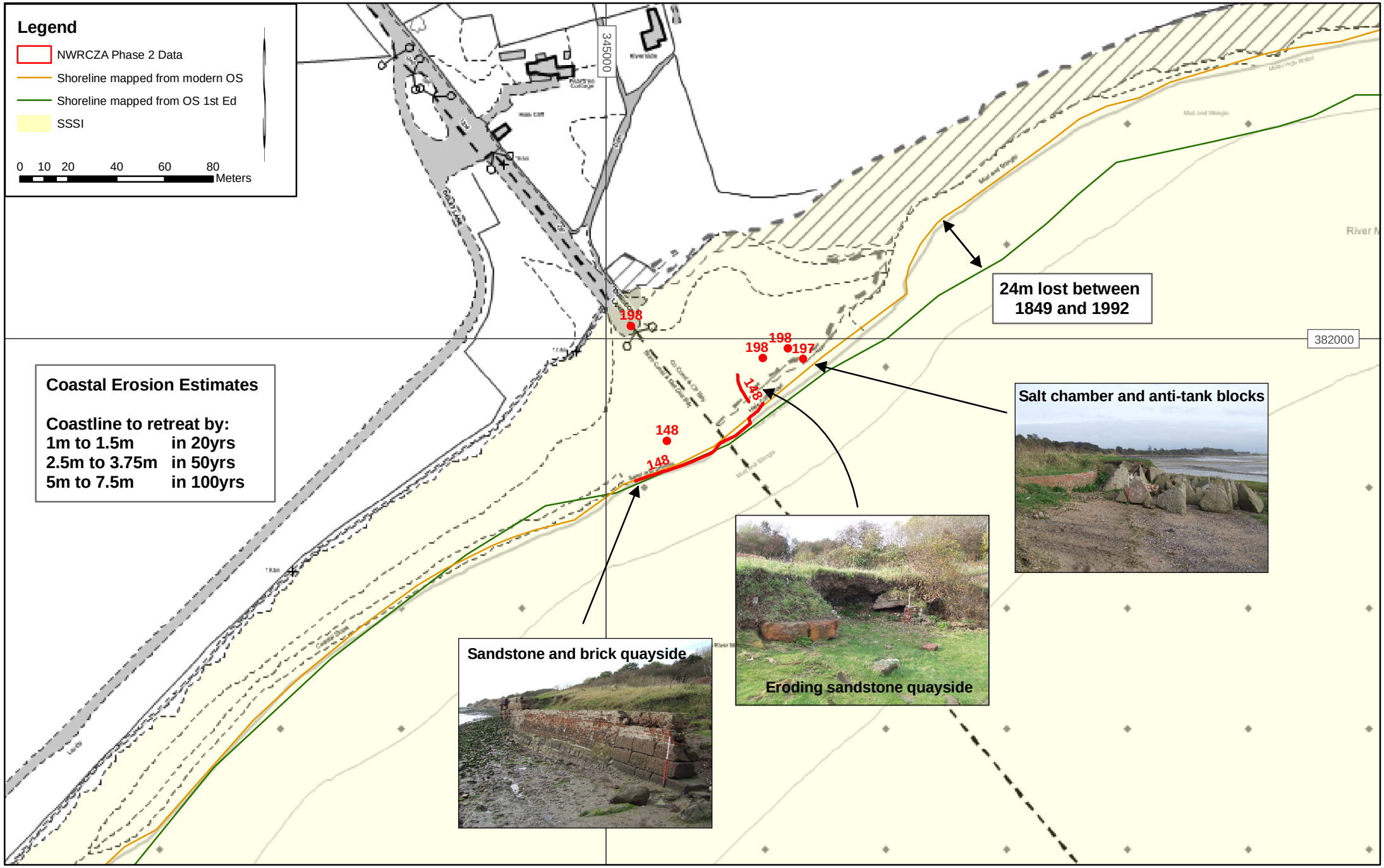

Figure 3.22 Location of sites surveyed at Dungeon Lane.

3.5 Crosby (Map Figure 3.27)

3.5.1 Location and geology

Crosby (SJ 3019 9938) lies on the Sefton Coast at the northern mouth of the Mersey Estuary and south of the River Alt. It is *c.*1.3km northwest of the docklands of Liverpool and c.0.67km south of Formby Point. It is composed of a series of settlements along the Irish Sea Coast namely Great Crosby, Little Crosby, Blundellsands, Waterloo, Brighton-le-Sands and Thornton.

