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# FULL ANALYSIS OF HUMAN REMAINS FROM FIELD 261 OF THE A1 WIDENING SCHEME

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## Introduction

During excavations in 2014 in Field 261 of the A1 Leeming to Barton Joint Venture for widening of the A1, a single inhumation was identified. The inhumation was within a grave cut that had been inserted through the fill of an E-W ditch. They had been buried in an unusual position, being prone, and legs tightly flexed at the hips and knees.This document presents the objectives, methods and results of the analysis of the articulated skeletal remains.

## Objectives

The skeletal assessment aimed to determine age and sex, as well as any manifestations of disease from which the individual may have suffered.

## Methodology

The skeleton was analysed in detail, assessing the preservation and completeness, as well as determining the age, sex and stature of the individual. All pathological lesions were recorded and described. A summary of the osteological and palaeopathological data for the inhumation burial is given in Table 1.

## Osteological Analysis

Skeletal preservation depends upon a number of factors, including the age and sex of the individual as well as the size, shape and robusticity of the bone. Burial environment, post-depositional disturbance and treatment following excavation can also have a considerable impact on bone condition. Preservation of human remains is assessed subjectively, depending on the severity of bone surface erosion and post-mortem breaks, but disregarding completeness.

Preservation was assessed using a grading system of five categories: very poor, poor, moderate, good and excellent. Excellent preservation implied no bone erosion and very few or no post-depositional breaks, whereas very poor preservation indicated complete or almost complete loss of the bone surface due to erosion and severe fragmentation.

Skeleton 7182 was moderately fragmented, but the surface preservation was very good, with complete preservation of detail. Approximately 80% of the skeleton had been preserved, although due to fragmentation there were a large number of unidentified bone fragments, therefore it is possible that more of the skeleton was represented.

A count of the 'minimum number of individuals' (MNI) recovered from a cemetery is carried out as standard procedure during osteological assessments of inhumations in order to establish how many individuals were represented by the articulated and disarticulated human bones (without taking the archaeologically defined graves into account). The MNI is calculated by counting all long bone ends, as well as other larger skeletal elements, such as the hip joints and cranial elements.

The MNI was one, with bones from at least one adult present, and no evidence of any additional individuals present.

Age was determined using standard ageing techniques, as specified in Scheuer and Black (2000a; 2000b) and Cox (2000). Age estimation relies on the presence of the pelvis and uses different stages of bone development and degeneration in order to calculate the age of an individual (Lovejoy et al 1985; Meindl and Lovejoy 1989). Age is split into a number of categories, from foetus (up to 40 weeks in *utero*), neonate (around the time of birth), infant (newborn to one year), juvenile (1-12 years), adolescent (13-17 years), young adult (ya; 18-25 years), young middle adult (yma; 26-35 years), old middle adult (oma; 36-45 years), mature adult (ma; 46+) to adult (an individual whose age could not be determined more accurately as over the age of seventeen).

Based on ageing criteria from the pelvis, and incomplete fusion of the medial clavicle, Skeleton 7182 was estimated to be 26-35 years of age (young middle adult).

Sex determination is usually carried out using standard osteological techniques, such as those described by Mays and Cox (2000). Assessment of sex in both males and females relies on the preservation of the skull and the pelvis and can only be carried out once sexual characteristics have developed, during late puberty and early adulthood.Based on cranial and pelvic morphology, it was determined that Skeleton 7182 was likely male.

Stature depends on two main factors, heredity and environment; it can also fluctuate between chronological periods. Stature can only be established in skeletons if at least one complete and fully fused long bone is present, but preferably using the combined femur and tibia. Knowing the sex of the individual is also necessary, which is an issue with disarticulated long bones where sex cannot be determined. The bone is measured on an osteometric board, and stature is then calculated using a regression formula developed upon individuals of known stature (Trotter 1970). Where possible, bones from the legs were used in preference to those of the upper limb as these carry the lowest error margin (*ibid*). Due to fragmentation, there were no whole long bones present for measurement. However, the left femur was only broken into two pieces, and could be reliably reconstructed, giving a stature estimation of 163.3cm (5’4”), but due to the post-mortem damage he may have been slightly taller.

