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JOPPA SALT PANS, MIDLOTHIAN

Geophysical survey and Evaluation

Donald Wilson
BA AIfA FSA Scot

HEADLAND
ARCHAEOLOGY Ltd

PROJECT SUMMARY SHEET

Client	EDINBURGH CITY COUNCIL FLOOD PREVENTION DEPARTMENT
National Grid Reference	NT 3210 7340
Parish	EDINBURGH CITY
Council	MIDLOTHIAN
NMRS No	NT37SW 214
Oasis No	HEADLAND1–84333
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Schedule	
Fieldwork	SEPTEMBER 2010
Report	OCTOBER 2010

Signed off by: .....

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Date:.....

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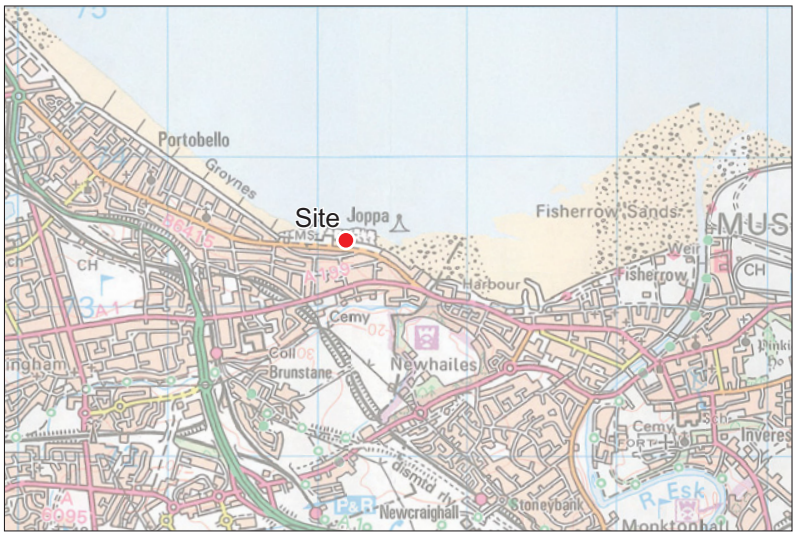

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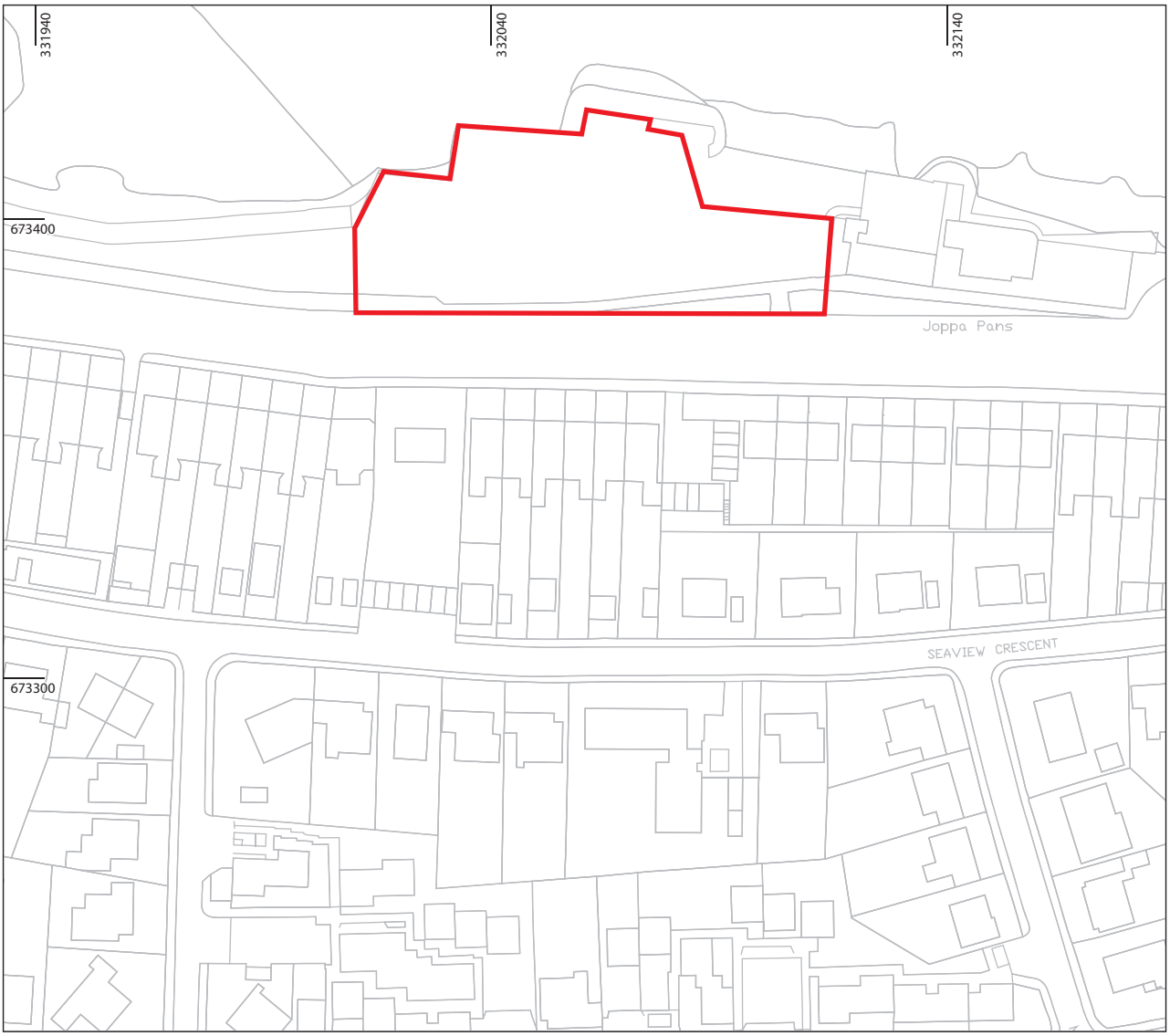