The bedrock geology of the Sefton Coast is predominantly Triassic Sidmouth Mudstones (BGS 2008) with extensive wind-blown sands forming the superficial geology of the Crosby area (Figure 3.24). These are backed by sand dune systems which have been significantly modified with man-made seaward defences (Halcrow 2011). The principal soil along the Crosby foreshore is Dune Sand which has limited agricultural potential and is more suited to recreational use and coniferous woodland.

Figure 3.24 Crosby beach featuring Anthony Gormley's 'Another Place' art installation, looking southwest.

Whilst at one time the towns of Crosby would have been discrete settlements, the area now has the appearance of a single urban conurbation, north of which lies the West Lancashire Golf Club. The beach is publicly accessible and forms part of the Sefton Coastal Footpath. It houses the permanent Anthony Gormley 'Another Place' art installation consisting of 100 cast iron statues facing out to sea. The foreshore is in recreational use, frequented by dog-walkers and tourists. Crosby beach lies within The Sefton Coast SSSI.

3.5.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 2 of the study area (Johnson 2011). It did not highlight the potential for prehistoric footprints

in the Crosby area as no previously recorded footprints existed that far south of the well-known footprints at Formby Point. It did, however, state that extensive fieldwalking programmes in Little Crosby and Ince Blundell had revealed the presence of Mesolithic activity in the nearshore area that would most likely extend to the present shoreline (Johnson 2011, 114).

The presence of possible prehistoric footprints preserved in exposed silts at Crosby beach has been known since at least the late 1990s and in 1996 Gordon Roberts photographed bovine hoofprints in an exposure of estuarine silts along this stretch of coast (Mark Adams and Gordon Roberts pers. comm.). However, no human footprints had ever been fully recorded and analysed before being re-covered by wave action and wind-blown sand. This has led to a focus of recording on the footprints at Formby Point, where they are well-known and better understood (Roberts 2009). In December 2011, however, a newly recorded silt exposure at Crosby showed two distinct tracks of possible prehistoric footprints which have been recorded as part of a Heritage Lottery Funded, community-based programme of recording under the Sefton Coast Partnership (Current Archaeology 265 2012, 10). This programme aims to increase local knowledge and foster local people to actively participate in the management of this archaeological resource.

3.5.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area involved an extensive walkover of Crosby beach.

3.5.4 Prehistoric

In December 2011 two distinct tracks of human footprints extending for *c.*5m were recorded in exposed silts at Crosby beach by Gordon Roberts and the Sefton Coast Partnership (Figure 3.25). Gordon Roberts has been influential in the analysis of footprints in the Formby area (see Section 3.6.2) and he believes the Crosby footprints were made by three well-built adult males and could be as much as 6000 years old (Current Archaeology 265 2012, 10).

The field survey, conducted in early February 2012 revealed a series of exposed laminated silt deposits extending for a length of 526m along the foreshore (239). The Crosby promenade is protected by a concrete revetment topped with a wave return wall and is further supplemented by a dump of First World War building debris (HER: MME9501) forming a seaward defence (Figure 3.26). Unfortunately at the time of survey no footprints were visible in the exposed silts highlighting the rate at which these features can be destroyed or re-covered once exposed.

Figure 3.25 Exposed silts with preserved prehistoric footprint trails at Crosby Beach, looking east. © Mark Adams, National Museums Liverpool.

Figure 3.26 Exposed silts on Crosby beach, looking south (scale = 1m).

3.6.5 Threat from erosion

Crosby lies on the Sefton Coast at the northern mouth of the Mersey Estuary in policy unit 11a 8.1, which recommends 'Hold the Line' for the next 100 years. This states; 'only intervene when assets are at risk. Maintain existing defences to appropriate standard. Maintain Alt training walls'.

The eastern Irish Sea is characterised by strong tidal currents and the Sefton Coast is macrotidal, with a mean spring range of *c.*9m. It is transitional between open coast and estuarine regimes and is influenced by processes in the Mersey, Liverpool Bay and the Ribble (Halcrow 2011). The Mersey and Ribble estuaries generally act as sinks for sediment within the system. Most of the Sefton coastline relies on dune systems as a natural protection against inundation. At Crosby this has been supplemented with seaward defences that have created a shallow bay resulting in the net accretion of sand (Halcrow 2011). Wind-blown sand still creates a nuisance in the surrounding towns and sand is occasionally removed from Crosby to manage this problem. The course of the River Alt, to the north of Crosby, has also been altered with a training wall built in the 1930s to direct its course away from the shoreline. The behaviour of the Crosby coastline is largely dependant upon this river course and the training wall has helped to reduce erosion of the Crosby dunes.