The term ‘ancestry’ is used to describe the genetic background of individuals. An attempt was made to determine the ancestry based on the visual appearance of traits in the cranial skeleton, as described by Byers (2010, 154-165). Unfortunately, the expression of the various traits used to define ancestral groups can be ambiguous and assessing them is subjective; consequently, it can be very difficult to determine ancestry (Byers 2010, 152-154). Unfortunately, the fragmentary nature of the cranium of Skeleton 7182 hindered a full analysis of the cranial traits. However, he did have pronounced nasal guttering, possible prognathism of the maxilla, and a very robust mandible. These traits may be more associated with African or mixed ancestry. However, further research is recommended to determine this. If stature were to be recalculated in line with measurements from a black population, Skeleton 7182 (young middle adult male) would have been approximately 160.7cm (5’3”) in height.

Non-metric traits are additional sutures, facets, bony processes, canals and foramina, which occur in a minority of skeletons and are believed to suggest hereditary affiliation between skeletons (Saunders 1989). The origins of non-metric traits have been extensively discussed in the osteological literature and it is now thought that while most non-metric traits have genetic origins, some can be produced by factors such as mechanical stress (Kennedy 1989) or environment (Trinkhaus 1978). Skeleton 7182 (young middle adult male) had multiple cranial and post-cranial non-metric traits, including bridging of the supraorbital notch and an accessory supraorbital foramen above the left orbit, hypotrochanteric fossae and plaque on the femora, a vastus notch on the patellae, and lateral squatting facets on the tibiae.

### Pathological Analysis

The analysis of skeletal and dental manifestations of disease can provide a vital insight into the health and diet of past populations, as well as their living conditions and occupations. A small number of pathological changes were seenSkeleton 7182 (young middle adult male).

Transitional vertebrae can occur at the borders between different types of vertebra, when a vertebra from one group takes on some or all of the characteristics of an adjacent group (Barnes 1994). The process by which this happens is known as ‘border shifting’. Skeleton 7182 (young middle adult male) had a possible lumbar-sacral border shift. The first sacral vertebra had retained its normal winged appearance on the left side, but the right side was only partially fused to the rest of the sacrum, looking more similar to a lumbar transverse process. There were already five lumbar vertebral bodies accounted for, and without the transitioning segment there would only have been four sacral bodies, therefore it is likely that the first sacral vertebra had partially lumbarised.

Small notches were apparent on the lateral/posterior margins of both acetabulae (hip joints). The indents were porous, and well defined. They were likely developmental anomalies as no trauma or joint disease was evident. It is possible that they were residual clefts from the fusion of the ilium and ischium during development.

A possible congenital anomaly of the first distal foot phalanges was also seen. Both distal phalanges had an extra barb-like nodule of bone on the lateral surface of the phalangeal shaft. The additional nodule was smaller than the main distal end, and a slight subtle indentation appeared to run between them. It is possible that the first distal phalanges bifurcated (Barnes 2012, 196), or that the distal-most ends of the first and second rays of the feet failed to separate, remaining conjoined (Barnes 2012, 192). Not enough intermediate phalanges were preserved to determine which of the above aetiologies is more likely.

Spondylolysis refers to the separation of the neural arch of a vertebra from the body just beneath the superior articular facets at the pars interarticularis. Debate has focused on whether the condition is congenital, develops as a result of trauma, or requires a combination of trauma and an underlying developmental weakness (Ortner 2003). It is possible that repeated stress placed on the lower back, for example through bending and lifting, or movements associated with activities such as dancing, gymnastics, weight lifting, kayaking, wrestling, long jumping and playing football may lead to the development of spondylolysis (Roberts and Manchester 2005, 106; Galloway 1999, 101). Dandy and Edwards (2003, 433) also indicate that spondylolysis may be more common in young, active individuals, particularly athletes. The affected individual may suffer from slight discomfort in their lower back (Roberts and Manchester 2005, 107). Bilateral spondylolysis was seen in the fifth lumbar vertebra of Skeleton 7182, and appeared to be well healed, with some porosity and lamellar bone spicules on the pseudofacets. Dandy and Edwards (2003, 433) note that 5-6% of the normal population will have spondylolysis.

Healed pitting of the ectocranial surfaces of the frontal, parietal, and occipital bones was seen in Skeleton 7182 (young middle adult male), starting at the forehead and spreading to the nuchal crest at the back of the head. Such healed lesions could be caused by past episodes of psoriasis, dermatitis or a head-lice infestation; all of which would cause the individual to scratch the affected area and could lead to the breaking of the skin, allowing infection to enter.

