St James Area Redevelopment Dover

Archaeological Monitoring of Geotechnical Investigation

Geotechnical Monitoring Report

oxford archaeology

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Geotechnical Monitoring Report

Little St James Area Redevelopment
Dover
Kent

Archaeological Report on Monitoring and Recording during Geo-technical Survey at Dover, Kent

NGR TR 321 414

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SUMMARY

Between April and May 2008 Oxford Archaeology (OA) carried out a programme of monitoring and recording during a geotechnical survey in the St James area of Dover Kent. The investigation was commissioned by CgMs Consulting Ltd on behalf of Bond City Development Ltd in advance of re-development of the site.

In total 41 geotechnical interventions, along with data from previous archaeological work, were assessed in order to further characterise the sub-surface (geo)archaeological sequence. Correlation of lithological data into key stratigraphic units has allowed the creation of a preliminary deposit model for the site.

The model demonstrates that significant topographical and sedimentary variation is present underlying the development area .The sequence comprises two phases of storm beach development (typified by interbedded sands and gravels) and phases of estuarine sedimentation (typified by silt and peat formation). These deposits overlie soliflucted chalk and gravel. The estuarine deposits have generally remained waterlogged and should be considered of palaeo-environmental interest, The potential for the preservation or organic material is high, and may include the remains of wooden structures given the development lies on the site of the silted up Roman Harbour. The development is also immediately adjacent to the site of the Dover Bronze Age boat.

Overlying that natural sequence is a significant thickness of up to 4m of well-preserved, stratified, medieval and post-medieval archaeology. These deposits are generally sealed beneath a thin layer of modern made-ground, although there are localised areas of disturbance extending to greater depths. To the east of the development, in the Russell Street car park and adjoining land to the BP Garage, stratified archaeological deposits overlie the storm beach deposits between 2.5m and 4m in depth. Well-preserved archaeological remains in the form of stone, chalk and brick built structures with associated deposits, have been previously identified. To the west, between Dolphin Lane and St James Lane, the model indicates disturbance of up to 2m, and in the areas of former basements and the gas works this is likely to be much greater.

Overall the potential of the site to preserve stratified multi-period archaeological remains is considered high. It is likely that the development will impact on archaeological and waterlogged deposits that underlie the site that will require mitigation through design or excavation.

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The fieldwork was undertaken by Rob Tannerhill and Carl Champness. The report and stratigraphical model was produced by Carl Champness (Geoarchaeological Services, OA) . The project was managed by Richard Brown and Dan Poore.

Archaeological Report on Monitoring and Recording during Geo-technical Survey at Dover, Kent

NGR TR 321 414

1 INTRODUCTION

1.1 Location and scope of work

1.1.1 Bond City Ltd and ASDA are proposing to develop a new comprehensive mixed-use scheme in the St James area of Dover. The proposed development comprises an anchor superstore, smaller shops, restaurants, a 100 bedroom hotel, private residential flats, a Visitor Centre and a new landscaped 460-space shoppers' car park.

1.1.2 It is likely that the development construction will have some impact on archaeological remains that underlie the site and that these impacts will need to be addressed by conditions attached to planning permission for mitigation of the impact. Accordingly Bond City Ltd and ASDA have appointed CgMs Consulting to act on their behalf in relation to ensuring that archaeological and historical remains are appropriately considered during the process of development.

1.1.3 Some investigative works have already been carried out on the site (see below). A recent geotechnical investigation has been carried out across the site by STATS Limited. This has given an opportunity to gain further information about the site, which can inform archaeological and historical mitigation strategies for the development.

1.1.4 CgMs Consulting contracted Oxford Archaeology (OA) to monitor the geotechnical investigation. This report sets out the results of the monitoring exercise and details the geoarchaeological dataset that OA has generated in order to model the strata across site.

1.2 Geology and topography

1.2.1 The St James's site is to the south of Dover town centre, at NGR TR 321 414 (centred), and shown in Figure 1. It is roughly the area bounded by Woolcomber Street on the east, Townwall Street on the south, the River Dour on the west and the rear of the properties on Castle Street to the north. Presently, the site contains a vacant multi-storey car park and the Burlington House office block, together with the Russell Street car park and adjoining buildings.

1.2.2 The development site lies over the partially infilled River Dour estuary and historic harbour basin with chalk bedrock at its base. Surface levels across the site vary between 5.4 m and 7.6 m OD. Generally height changes reflect the underlying topography and therefore increase upslope away from the centre of the basin. However, there are also severe erratic surface undulations visible. No archaeological

investigation has recorded the level of chalk 'natural'. Boreholes indicate bedrock lies at a maximum depth of -20 m OD and is overlain by 8-9 m of chalk rubble (possibly solifluction deposits). These 'natural' deposits are overlain by sequences of silt and gravels, including an extensive sand and shingle spit which accumulated across the mouth of the harbour basin and formed the base of medieval occupation prior to full reclamation.

1.3 Archaeological and historical background

1.3.1 Desk-based assessments (DBAs) specific to the proposal area have been carried out by Canterbury Archaeological Trust (CAT 1997), and more recently by Foundations Archaeology (FA 2005). These comprehensively detail previous investigations and excavations and assess the site potential through the archaeological data and historic map regressions. The archaeological and historical background is not reproduced here, however, this document should be read in conjunction with the most recent DBA (FA 2005).

1.3.2 The work conducted within this area over the last 25 years has consistently indicated the presence of a sequence of early estuarine deposits and later, medieval, occupation evidence (Welby 1976, OA 1990b; Parfitt 1997). Previous geoarchaeological research on the sediments of the Dour (Bates, 1990) has revealed that a complex sequence of chalk bedrock, solifluction deposits, organic silts and sands with gravels underlie the area. Well-preserved, deeply stratified, archaeology overlies this natural sequence, with some of the earliest occupation being identified on a shingle spit, identified underneath the Russell Street car park. Between 2.5 m and 3.5 m of archaeological deposits have been previously identified, just 0.40 to 0.60 m below the present ground level (Parfitt, 1998).

1.3.3 In March 2008 Foundations Archaeology completed a trench evaluation in the south eastern part of the development area. The evaluation revealed well preserved archaeological remains in the form of stone, chalk and brick built structures, with associated wall and floor surfaces, cut features and soil deposits. These predominantly dated from the medieval, post-medieval and early modern periods, with residual prehistoric and Roman material. Only the very top of the archaeological deposits within the area could be investigated within the scope of the evaluation. Consequently the full depth of the archaeological deposits remains unknown.

2 AIMS

2.1.1 The main objective of the geotechnical monitoring was to provide additional base-line data regarding the character and archaeological potential of the sub-surface stratigraphy. It was intended the data be used to generate a predictive topographical deposit model, which can be related to the impact of the development and inform mitigation strategies for preservation (whether in-situ or by record) of archaeologically significant deposits.