The SMP2 states that if the training walls of the River Alt were not maintained, or were breached during storm events, then the seaward defences at Crosby would be at risk of erosion. Under this scenario, the present shoreline is predicted to relocate 50 to 100m landward of its current position. The SMP2 policy of 'Hold the Line', however, states that the training wall for the River Alt will be maintained for the next 100 year period and this should mitigate the risk of dune erosion at Crosby. The SMP2 does note, however, that there is a risk of wave action overtopping the defences due to sea level rise and the current management policy does not address this issue.

The silt exposures noted during the Phase 2 survey (239), and in December 2011 when footprints were recorded, can only have been revealed by the process of coastal erosion causing the removal of sand in the inter-tidal zone. This may indicate a recent shift in coastal processes from accretion to erosion. The process that brings these remains to our attention is also the process by which they are damaged and destroyed and the maintenance of the seaward defences will not afford protection to heritage assets already exposed in the inter-tidal zone. Immediate further damage to these remains is inevitable. The maintenance of seaward defences should protect any unknown buried archaeological deposits in the dune system, however, any associated groundwork may also damage such unrecorded heritage assets. This is despite the SMP2 statement that the preferred policy will have 'no known impact on the historic environment'.

The current programme of footprint recording under the Sefton Coast Partnership is due for completion next year, after which time it is hoped that the local community will continue to record and monitor the remains. Production of a formalised management plan and systematic recording and monitoring methodology is a priority for the future.

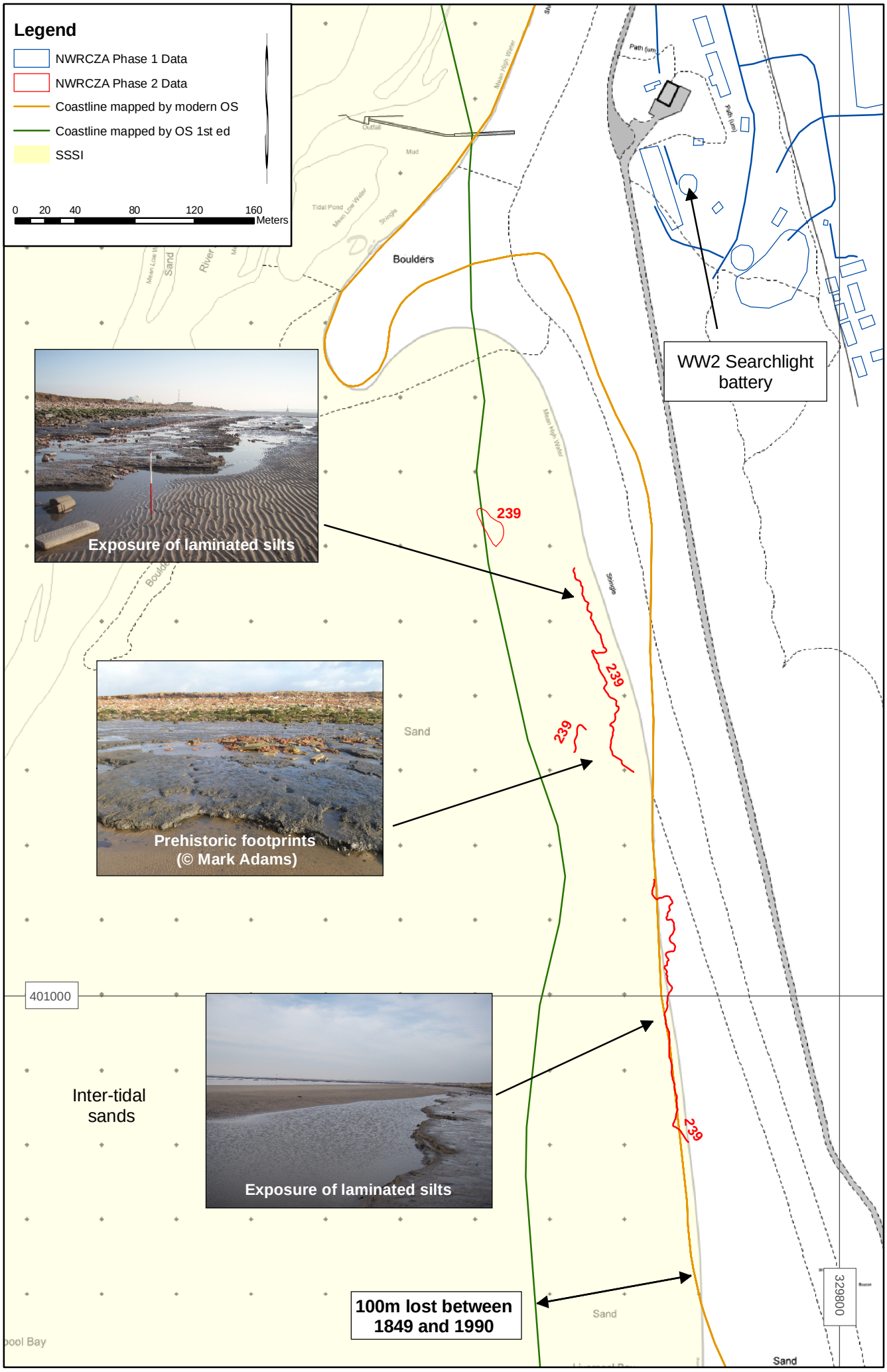

Figure 3.27 Location of silt and mud exposures surveyed at Crosby.