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0 50m
1:1500@A4

Illus 1
Site location plan

JOPPA SALT PANS, MIDLOTHIAN

Geophysical survey and Evaluation

by Donald Wilson

Headland Archaeology conducted a programme of archaeological works on the site of the former salt pan works at Joppa following the collapse of the north-western corner of the seawall. The programme of works comprised a survey of the main sea wall and wall sections exposed due to storm damage. This was followed by a desk-based assessment and a geophysical survey of the area prior to an intrusive evaluation at the site by means of trial trenching. The work was commissioned by Edinburgh City Council.

The geophysical survey was used in conjunction with historic maps in order to inform the position of the trenches. Six trenches were excavated in total, revealing a number of wall foundations and a section of a poorly preserved tank wall close to the northern end of the site; all thought to be associated with the extant salt pan works. No floor surfaces were revealed during the trial trenching. This was most likely due to their removal when the site was finally demolished and the area was redeveloped. No significant artefacts associated with the salt pan works were retrieved during these works.

1. INTRODUCTION

1.1 Background

Headland Archaeology Ltd was commissioned by Edinburgh City Council to carry out a programme of archaeological works which included a desk-based assessment followed by field survey and structural recording; a geophysical survey and an archaeological evaluation of a site previously occupied by Joppa salt pan works (NMR: NT37SW214).

The work was commissioned by the City of Edinburgh Council (City Development Flood Prevention & CECAS) in advance of repair of a collapsed section of the sea wall caused by storm damage. The damaged section of the sea wall is constructed from both original historic fabric associated with the salt works and later 20th century improvements. The work was conducted in accordance with a Written Scheme of Investigation prepared by Headland Archaeology Ltd and agreed with CECAS.

1.2 Site Location and Description

The site is located between Portobello, Midlothian to the west and Musselburgh, East Lothian to the east (National Grid Reference: NT 3210 7340) approximately 7 miles to the east of Edinburgh. The site covers an area of *c.*0.3ha bounded to the north and west by the sea wall, to the south by Musselburgh Road and to the east by 1 Joppa Pans (Rock Cottage). (Illus 1)

Rock Cottage (or Joppa Pans House) is of probably 17th century date with later alterations. The building was originally part of the salt pans that were located on this site for many centuries. Joppa Salt Pans are of more recent origin and date from the beginning of the 17th century.

The area is grassed over and may have included flower beds at some point. It is currently used as an open park area.

1.3 Objectives

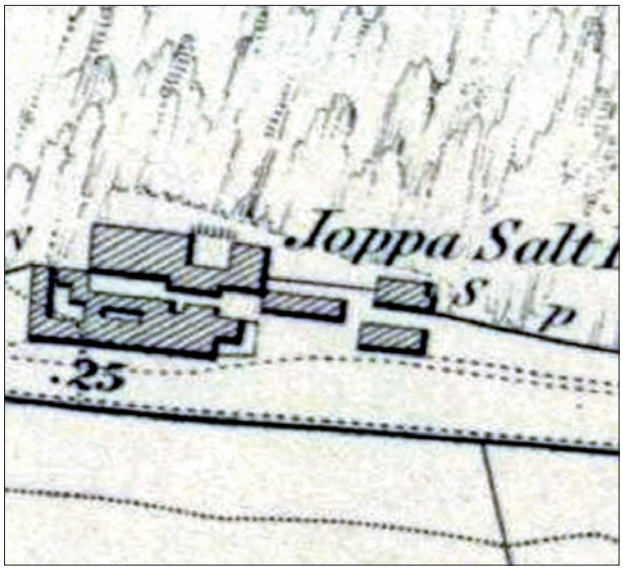
The various phases of archaeological works were undertaken in order to assess the archaeological potential of the site and to establish the presence or absence, quality, condition and extent of archaeological remains in order to inform the development design and the scope of any required mitigation measures.