2.1.2 Specifically the monitoring aimed to;

- Record and interpret the sediment sequence from the boreholes and trial pits with particular emphasis on identifying key stratigraphic units, e.g. bedrock, natural alluvial/estuarine and peat deposits, beach shingle and archaeological or 'man-made' deposits.
- Identify significant variations in the stratigraphic sequence indicative of localised features such as storm beach, organic and archaeological deposits.
- Identify the location and extent of any waterlogged organic deposits and address the potential and likely location for the preservation of archaeological and palaeoenvironmental remains.
- Clarify the relationships between marine/estuarine sediment sequences and other deposit types, including periods of 'soil' development, peat growth, archaeological deposits and the effects of relatively recent human disturbance, including the location and extent of made-ground.
- Characterise the sequence of pre-modern made-ground across the site including the retrieval of artefactual material for dating purposes.
- Relate the site sequences to previous (published and unpublished) archaeological and geoarchaeological work carried out within, and in the immediate vicinity of, the development area.
- To present a stratigraphic model for the site in order to help provide baseline data on the types and depths of deposits that will be encountered.

3 METHODOLOGY

3.1 Scope of fieldwork

3.1.1 The geotechnical investigations comprised a total of 41 sample locations distributed across the development area (Figure 2). A number of different sampling methodologies were employed including, 6 test pits, 8 cable percussive boreholes, 18 window samples and 9 continuous flight auger holes.

3.2 Fieldwork recording

3.2.1 The excavation of key geotechnical sample locations were subject to archaeological monitoring and recording. All trial pits were monitored to the full depth of excavation by an archaeological supervisor. Where practicable, archaeological features were hand sampled. In practice trial pits were not entered by OA staff beyond a safe working depth.

3.2.2 The deposit sequence observed during the borehole drilling was monitored on site by a qualified geoarchaeologist. The cores were logged using standard sediment terminology according to Jones *et al* 1999. This include information on colour,

composition, texture, structure, compaction, erosional contacts, artefactual and ecofactual inclusions.

3.3 Finds

3.3.1 All features and deposits were issued with unique context numbers. Context recording was in accordance with the previously established administration system for fieldwork recording and archiving for the project. All contexts, and any small finds and samples from them were allocated unique numbers. Bulk finds were collected by context.

3.4 Geoarchaeological modelling

3.4.1 The lithological data from the boreholes and testpits was inputted into geological modelling software (©Rockworks 2006 and ©ArcGIS*)* for analysis and correlation of deposits into key stratigraphical units. These units have been used to demonstrate the nature and the extent of sediment accumulation patterns across the site. Two cross-sections (Figure 4 and 5) have been produced in order to illustrate the main points of discussion.

3.4.2 A 3-D model has also been created from this data in order to better understand and interpret the sub-surface sedimentary sequence of the site (Figure 6).

4 RESULTS: GENERAL

4.1 Ground conditions

4.1.1 Current land-use across the development site comprises car parks, standing buildings and access roads. The majority of geotechnical interventions were drilled through tarmac and made-ground deposits. The distribution of boreholes was significantly restricted by access issues and not all interventions could achieve their full intended depth. This has limited site coverage in certain areas of the development.

4.2 Testpits

4.2.1 In total six test pits were monitored by OA as these offered the best opportunity to investigate the archaeological potential of the underlying sequence. Test pits 1 and 1A were dug at the eastern edge of the Russell Street car park, and revealed a deeply stratified sequence of archaeological deposits underlying a thin deposit of modern disturbance. A second group of test pits were dug just to the north of Dolphin Lane, in an area of waste ground. These revealed a sequence of estuarine clays and organic silts/peat, overlain by modern make-up.

Test pits 1 and 1A (Figure 3)

4.2.2 Mid reddish brown sand (907) was encountered at the base of Test Pit 1A at 4.30 m in depth. This was overlain by a natural mid greyish brown sandy silt (906). Between 3.90 m and 3.00 m light grey clay (905) was encountered and contained large rounded cobbles, frequent charcoal fragments, pottery and animal bone. The small

assemblage of pottery recovered indicated a late medieval date. This was overlain between two deposits of silt and grey clay (904 and 903) between 3.00 m and 1.10 m, with frequent gravel, chalk and charcoal inclusions. Based on the few fragments of pottery recovered, these deposits are believed to be post medieval in date. A possible wall foundation (902) was encountered between 1.10 m and 1.00 m. This was overlain by 0.50 m of mid greyish brown silt (901) and sealed by 0.50 m of modern deposits (900).

4.2.3 Test pit 1 contained a similar sequence of deposits to those identified in test pit 1A. Light grey clay (106), similar to (905), was recorded between 3.50 m and 2.90 m. Light greenish grey clay (105) was encountered between 2.90 m and 2.20 m. This deposit was sealed by a 0.10 m layer of black silt (104) rich in charcoal. This was overlain by three deposits of mid brownish grey silt (103, 102, and 101) between 2.10 m and 0.90 m, which were similar in nature to the post-medieval deposits identified previously. This was overlain by 0.90 m of modern disturbance (100).

Test pits 2, 3, 4 and 5 (Figure 3)

4.2.4 Test pits 2 and 3 revealed a sequence of estuarine silts and clay deposits, and peats. Mid brownish grey silt (205) with frequent shells was encountered at the base of Test Pit 2, between 3.20 m and 3.00 m. This was overlain by a thick deposit of dark brown partially humified peat (205) between 3.00 m and 2.36 m. A mid greenish grey slightly silt coarse sand with frequent grit-sized gravel was encountered between 2.36 m and 2.00 m. This was overlain by three deposits of mid to light grey slightly clayey silt (203, 202 and 201) between 2.00 m and 0.90 m. These deposits contained occasional small rounded pebbles and fine organic laminations. The upper deposits (201) produced occasional fragments of animal bones and charcoal. This was sealed by concrete and modern made-ground deposits (200).

4.2.5 A similar sequence of natural mid greyish brown clayey silt (303, 302 and 301) was encountered in Test Pit 3, between 2.60 m and 1.35 m. These deposits were slightly sandy with occasional pebble inclusions and fine peaty laminations. These were overlain by what appeared to be the same sequence of concrete and modern made-ground deposits (300) as described previously.

4.2.6 Test pits 4 and 5 encountered obstructions at depths of 1.50 m and 0.12 m respectively before being abandoned.

4.3 Borehole monitoring

4.3.1 Due to the nature and rapid pace of the borehole program a selection of 15 boreholes were monitored on-site. The selection was based on the type and quality of samples retrieved, their depths and location. The aim of the monitoring was to develop an understanding of the deeply buried stratigraphy not observable in the shallow test-pits. The records from the other shallower boreholes (less than 4 metres in depth) were obtained later in order to help model the upper site stratigraphy.