3.6 Formby Point (Map Figure 3.3.7)

3.6.1 Location and geology

Formby Point (SD 2664 0678) lies on the Sefton Coast, north of the mouth of the Mersey Estuary. It is 1.25km south of the seaside town of Southport and 1.86km north-west of the docklands of Liverpool.

The bedrock geology of the Sefton Coast is predominantly Triassic Sidmouth Mudstones (BGS 2008) with extensive wind-blown sands forming the superficial geology of the Formby area (Figure 3.28). These are backed by extensive sand dune systems said to be the largest in England, providing the area with some degree of renown (Doody 1991). The wind-blown sands overlie peat and estuarine muds along Formby Point on the western edge of Downholland Moss (Pye and Neal 1991, 41). The shoreline topography of the area is influenced by shallow waters and a wide inter-tidal zone, characterised by a series of sand banks which feature well-developed ridge and runnel formations (Halcrow 2011).

Figure 3.28 View of Formby Point showing the wide sandy beach backed by dune formations. Looking north.

Land use at Formby Point is predominantly recreational and educational as the area is conserved and managed as a nature reserve by the National Trust. Inland from the point the affluent town of Formby has a population of *c.*25000, many of whom commute to nearby Liverpool. Formby Point lies within the Formby Sand Dunes SSSI.

3.6.2 Previous research

The NWRCZA Phase 1 study looked at this part of the coastline as part of Block 2 of the study area (Johnson 2011). It highlighted the prehistoric footprints as being at risk of erosion under the preferred SMP policy of 'Managed Realignment'.

The presence of ungulate imprints in occasional intertidal silt exposures along the foreshore of Formby Point had been noted locally since the 1950's, but their provenance was unknown. Their increasing frequency at the end of the 1980's prompted Roberts to devote much of the following two decades to an almost daily routine of recording, analyzing and interpreting these footprints (Roberts *pers comm.*). He has developed an extensive private archive of maps, photographs, plaster casts and other information relating to the footprints and the past environment of the Formby area (Roberts 2009).

The Sefton Coast Partnership is currently undertaking a Heritage Lottery Funded community-based programme of recording and monitoring of the footprints. This aims to increase local knowledge and foster local people to actively participate in the management of this archaeological resource. At the time of writing, the project is underway with the first major round of recording completed, under the management of Dr Mark Adams from Liverpool Museum Field Archaeology Unit. The project will run for another year, after which time it is hoped that the local community will be sufficiently skilled to continue to record and monitor the footprints on a more systematic basis (Mark Adams pers. com.).

3.6.3 NWRCZA Phase 2 Archaeological Investigation

The archaeological survey of this area involved an extensive walkover of Formby beach and revealed prehistoric footprints preserved in laminated silts, the remains of Formby lifeboat station and three post-medieval shipwrecks.

3.6.4 Prehistoric

The majority of work on the prehistoric footprints at Formby Point has been conducted by Gordon Roberts. By October 2004 219 different human trails of varying lengths had been recorded (Roberts 2009, 42). Of these, 179 have provided sufficient information to enable stature and gait characteristics to be calculated in detail. The footprints show the movements of men, women and children, together with roe deer, red deer, wild boar, dogs/wolves, unshod ponies, aurochs, wading birds and unshod horses (Roberts 2009, 41). These are preserved within laminated silts and muds dated through Optically Stimulated Luminescence to the Late Mesolithic to Early/Mid Neolithic period and they represent a fascinating record of past environments and human activity (Roberts 2009, 40-41). In addition to these, a superior, dune-edge peat stratum dated to the Iron Age also contains the hoofprints of domesticated oxen, suggesting the existence of a settlement beneath the dunes (Roberts 2009, 39). Once exposed, however, all of these remains are at immediate risk from further erosion and destruction (Roberts 2009, 38-9). An interpretation panel by Sefton Council, located inland of the dune system, provides information on the prehistoric footprints.

Two areas of exposed silts and muds containing potentially prehistoric human and ungulate footprints were recorded as part of the Phase 2 survey (149 and 150).