Sinusitis is characterised by the inflammation of the mucous membrane of the sinuses (cavities in the cheek bones). Acute sinusitis lasts between seven days and one month, but the condition is classed as chronic if it persists for more than three months (Merrett and Pfeiffer 2000, 304). If untreated, chronic sinusitis can persist for years and skeletal changes occur after a number of weeks. In modern groups, around 60% of patients with chronic sinusitis develop bone changes that are radiographically visible (Boocock *et al* 1995:484). Most commonly, the skeletal manifestations take the form of pitting or spicular bone formation on the floors of the sinuses. Symptoms include pain in the forehead, cheeks and eyes, together with fever and a general unwell feeling (Youngson 1992, 551). The quality of life and productivity can be greatly reduced for those suffering from sinusitis. Infection of the maxillary sinuses can result from upper respiratory tract infections, pollution, smoke, dust, allergies, or a dental abscess that has penetrated the floor of the sinus cavity (Roberts and Manchester 2005, 174-176). The left maxillary sinus of Skeleton 7182 (young middle adult male) had slight pitting and nodules of lamellar bone formation, suggestive of sinusitis. The right maxilla was not present for observation.

## Dental Health

Dental pathology was also noted on the dentition of Skeleton 7182 (young middle adult male).He had fourteen tooth positions, and 29 teeth present for analysis.

If plaque is not removed from the teeth effectively (or on a regular basis) then it can mineralise and form concretions of calculus on the tooth crowns or roots (if these are exposed), along the line of the gums (Hillson 1996, 255-257). Mineralisation of plaque can also be common when the diet is high in protein (Roberts and Manchester 2005, 71). Calculus is commonly observed in archaeological populations of all periods, although poor preservation or damage caused during cleaning can result in the loss of these deposits from the teeth (*ibid*, 64). Calculus deposits were seen on 26 teeth from Skeleton 7182, ranging from flecks to moderate deposits.

Dental caries (tooth decay) forms when bacteria in the plaque metabolise sugars in the diet and produce acid, which then causes the loss of minerals from the teeth and eventually leads to the formation of a cavity (Zero 1999). Simple sugars can be found naturally in fruits, vegetables, dried fruits and honey, as well as processed, refined sugar; since the latter three contain the most sucrose they are most cariogenic. Complex sugars are usually less cariogenic and are found in carbohydrates, such as cereals. However, processing carbohydrates, including grinding grains into fine powders or cooking them, will usually increase their cariogenicity (Moynihan 2003). In total eight carious lesions were seen in Skeleton 7182, affecting seven teeth. These varied from smaller interproximal lesions, to large lesions that had resulted in complete destruction of the tooth crowns.

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## Appendix

### Table 1 Summary of osteological and palaeopathological results

**Key**: SP = Surface preservation: grades 0 (excellent), 1 (very good), 2 (good), 3 (moderate), 4 (poor), 5 (very poor), 5+ (extremely poor) after McKinley (2004); C = Completeness; F = Fragmentation: min (minimal), sli (slight), mod (moderate), sev (severe), ext (extreme)

Non-adult age categories: f (foetus, <38 weeks *in utero*), p (perinate, c. birth), n (neonate, 0-1m), i (infant, 1-12m), j (juvenile, 1-12y), ad (adolescent 13-17y)

| Sk No | Fragmentation | SP | Completeness (%) | Age | Age Group | Sex | Dental Pathology | Skeletal Pathology |
|---|---|---|---|---|---|---|---|---|
| **7182** | Mod | 1 | 80 | 26-35 years | YMA | M | Calculus, caries | Border shift; sinusitis; periosteal reaction on scalp; spondylolysis of a lumbar vertebra; congenital anomaly of the 1st distal foot phalanges |

Adult age categories: ya (young adult, 18-25y), yma (young middle adult, 26-35y), oma (old middle adult, 36-45y), ma (mature adult, 46+y), a (adult, 18+y)

R – right; L – left; OA = Osteoarthritis; DJC = Degenerative Joint Changes; DEH – dental enamel hypoplasia