4.3.2 The fifteen monitored boreholes (BH2, BH6, WS6, WS7, WS10, WS14, WS15, WS17, WS18, WS19, WS20, WS21, WS22, WS23 and WS24) produced a mixed sequence of deposits that indicated a range of different sedimentary environments existed across the development area. The sequences are best discussed in terms of the sediment types that exist within specific areas of the development.

Russell Street Car Park

4.3.3 This area contains laterally extensive well-preserved and deeply stratified archaeological deposits. The archaeological potential of these deposits have been previously considered in more detail (OA 1990b, Parfitt 1997, and Foundation Archaeology 2008). The test pits and boreholes indicate archaeological deposits down to a depth of just under 4 m overlying natural sands and storm beach deposits. Underlying this sequence are marine sands, and compacted Pleistocene gravels. The chalk bedrock (or possible solifluction deposits) were encountered at a depth of 13.30 m (-7.06 m OD).

Dolphin Lane

4.3.4 The area to the north of Dolphin Lane was formerly occupied by buildings of Leney's Brewery. Previous work has indicated that the upper parts of the archaeological sequence may have been removed by later cellars (Parfitt, 1992). One testpit (TP2-5) and a borehole (CFA5) located just off the lane indicate the preservation of an estuarine sequence of sediments beneath modern basement foundations.

East Kent Bus Garage

4.3.5 The garage occupies part of the former site of old Dover Gas Works which was dug 6 m down into estuarine deposits of the River Dour. The remains of a section of the Roman harbour were identified during the excavation of the gas works in 1855-6. Several of the boreholes (CFA4, CFA4 and CFA3) were drilled through a thick sequence of modern deposits associated with the Gas Works. Away from this area a limited number of boreholes (CFA2, WS6, WS7 and WS10) indicate a sequence of early deposits associated with the former Dour Estuary.

St James Lane and the multi-storey car park

4.3.6 With the exception of borehole 2, all other samples could not be drilled beyond a depth of 1.00 m. This may reflect either the presence of former basements, or dense gravel deposits within the area that impeded drilling. The limited number of samples obtained within this area indicated a 1.5 - 2.0 m deep sequence of alluvial silts and organic deposits overlain by storm beach deposits. The Pleistocene gravels were encountered at a depth of 11.40 m (-6.50 m OD).

4.4 Deposit model

4.4.1 Based on the result of the geotechnical monitoring a stratigraphic sequence for the site has been developed to aid in the assessment of the archaeological and palaeoenvironmental potential. The following sequence has been proposed:

- Chalk/soliflucted bedrock
- Gravels
- Sandy alluvium
- Organic silts and peat
- Storm beach deposits
- Wind blown sands/beach
- Archaeological fills
- Modern disturbance

Pre-Holocene deposits and basement stratigraphy

4.4.2 *Bedrock:* The chalk bedrock was recovered within only a limited number of boreholes (BH6, BH8A, BH9, BH10) as a structureless chalk composed of creamy slightly sandy silt with occasional medium to coarse angular to sub-angular white chalk. The angularity of some of the chalk and gravel inclusions may indicate that parts of this deposit represent soliflucted chalk rather than in-situ bedrock. The chalk was encountered between 0.00 m OD (BH9) and -7.50 m OD (BH10). The chalk appears to dive down at the eastern edge of the Russell Street Car Park, southwards towards the River Dour.

4.4.3 *Gravels:* Overlying the chalk is a unit of well compacted gravel recovered in all the deeper boreholes (BH2, BH6, BH7B, BH8A, BH9 and BH10) as dense light brown slightly sandy gravel. The clasts were predominantly medium to coarse angular to sub-rounded flint with some chalk inclusions. The gravels were recovered between 3.00 m OD and -6.00 m OD. The gravels appear to follow a similar profile to the chalk, indicating the presence of a Pleistocene channel.

4.4.4 The development lies at the eastern edge of the mouth of the River Dour valley. The valley has a broadly asymmetric profile that may reflects significant alteration of its sides by periglacial erosion (Bates, 1990). The chalk and Pleistocene gravels dip gradually downwards across the development area from east to west. They do not start to rise up until just west of the Heritage Centre. They provide the template upon which later Holocene sedimentary patterns were determined.

Holocene sediment sequence

4.4.5 *Marine sands/silts:* The sand represents the first episode of Holocene sedimentation representing encroachment of marine conditions within the site. The sands were recovered as a dense light-brown slightly gravely sand/silt with sub-rounded gravel within a limited number of boreholes (BH2, BH6 and BH10). These deposits were identified between -6.5 m OD and -1.0 m OD.

4.4.6 *Storm beach deposits:* The storm beach deposits were recovered as light brown sands and well rounded to sub-rounded gravels. The deposits consisted of interbedded sand and gravels that represented aeolian and marine deposition. The gravel units potentially represent the formation of a shingle spit created by processes of long-shore drift.

4.4.7 Two distinct episodes of storm beach formation were identified within the site sequence. One episode appears to have accumulated underneath the Multi-storey car park between – 5.70 m OD and +0.50 m OD. Slightly later deposits developed underneath the Russell Street Car Park between -1.50 m OD and + 3.75 m OD. It is this later unit that was initially stabilised and formed the first area reclaimed and utilised for early medieval settlement.

4.4.8 *Organic silts and peats:* A complex series of organic deposits were recovered from the boreholes just off the Russell Street Car Park storm beach deposits (BH10) and overlying the earlier storm beach deposits (BH2, WS6, CFA5). These were recovered as a firm fibrous peat, with the lower deposits being organic clay with peaty lenses. These deposits were identified between -1.5 m OD and +2 m OD, with the deepest and thickest deposits being located in the Bus Depot, near to where the Roman harbour was previously identified.

4.4.9 The 30 metre length of a substantial timber harbour wall or mole has previously been found associated with these organic deposits. The locations of three of the boreholes (CFA3, CFA4 and CFA4A) were taken through the backfilled deposits of the former Gas Works. Only Borehole CFA2 shows the seaward side of the outer harbour where a much deeper sequence of organic deposits were recorded. All the other samples represent the inner harbour area where the organic deposits were identified at higher elevations.

4.4.10 *Upper alluvium:* The upper alluvium was recovered as soft brown slightly sandy gravely clay within boreholes WS6, CFA5, CFA2. This accumulated between 0.00 m OD and +3.00 m OD. It contained frequent dumps of charcoal and bone indicative of medieval rubbish deposits.

4.4.11 *Wind-blown sands:* This unit was confined to the boreholes located within the Russell Street Car Park overlying the storm beach deposits and underlying the archaeological deposits. These deposits were only recovered in a small number of boreholes.