The first recorded exposure of silt (149) containing potentially prehistoric footprints was a narrow band measuring 162m x 12m. This contained one very well-defined human footprint (Figure 3.29), showing the characteristic pointed toes interpreted as the drag caused by unclipped toe nails (Roberts 2009). Further imprints in the silt may have been the remains of more eroded human footprints and several well-defined ungulate tracks were also identified (Figure 3.30). There was a significant amount of damage to this exposure of silt caused by 4x4 vehicles and this represents a further threat to the remains

(Figure 3.31). This exposure was initially recorded in July 2011 and by October 2011 it had been re-covered with wind-blown sand.

Figure 3.29 Very well defined human footprint on exposed silt at Formby Beach (scale = 0.2m graduations).

Figure 3.30 Ungulate footprints on exposed silt at Formby Beach (scale = 0.2m graduations).

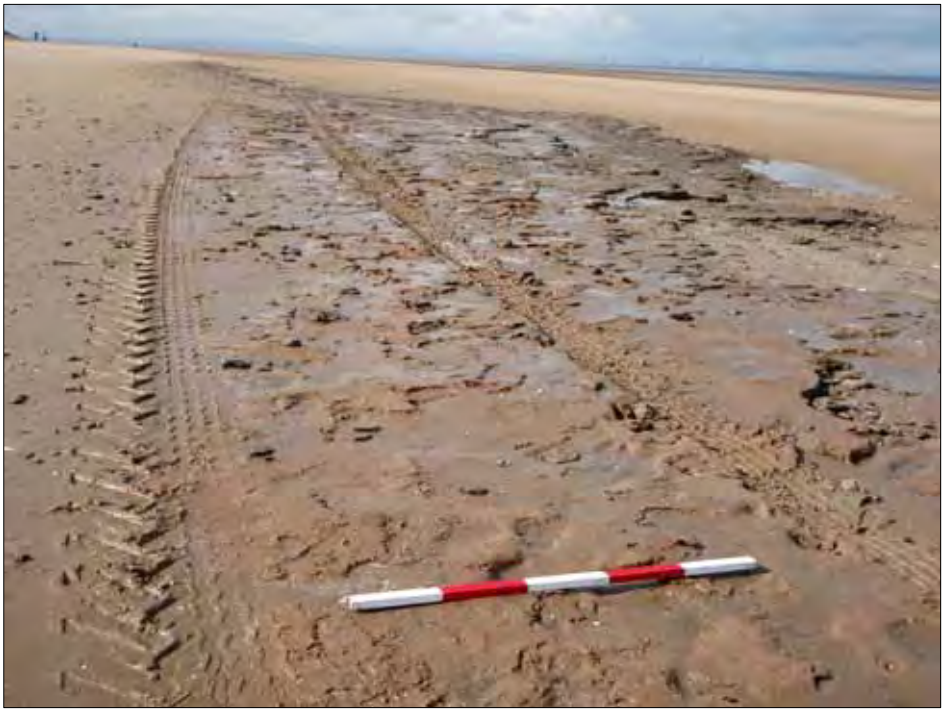

Figure 3.31 Vehicular damage to exposed silt containing prehistoric human and ungulate footprints at Formby Beach. Looking south (scale = 1m).

Figure 3.32 Recording of exposed human trails under the Sefton Coast Partnership Scheme.

The second recorded exposure of silt (150) containing potentially prehistoric footprints was a larger area, measuring 283m x 24m. This contained several well-defined tracks of human footprints which were in the process of being recorded by undergraduate student,

Ronan Mooney, as part of the Sefton Coast Partnership Scheme. This involved marking the footprints using different coloured flags (Figure 3.32), completing pro-forma record sheets, recording their location on a handheld GPS unit and undertaking a photographic record (equipment supplied by the Partnership Scheme). This detailed record will be provided to the Merseyside HER and will allow for the future analysis of the footprints, should they be destroyed by erosion or re-covered by wind-blown sands.

3.6.5 Romano-British to Medieval
No Romano-British or medieval remains were identified during the course of the survey.

3.6.6 Post-medieval
The draining of mosslands and other active land management techniques in the 18th century, together with the growing importance of the port town of Liverpool, allowed Formby and other areas on the Sefton Coast to develop as seaside leisure resorts (Jones *et al* 1993, 8-12). The most successful of these was Southport to the north. Increased population led to major changes in the area, as asparagus farming reached its peak and attempts were made at large-scale dune afforestation to protect the asparagus fields (Jones *et al* 1993, 11-12).