### Table 2 Osteological and palaeopathological catalogue

| | |
|---|---|
| **Skeleton Number** | **7182** |
| Preservation | 1 (very good) |
| Fragmentation | Moderate |
| Completeness | 80%<br>Cranium, mandible; clavicles; scapulae; minimum 5 cervical vertebrae, minimum 9 thoracic vertebrae, 5 lumbar vertebrae; sacrum; minimum 9 left ribs, minimum 5 right ribs; humerii; radii; ulnae; right hand (7 carpals, 5 metacarpals, 5 proximal phalanges, 4 intermediate phalanges, 4 distal phalanges); left hand (8 carpals, 5 metacarpals, 5 proximal phalanges, 4 intermediate phalanges, 3 distal phalanges); pelves; femora; patellae; tibiae; fibulae; right foot (7 tarsals, 5 metatarsals, 5 proximal phalanges, 1 distal phalanx); left foot (7 tarsals, 5 metatarsals, 4 proximal phalanges, 1 distal phalanx); unsided foot (3 intermediate phalanges) |
| Age | 26-35 years (YMA) |
| Sex | Male |
| Stature | 163.3cm ±3.27 (5'4") (L. Femur) |
| Non-Metric Traits | *Highest nuchal line* (bilateral), *bridging of supraorbital notch* (left), *accessory supraorbital foramen* (left), *plaque* (bilateral), *hypotrochanteric fossa* (bilateral), *exostosis in trochanteric fossa* (bilateral), *vastus notch* (bilateral), *lateral tibial squatting facet* (bilateral), *lateral talar extension* (left) |
| Pathology | Sinusitis – very slight pitting and nodules of lamellar bone in the left maxillary sinus<br>Scalp inflammation – healed pitting on the ectocranial surface of the frontal, parietal, and occipital bones, along the sagittal plane (along the top of the head). Starts at forehead, and spreads to the nuchal crest<br>Spondylolysis of L5 – neural arch separated from just below the superior facets. Porous pseudofacets present on both sides of the two halves<br>Lumbar-sacral border shift – S1 has retained its normal alar appearance on the left side, but the right side is only partially fused to the rest of the sacrum, and looks more like a lumbar transverse process. There are already five lumbar vertebral bodies accounted for, and without the transitioning segment there would only be four sacral bodies, therefore it is likely that S1 is partially lumbarised<br>Small notches apparent on the lateral/posterior margins of both acetabula. The indents are porous, and defined. They are likely developmental anomalies as no trauma or joint disease is evident. Possible residual clefts from the fusion of the ilium and ischium |

| | |
|---|---|
| | Congenital anomalies of the 1st distal foot phalanges – both have extra barb-like nodules of bone on the lateral surface of the phalangeal shaft. The additional nodule is smaller than the main distal end, and a slight subtle indentation appears to run between them. The proximal joint surface is also slightly contoured, with a "flick" at the medial 1/4. Possible that the 1st distal phalanges have bifurcated, or that the distal-most ends of the 1st and second rays have failed to separate. Not enough intermediate phalanges preserved to determine which is more likely |
| Dental Health | 14 tooth positions, 29 teeth present<br>26 teeth with calculus, 7 teeth with caries (8 lesions in total) |

| | Right Dentition | | | | | | | | Left Dentition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Present | P(l) | R | R | P(l) | P(l) | P | P | P | P(l) | P(l) | P(l) | P(l) | - | P(l) | - | P(l) |
| Calculus | Sd | - | - | Sb | Sbm | Sbl | Sb | Fb | Fbm | Sbl | Sb | Sb | - | Mbdlm | - | Fdb |
| DEH | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Caries | Sm | La | La | - | - | - | - | - | - | - | - | - | - | Mmo | - | Sm |
| Wear | 2 | - | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | - | 4 | - | 3 |
| Maxilla | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| Mandible | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| Present | P(l) | P(l) | R | P | P | P | P | P | - | P | P | P | P | P | P | P(l) |
| Calculus | Fbmld | Smld | - | Sbm | Fbdl | Fbl | Mm | Mdbm | - | Smbl | Sbmld | Sbl | Sb | Mbl | Sbdl | Sbdlm |
| DEH | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Caries | - | - | La | - | - | - | - | - | - | - | - | - | - | Sm+Md | - | - |
| Wear | 2 | 3 | - | 3 | 2 | 2 | 2 | 3 | - | 2 | 2 | 2 | 2 | 3 | 2 | 2 |

**KEY:**

Present - Tooth presence; am - ante-mortem tooth loss; pm - post-mortem tooth loss; p - tooth present; - - jaw not present; o - erupting

Caries - Calculus; F - flecks of calculus; S - slight calculus; M - moderate calculus; H - heavy calculus; a - all surfaces; b - buccal surface; d - distal surface; m - mesial surface; l - lingual surface; o - occlusal surface

DEH - dental enamel hypoplasia; l - lines; g - grooves; p - pits

Caries - caries; s - small lesions; m - moderate lesions; l - large lesions

Wear - dental wear; numbers from 1-8 - slight to severe wear