4.4.12 *Stratified archaeological fills:* A deeply stratified sequence of archaeological deposits was identified underlying the thin topsoil and modern deposits within the area of the Russell Street Car Park to a depth of 4 m. These deposits include the well-preserved remains of timber, chalk, stone and brick-built structures, with associated floor surfaces, cut features and soil development.

4.4.13 The archaeological deposits appear to extend across the entire development area, but are less well preserved to the west, in the area of Dolphin Lane and St James Street.

4.4.14 *Modern disturbance:* Over parts of the development area there has been significant disturbance of archaeological deposits by later building, basements and service trenches. The area to the west of the development between Dolphin Lane and St James Lane indicate disturbance to between 1-2 metres and in areas of former basements this is likely to be much greater. Whilst archaeological deposits may be disturbed within this area, important estuarine deposits have been shown to survive to a depth of 8 m. This is in contrast to the east, between Russell Street Car Park and adjacent to the garage, where undisturbed archaeological deposits lie between 0.40 m and 0.90 m below the present ground level.

5 3D STRATIGRAPHIC MODELLING

5.1.1 The stratigraphic framework that has been developed to interpret the site allows the generation of a 3-D model (Figure 6). The model is preliminary, based on the monitoring of the geotechnical investigations and previous archaeological investigations. It provides an insight into the sub-surface stratigraphy, with deposits represented by their upper and lower surfaces.

5.1.2 A representation of the Roman harbour and the projected line of the medieval town wall have been included in the model. Their position is based on the data collected during previous excavations. Due to the clustered distribution of sampling the model is most accurate within the central area of the proposed development. Beyond this area correlation between points become more tentative.

5.1.3 The current preliminary model is constrained by a number of factors:

- Many of the stratigraphic correlations are based on historical geotechnical records which do not always contain sufficient information
- The geotechnical sample locations were not evenly distribution across the proposed development area and large gaps exists within the data that was used to generate the model. Key areas like the area around the Roman harbour, East Brook Water and along the River Dour are not well represented.
- The stratigraphic sequence is only tentatively dated through stratigraphic interpretations and elevation data.
- Interpretations are based solely on field observation and correlation of elevations.

5.1.4 The development of a 3-D stratigraphic model provides a valuable tool as an aid to impact assessment and understanding the site's archaeological and palaeoenvironmental potential.

5.1.5 The advantage of 3D modelling has over conventional 2-D representation is that it is much easier to understand and communicate complex inter-stratified sequences. For example, the storm beach deposits are not continuous across the area, they consist of two separate discrete units and are associated with a number of different deposit types. 2-D cross-sections can sometimes give a simplified representation of a

sequence that can hide its complexities. 3-D modelling has the advantage that it can be viewed and tilted from any angle, providing a much greater understanding of the interrelationship of deposits and closer to reality. It also has the advantage that particular deposits or layers can be turned off in order to view the lower sequences more clearly.

6 DISCUSSION AND INTERPRETATION

6.1 Reliability of field investigation

6.1.1 The model is based on geotechnical investigation with limited access to open sections, which occasionally made interpretation of deposits difficult. However, the majority of boreholes did reach their intended depth and the sequence of vertical stratigraphy overlying the gravel and chalk, whilst not fully characterised in places, is broadly understood.

6.1.2 Whilst the coverage of the site area was limited in certain areas due to access and sub-surface ground obstructions, a reasonable interpretation of the range and preservation of surviving archaeological deposits and alluvial/estuarine sediments can be presented.

6.2 Overall interpretation

6.2.1 The model has successfully identified the types and depths of deposits that underlie the proposed development area. It presents a sequence of late-Devensian/Holocene sedimentation for the site. It also attempts to place previously identified archaeological features and deposits within a wider stratigraphic framework.

6.2.2 The incision of the river Dour into the Chalk of the North Downs probably occurred during the Pleistocene (over 10, 000 years ago). A complex sequence of gravel and chalk deposits filled the base of the valley. These deposits range from high energy fluvial gravels that were deposited in a braided river system. The presence of sub-angular gravel and chalk clasts within the deposit might indicate that they may also represent solifluction deposits derived from terrace stabilisation and cold climate colluviation rather than fluvial action.

6.2.3 Some difficulties exist with the interpretation of the lower part of the sequence that has been identified within the site area. Previous geoarchaeological work (Bates, 1990) has highlighted the difficulty in identifying different gravel and chalk units within borehole samples. Interdigitation between gravel units further complicate matters. In areas like the Russell Street Car Park where there is a sequence of superimposed gravel deposits, division of units is subjective and simplifies a complex sequence of deposition.

6.2.4 The deposition of estuarine sands/sands between -6.50 m OD and -1.50 m OD potentially represents the earliest Holocene deposition within the sequence (c.8000-7000BC). The sands potentially represent the beginning of marine incursions or estuarine sedimentation. These deposits are currently undated, although

stratigraphically they are likely to have accumulated in the early to mid Holocene (c. 8000-3000BC)

6.2.5 The organic silts and peat deposited between -1.50 m OD and +2 m OD, reflect the development of backwater marsh environments. These estuarine deposits have generally remained waterlogged and should be considered of palaeo-environmental interest. The potential for the preservation or organic material is high, and may include the remains of wooden structures. Remains of the Roman harbour, identified at the former Gas Works appears to be associated with this sequence of peat deposits and marine silts. This sequence of organic deposition has been previous shown to be much more complex then is represented within the geotechnical records. Martin Bates (pers. comm) has indicated that the lower peat units are believed to date from the Bronze Age, and the upper peats to the Saxon or early medieval period.

6.2.6 The storm beach deposits appear to have started to accumulate in the early to mid Holocene. The presence of tufa nodules within the gravels may indicate that they continued to form into the late prehistoric and Roman periods. The formation of the shingle spit may have been caused by, or at least exacerbated by, the affect of the Roman harbour. The interstratified deposits of sand and gravel represent periods of dune development and storm events.

6.2.7 Dover was an important settlement during the late Saxon period, with a Mint established from the 10th century and the Royal Fleet from the early 11th century. Post Roman silting of the estuary was presumably on-going throughout the period, although the exact location of the Saxon harbour is unknown. St James Street is believed to be of Saxon origin and closely follows the line of the shingle spit that infilled the Roman harbour. The outwash of the estuary appears to have run through the site in the area of the Bus Depot, although this is based on very limited data. The upper peat deposits were deposited in a backwater marsh environment away from the shingle spit.

6.2.8 The medieval town of Dover appears to have been situated on the western side of the valley, mostly within the area of the Roman and Saxon settlements. By the 12th century low status, timber built structures owned by fishing and seafaring families were constructed on the ridge of the shingle spit. These were located at the edges of Townwall Street at the high water tide mark. Settlement is likely to have spread quickly along the shingle spit, covering the area now occupied by the Russell Street Car Park. By the later medieval period much of the former estuary must have been reclaimed with the River Dour confined to its present course by the 14th century. Parts of the Flying Horse Lane Bridge and river culvert certainly contain late medieval stonework.