At this time of increased development of the coastal belt, Formby was chosen as the location for the earliest dated lifeboat house in the country. Documentary evidence shows that between 1745 and 1946 over 300 vessels were damaged or sunk on the banks of the Mersey and Ribble Estuaries (Sefton Council). The lifeboat house at Formby was established between 1771 and 1776 in response to this growing threat, as increased numbers of vessels were making their way to the ports of Garston and Liverpool. It was the only lifeboat house to serve Liverpool Bay until 1803 and it remained in operation until 1918, when it was decommissioned and the building turned into a tea rooms.

Evidence of this maritime history was recorded during the Phase 2 survey as the remains of the lifeboat house (199) and three shipwreck sites (151, 152 and 153). The lifeboat house has been reduced to foundations following its demolition 1965. These consist of a sloping base of handmade bricks with keyed-in red sandstone blocks, measuring *c.*10m x *c.*20m (Figure 3.33). The remains are partially buried in sand and some damage is apparent on the northernmost corner. An interpretation panel by Sefton council, next to the remains, gives an explanation of the feature.

Three shipwreck sites were recorded in Phase 1 of this project as part of the aerial photograph transcription. The three vessels described below are likely to be the same three vessels mapped in Phase 1. Archaeology in the inter-tidal zone is difficult to accurately locate through aerial photography due to the lack of control for the photographs. The Phase 2 survey has more accurately located these features.

The best-preserved shipwreck recorded as part of the survey (151) consists of the bow or stern of a timber sailing vessel with a single mast surviving (Figure 3.34). The remaining sections measure *c.*26m x *c.*11m and stand at varying heights up to 2m at the mast. The timbers are degraded and covered in mussels, but are still recognisable as a possible schooner-type vessel.

Figure 3.33 Foundations of the 18th century Formby lifeboat house looking north-east (scale = 1m).

Figure 3.34 Bow or stern of a timber sailing vessel looking south-east (scale = 1m).

The second shipwreck recorded (152) consists of eight remaining timbers, covering an area of *c.*23m x *c.*5m and is almost fully buried in sand. The morphology of the vessel is no longer recognisable (Figure 3.35).

Figure 3.35 Remains of a timber vessel. Looking south-east (scale = 1m).

The third shipwreck recorded (153) consists of three iron L-shaped brackets and a single timber baulk. The remains cover an area of *c.*9m x *c.*8m. The morphology of the vessel is no longer recognisable (Figure 3.36).

Figure 3.36 Remains of an iron and timber vessel or structure looking west.

3.6.8 Threat from erosion

Formby Point lies on the Sefton Coast at the northern mouth of the Mersey Estuary in policy unit 11a 9.1, which recommends 'Managed Realignment' for the next 100 years. This states; 'allow the dune system to evolve naturally with limited intervention to manage dunes, and manage adaptation in the erosion risk zone'.

The eastern Irish Sea is characterised by strong tidal currents with a mean spring range of *c.*9m at Formby Point (Halcrow 2011). Waves from the west and west-north-west are refracted as they approach the shore, resulting in a focusing of waves onto Formby Point (Pye and Neal 1994). This has created an inter-tidal drift divide, with sediment being removed from Formby Point and redistributed to the north and south.

There was a change from net accretion to net erosion around Formby at the turn of the 20th century and since then the beach and dunes have continued to erode. Dune erosion at Formby is primarily driven by storm events, as during normal tides the toe of the dunes is beyond wave action and the wide inter-tidal zone dissipates wave energy (Halcrow 2011). The level of erosion during these severe conditions is dependent upon the characteristics of the storm; the most severe occurred in February 1990, when up to 14m of dune recession was recorded (Pye 1991).

Pye and Neal (1993) state that there is little evidence to suggest that the erosional trend at Formby Point will reverse naturally in the near future, however the rate of erosion has slowed and the system may be beginning to reach a point of dynamic equilibrium. The system is still vulnerable to storm surges, however, and any recovery along the central section would be restricted by the limited sediment input. In 2000 the Coastal Defence Issues and Strategy (Sefton Council, 2000) predicted that by 2050 the coastline between Lifeboat Road and Victoria Road would erode by 150m, whilst that north of Victoria Road would erode by 270m. In 2007 Sefton Council (2007c) made further predictions of potential shoreline change, using Bruun Rule to take account of sea level rise. Their studies estimate an erosion rate of 49m to 88m by 2025; 109m to 278m by 2055; and 237m to 681m by 2105 for the coastline between Fisherman's Path and Lifeboat Road.