2. DESK-BASED ASSESMENT

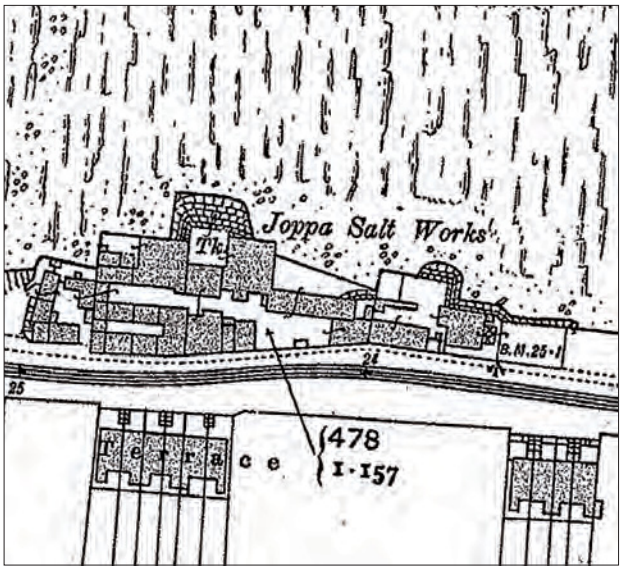
2.1 Methodology

The following sources were consulted:

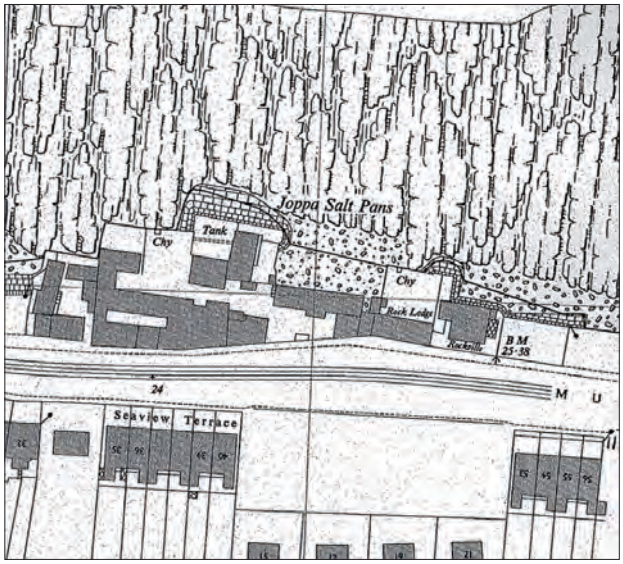
- the CECAS Historic Environment Record (HER)
- the National Monuments Record for Scotland (NMRS)
- Historic Scotland's databases of listed buildings, Scheduled Ancient Monuments and monuments proposed for scheduling



Illus 2
1853 Ordnance Survey



Illus 3
1896 Ordnance Survey



Illus 4
1948 Ordnance Survey

- vertical stereo aerial photographic coverage held by RCAHMS
- Ordnance Survey map coverage from 1850 onwards, and any other readily available early cartographic sources held at the National Library of Scotland Map Library
- bibliographic references.

2.2 Results

Historic Background

The settlement of Joppa was formed on the Marquess of Abercorn's land immediately to the east of Portobello (Gifford *et al.* 1991). The town was formed around the salt working and coal mining industry. The industries were closely related as the availability of abundant fuel supplies, such as coal, or peat, was required in order to fuel the evaporation process, as for every ton of salt produced about 16 tons of coal were consumed (Butt 1967). Therefore, the location of salt pans was often related to the presence of coal-bearing rocks. Often, coal-masters owned salt works and often, the accounts were organised jointly (Butt 1967). Coal seams were abundant in the area surrounding Joppa pans. Joppa pans formed part of the Prestonpans group which consisted of a series of small manufacturing villages that formed along the coast of East and Midlothian, based on the coal supplies from the Lothian coalfield (Adams 1965).