6.2.9 In 1324 there are references to the construction of a defensive stone wall around the town that would have extended across the former estuary. The exact line of the wall beyond the gate over the Dour is uncertain. Two possibilities exists as to its potential line. Historical accounts indicate the presence of the town wall either continued along

Townwall Street to enclose St James, or turning sharply and running northwest-southeast across the site in the area of the Bus Depot.

6.2.10 The town continued to grow in the post-medieval period, although the threat from the sea continued. The construction of various piers from the late 15th century onwards added to problems of shingle deposition.

7 SUMMARY CONCLUSIONS

7.1 Summary

7.1.1 Based on the results of the data collected and the model, the following conclusions can be drawn:

- The approach of three-dimensional mapping of the sub-surface stratigraphy is of value in understanding the formation of the site.
- The model provides a useful tool for planners as an indication of the type and depths of sediments that could be encountered It has also placed some of the previous archaeological discoveries identified within the area into a wider stratigraphic context.
- The work has identified the presence of deeply stratified archaeological deposits across the site. A sequence of up to 4 m has been identified in the east at the Russell Street Car Park and the adjacent to the BP Garage.
- The early estuarine deposits of the River Dour have generally remained waterlogged and should be considered of great palaeo-environmental interest. They have the potential to preserve containing preserved organic material, including important wooden structures associated with the Roman harbour.

7.2 Recommendations

7.2.1 As part of a detailed and well defined strategy for the site the following recommendations are proposed:

- To expand the model by including new data or previous collected data just outside and at the edge of the proposed development area. This will help to fill the gaps in the model. A large volume of unpublished data is know to exists for this area of Dover, which includes more borehole data, palaeoenvironmental studies and archaeological work. It would be beneficial to collate this data and incorporate it into the model.
- Establish a tighter chronological framework to the model using appropriate scientific dating techniques in order to confirm some of the interpretations made in this report.
- To use the model as a mitigation tool in modelling impact scenarios using the proposed planning design.

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Parfitt, K	1992	Report and Recommendation on the Evaluation Phase at Dolphin Lane, Dover (CAT. Report 1992)
Parfitt, K.	1997	The Dover Town Regeneration Initiative: Archaeological Implications Report (CAT report)
Parfitt, K.	1998	Dover Town Centre Investment Zone: Archaeological Appriasal Stage 2. (Cat Report)
Rigold, S.E.	1969	The Roman Haven of Dover. Archaeological Journal 126: 78-100
Welby, D.	1976	The Tidy Ruin: History of the Parish Church of St James the Apostle, Dover (Dover Archaeological Group)

APPENDICES

APPENDIX 1 SUMMARY OF SITE DETAILS

Site name: St James Area Redevelopment, Dover
Site code: DOSJ08
Grid Ref: TR 321 414
Type of evaluation: Geotechnical monitoring
Date and duration of project: April-May 2008
Area of site: 3.2 ha (7.9 acres)
Summary of results: 41 geotechnical investigations and previous archaeological work within the area of historic Dover harbour were assessed in order to identify the nature of the sub-surface stratigraphy and develop a deposit model. The model revealed a sequence of estuarine and gravel deposits with palaeoenvironmental potential, and potential to preserve organic material including wooden structures. Overlying this are significant thickness' of up to 4 m of well preserved medieval and post-medieval archaeology, sealed beneath thin deposit of modern made-ground. Only towards the west of the site has this sequence been truncated by later basements, foundations and service trenches.
Location of archive: The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES, and will be deposited with the Dover Experience Museum in due course.