The footprints noted at Formby Point (149 and 150) are only revealed by the process of coastal erosion. Thus the process that brings these remains to our attention is also the process by which they are damaged and destroyed. This is exacerbated by damage caused through vehicular access and the use of the beach for recreational activities. Based on predicted levels of future erosion (Figure 3.37), immediate further damage to these remains is inevitable, as is damage to any unknown remains in the dune system, as dune rollback progresses. This is despite the SMP2 statement that the preferred policy will have 'no known impact on the historic environment'.

The current programme of recording work at Formby under the Sefton Coast Partnership is due for completion next year, after which time it is hoped that the local community will continue to record and monitor the remains. Production of a formalised management plan and systematic recording and monitoring methodology is a priority for the future. The lifeboat house (199) and shipwrecks (151, 152 and 153) recorded will also be at immediate risk of further damage caused by coastal erosion.

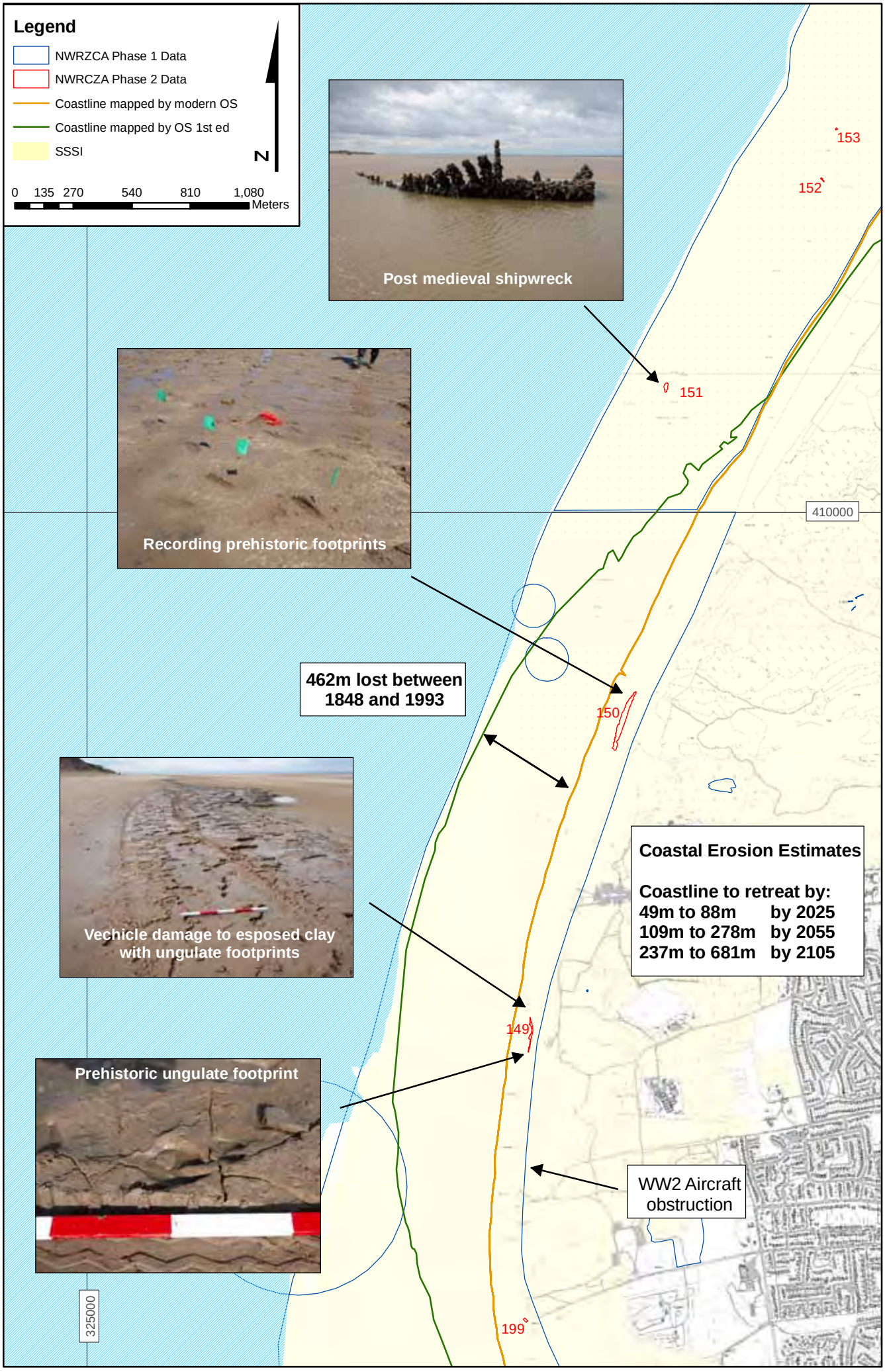

Figure 3.37 Location of sites surveyed at Formby Point.