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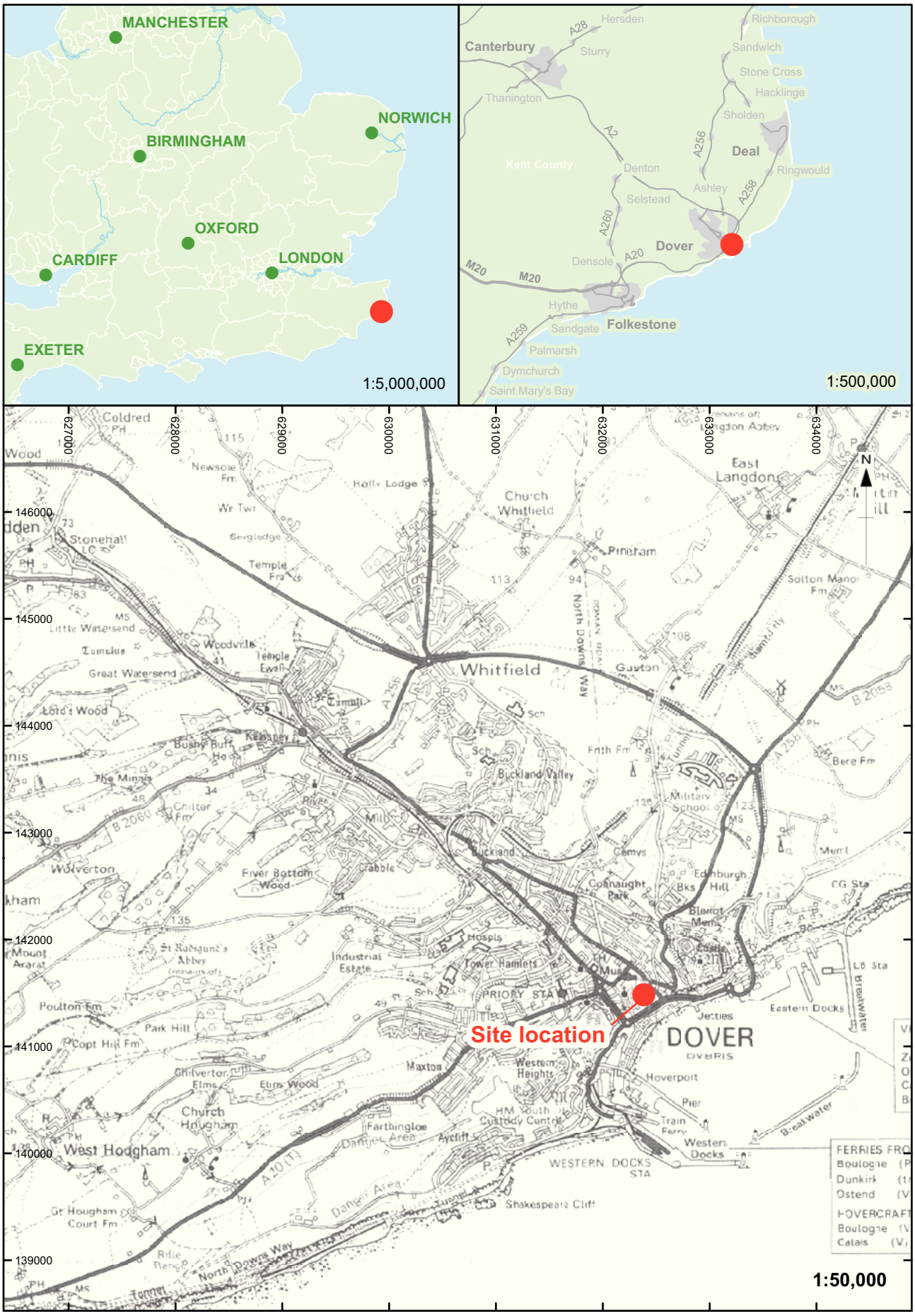
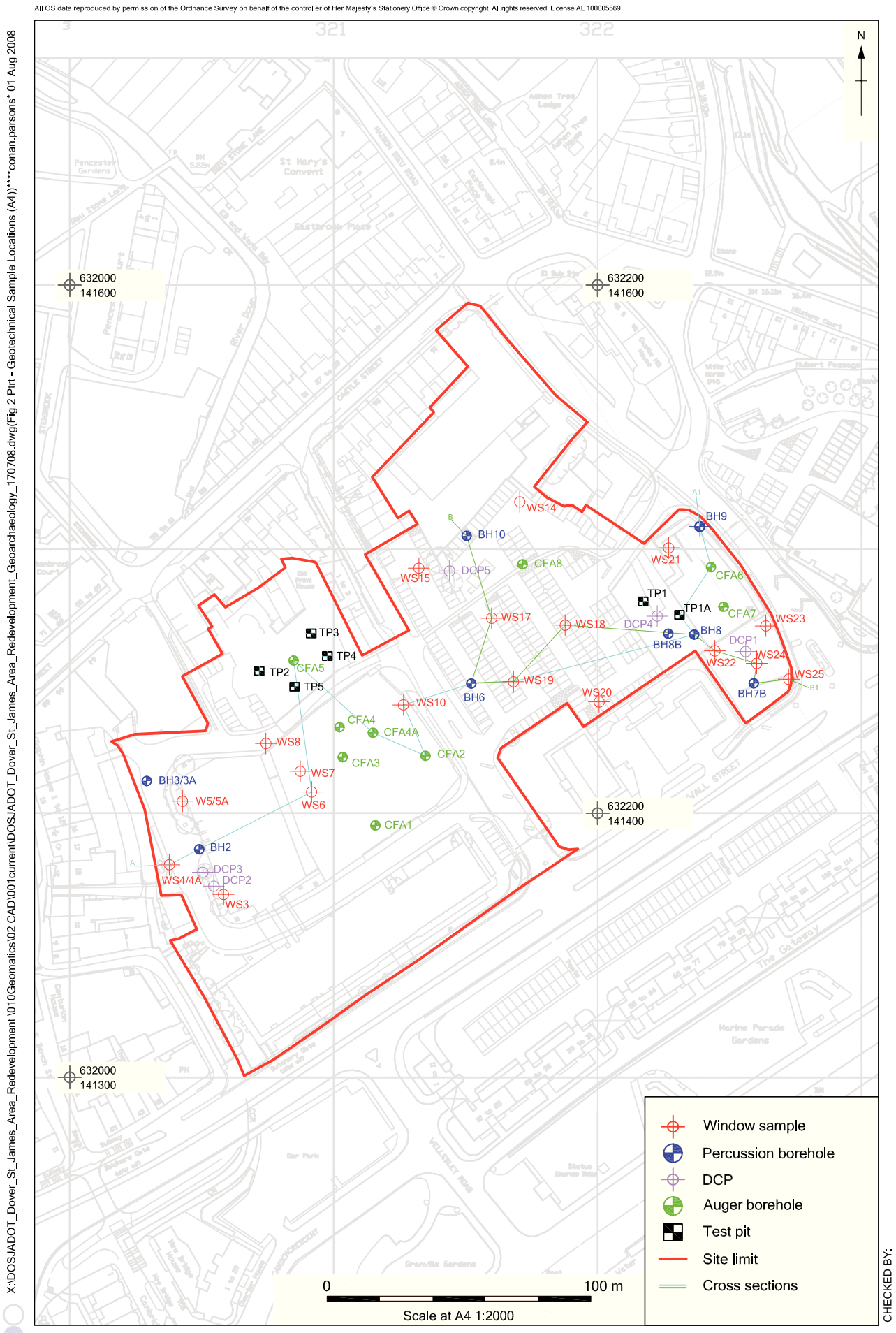


Figure 1: Site location



Figue 2: Geotechnical sample locations and cross sections.