3.7 Summary and conclusions

The archaeological survey of targeted sites in Merseyside revealed significant remains of prehistoric, medieval, post-medieval and 20th century archaeology at risk of erosion. These are summarised in Table 3.2 below which also provides an updated assessment of the special interest of each site and an updated assessment of the risk of coastal erosion, based on field observations. The assessment of special interest is subjective and not absolute, but is based upon the field teams' informed professional judgement. These initial assessments will be further refined in Chapter 7 and used as the basis to assess the level of threat to heritage assets along the entire coastline. This prioritisation will inform the development of management proposals.

Site name	NWRCZA 2 No:	SMP 2 policy at this site	Special Interest	Risk
Lithic sites and Midden, Hilbre Island	No evidence	HTL	High	High
St Hildeburgh's Chapel, Hilbre Island	No evidence/146	HTL	High	High
Lifeboat station, Hilbre Island	145	HTL	Medium	High
WW2 air-raid shelter, Hilbre Island	147	HTL	Low	Low
Bromborough Moated Site	218	HTL	High	Medium
WW2 Pillboxes on the New Chester Road	219	HTL	Low	Low
Saltworks, Dungeon	198	NAI	High	High
Hale Cliff Wharf, Dungeon	148	NAI	Medium	High
WW2 anti-tank blocks	197	NAI	Low	High
Crosby prehistoric footprints	239	HTL	High	High
Formby prehistoric footprints	149, 150	MR	High	High
Lifeboat house, Formby	199	MR	Medium	High
Shipwreck: possible schooner, Formby	151	MR	Medium	High
Shipwreck, Formby	152	MR	Low	High
Shipwreck, Formby	152	MR	Medium	High

Table 3.2 Summary of sites recorded during the Phase 2 archaeological survey

The same level of threat of coastal erosion does not apply to all areas covered by the survey in Merseyside, and the same level of special interest does not apply to all of the sites surveyed.

Clearly Formby Point is the area most at risk, with erosion predictions in the region of up to 600m in the next 100 years. Ironically, this is perhaps the area with remains of the highest special interest as a site of preservation of prehistoric human and animal footprints (149, 150) as well as potential paleoenvironmental and archaeological remains below the sand dunes. The use of 4x4 vehicles on the beach is adding to the damage caused to exposed remains and should be restricted to designated areas, or at least monitored when there is known to be exposures present in the inter-tidal zone. Priorities for the future should include the production of a formalised management plan and systematic recording and monitoring methodology, and the publication and presentation of the extensive archives of information recorded over the past 40 years. This should also extend to include the newly recorded footprints exposed on Crosby Beach, c.0.67km south of Formby (239).

The survey at Hilbre Island did not record any evidence of prehistoric lithic scatters and middens, however, the construction of sea defences is likely to be invasive and may still damage buried archaeological deposits of prehistoric and later date. The same can be said

for any buried remains of St. Hildeburgh's Chapel, which was also not located during the course of the survey. The recorded remains of the lifeboat station (145) represent an interesting time in Hilbre's history when it was more central to the maritime navigation of the Dee Estuary and beyond. The remains warrant recording and preservation, beginning with consolidating the slipway and roofing the structure. This could perhaps be done with a view to repurposing the station for recreational use.

The moated site at Bromborough (217) is at risk in the long term, i.e. within the next 100 years, of flooding due to sea-level rise and increasingly chaotic weather systems. The site is currently ill-understood as it is scheduled as a medieval moated site, said to contain the remains of the manor and court house of St Werburgh's Abbey, but excavations at the site have revealed no evidence of occupation, save for use as pasture, before the 18th century (Freke 1980, 50). As the site is at risk, a series of well-targeted excavations may shed more light on this monument allowing for a well-informed assessment of its significance and the justification for its designation. This will inform management options for the future.

The salt chamber at Dungeon (198) has high special interest, as a very well-preserved example of this particular technique of salt refining (Forshaw 1998). As well as this, Dungeon can be viewed as a representative site for the exploitation of the Cheshire saltfields and is of importance especially in the development of the port and town of Liverpool (Royden 1992). There are significant problems at the site caused by its present remote location. Vandalism has been noted with interpretation panels being damaged and the present use of the area for quad-bikes and off-roading does little to add to the aesthetic qualities of the location. The preferred SMP2 policy of 'No Active Intervention' will see the remains of the saltworks come under threat of erosion in the long term, i.e. within the next 100 years. A decision should be taken, before this occurs, as to whether the site is to be actively defended owing to its significance, or whether it should be fully investigated and recorded and then left for nature to take its course.

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