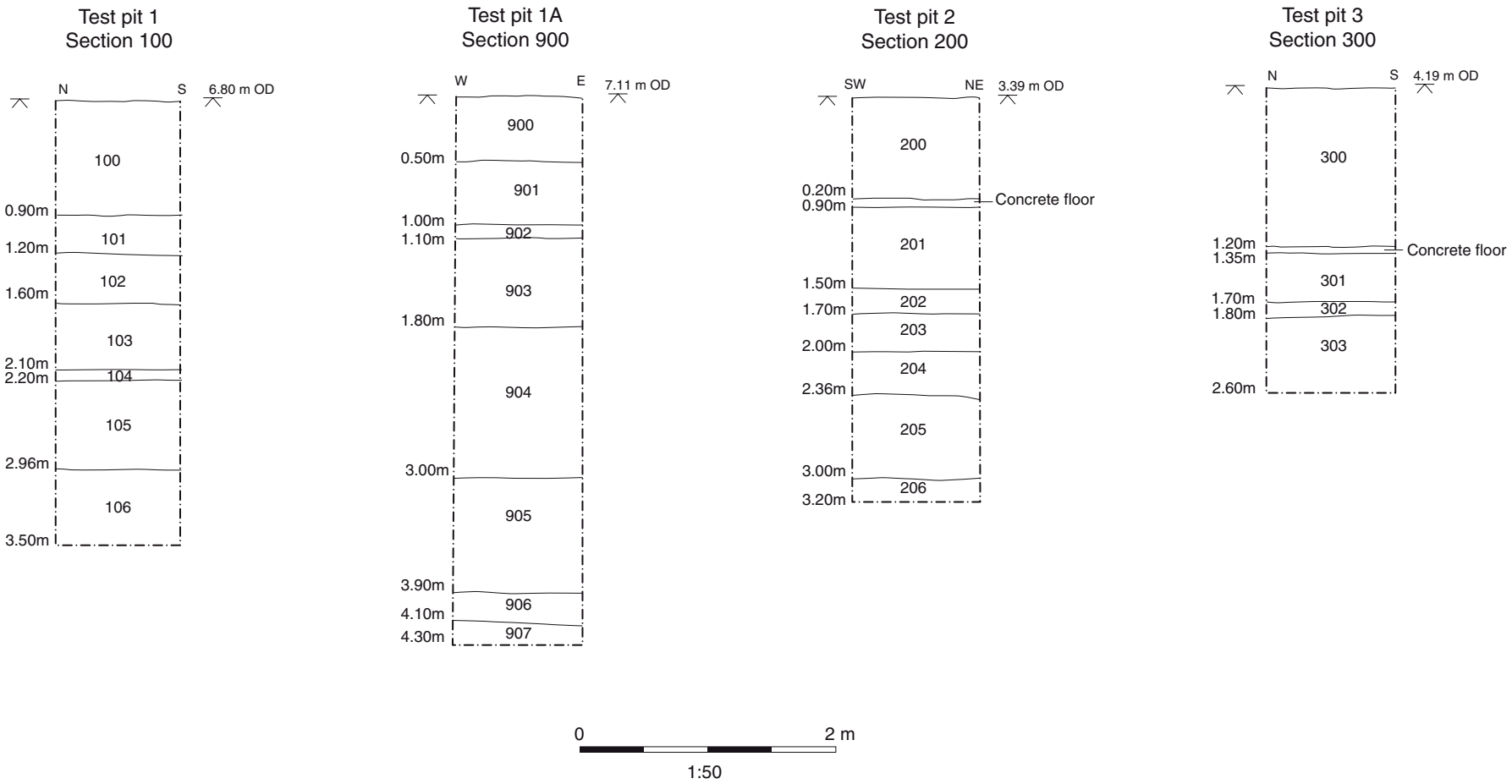


Figure 3: Test pit sections

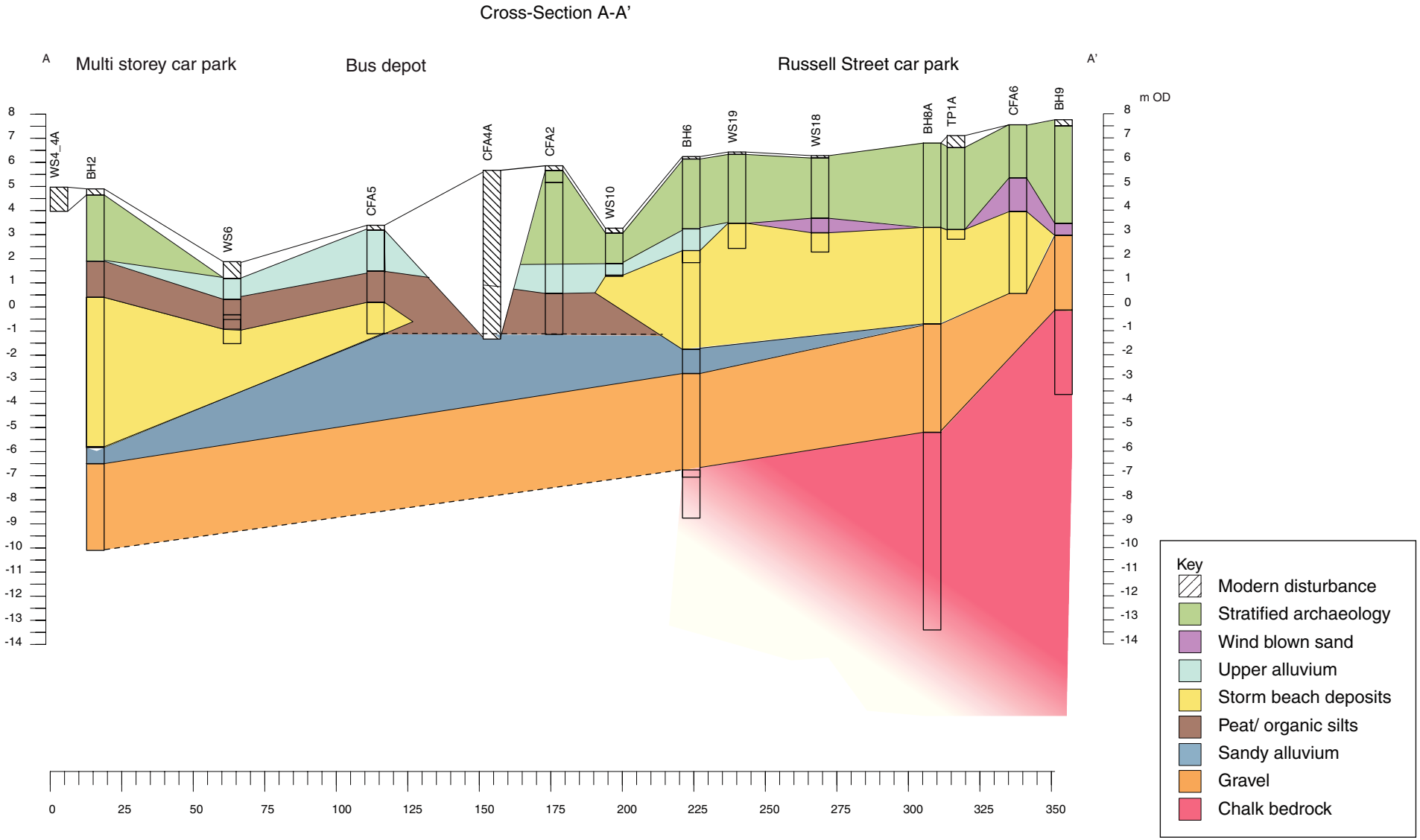


Figure 4: North-south stratigraphic cross section

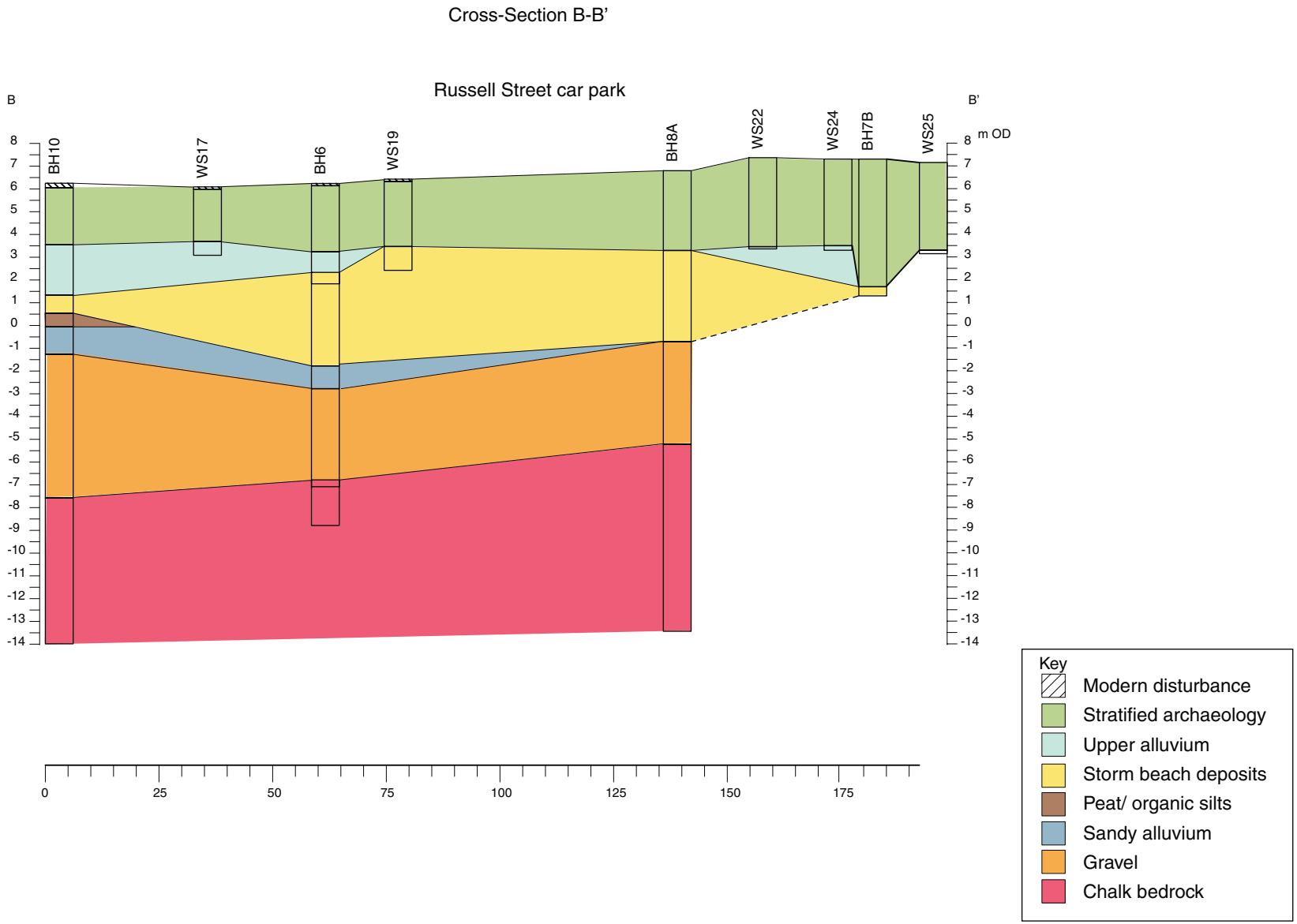
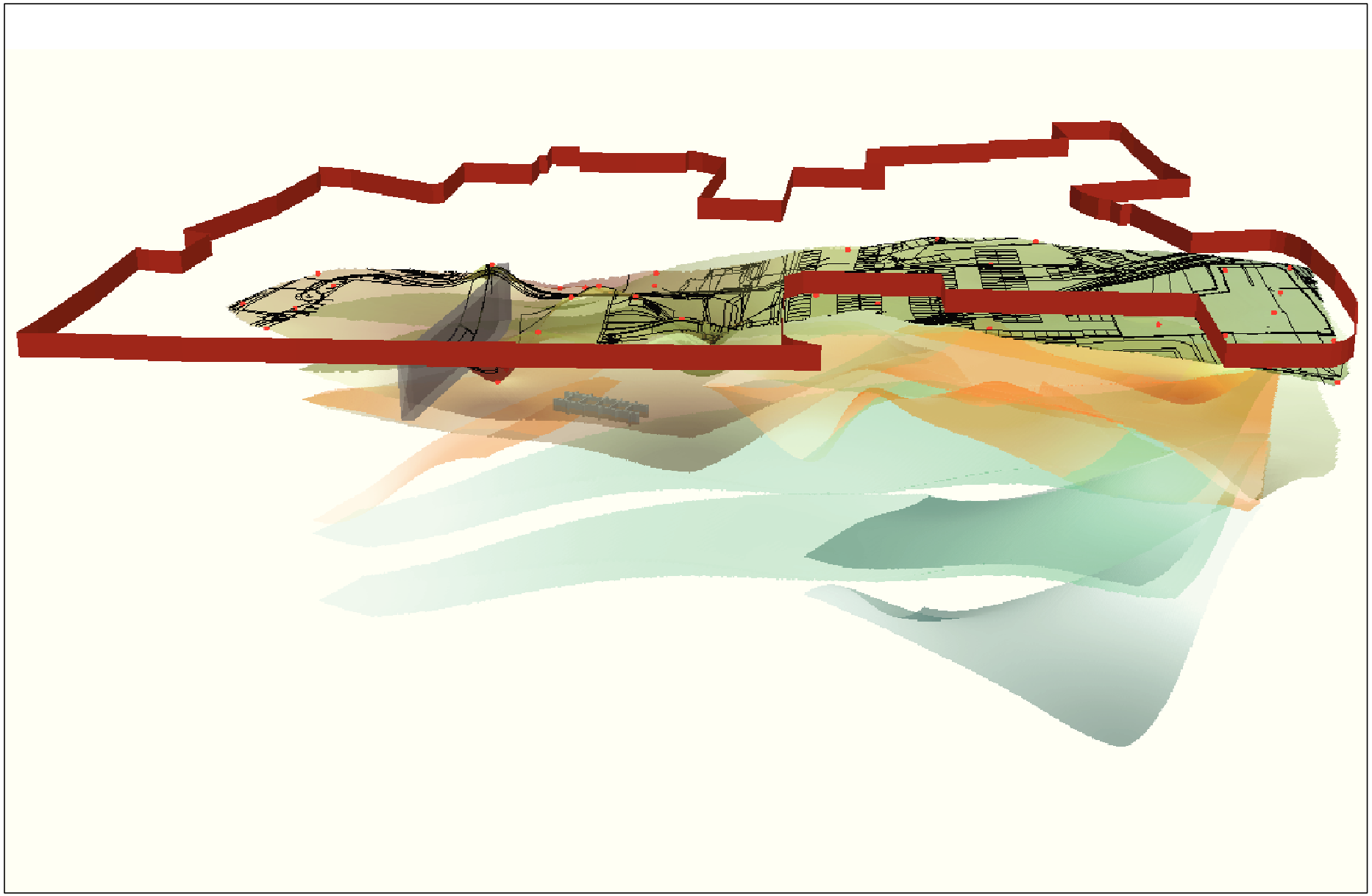


Figure 5: North-west/ south-east stratigraphic cross-section

X:\DOSJADOT_Dover_St_James_Area_Redevelopment \010Geomatics\02 CAD\001current\DOSJADOT_deposit model_310708.dwg(A4 landscape)****matt.bradley* 31 Jul 2008



CHECKED BY:

Not to Scale

Figure 6: 3D Stratigraphic Model

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