Salt pans industry

Salt boiling was a relatively simple but inefficient process. Seawater had to be collected and fed into a boiling pan. Bucket pots or reservoirs were built above the tideline to collect the seawater. The brine was then pumped or ladled into pans which were wide and shallow, and often

Illus 5
Postcard showing historic view of the salt pan works

heated from below by embers to evenly distribute heat and thus aid the evaporation process (Anderson 2000). When the correct concentration of salt was reached often a bucket of bullock's blood was thrown into the pan to separate organic matter. A thick brown scum formed on the surface as further evaporation occurred. The scum was then skimmed off by hand to leave salt and various related products (Butt 1967).

Salt pans were often built on pillars and fired from beneath. Therefore clinkers and ashes are often found on the site of salt works (Butt 1965, for a comprehensive exposition of the salt making process see Anderson 2000).

Joppa Salt works

Two salt works were located in Joppa: Joppa pans and a site at Magdalene Bridge to the east. Magdalene pans were much older and formed as dependants of Kelso Abbey (Baird 1898). Joppa pans date from the beginning of the seventeenth century. Baird (1898) states that 'David Preston of Craigmillar gave his son George Preston that piece of land and rock let to him by Sir Thomas Thomson of Duddingston for building a salt pan, with the house *etc*., near the sea, within the bounds of Duddingston'. However, Baird (*ibid*.) also states that 'we have reason to believe that the pans were built by David Preston before 1635'. From 1788 till 1808, the salt works, which belonged to the Earl of Abercorn, were leased by Mr John Thomson of Priorlatham at a rental of '90 per annum. In 1825, John Baxter and Company were listed as the proprietors of the Joppa Saltworks in Pigot's Directory of Scotland (Pigot 1825). Baird (1898) states that 'the Joppa Salt Pans are carried on with continued success under the management of Messrs Alex. Nisbet & Son, who entered in occupation of the works after the late Mr John Grieve some thirty years ago, the works were enlarged and improved'. In 1889, the Joppa pans were bought over by the Scottish Salt Company, by whom they have since been wrought along with the salt pans of Pinkie, Prestonpans, and Charleston (Baird 1898). The surviving pans were able to cave out a niche as the quality of salt had improved and demand for coarse cooking salt and salt related products increased. At this time Joppa pans diversified into pipeclay whiting (for doorsteps) (Anderson 2000). The demand for salt remained fairly steady, however the companies' other products were no longer selling. Salt was produced continuously on site until 1953 when the last salter retired (Adams 1965).

Map Evidence

Consultation of historic maps, including Adair (1682), Moll (1732), Laurie (1766), Roy (1747–55) all show the Magdalene salt pans, but not the Joppa pans. However, Knox's 1812 map depicts a group of buildings labelled salt pans in the location of the Joppa saltpans. Although the map is not very detailed it shows eight rectangular buildings in the area to the north of Musselburgh Road.

The first edition Ordnance Survey map (1853) (Illus 2) shows that five buildings were present on site. The northernmost building comprised two rectangular blocks that appear to be joined together by a central corridor; a square depression lies between these blocks. To the south of these buildings lies a block of buildings, with an L-shaped building situated on the western side. Three rectangular buildings lie to the east of these, the western building representing Rock cottage (Historic Building Number 27011), constructed as part of the salt works. An undated, annotated sketch plan produced by Adams (1965) corresponds with the buildings depicted on the first edition Ordnance Survey map (1853) and shows that the northernmost buildings to the east and west of the central corridor represent pans whilst the central, square depression represents a bucket pot. The large building to the south is labelled 'girnel', storehouse for the salt, and the L-shaped building to the west is a Salter's cottage. The westernmost of the three buildings to the east is labelled as an office.

The buildings generally remain the same on the 1896 Ordnance Survey map (Illus 3) with the exception of two additional buildings in the group on the eastern side. One

building is a small square structure located between the girnel and the eastern building (probably Rock Cottage) and the second is a sizeable structure, probably a house, constructed for the owner of the pans (Historic Building Number 27011). This building is labelled 'Rocks ville' on the 1958 Ordnance Survey map (not illustrated). The 1896 Ordnance Survey map is more detailed and shows that the structures actually comprised several buildings. The girnel was composed of 6 rectangular buildings, an inverted L-shaped building and two small square buildings. The Salter's cottage comprised four separate buildings.

No changes to the layout of the complex were visible on the 1908 Ordnance Survey map (not illustrated). However, postcards from 1908 show that two chimneys were present in the area during this period. It is likely that the chimneys pre-date this. A tramway, ran east to west to the south of the salt works during this time. Seaview terrace was also constructed between 1896 and 1908 suggesting that Joppa expanded during this time.

The 1914 map (not illustrated) shows that the girnel was renovated between 1908 and this time as an open area was present in the centre of the western part of the building. The bucket pot is labelled 'TK' suggesting that a tank was now in place. No changes were visible on site on the 1932 Ordnance survey map (not illustrated) however, to the south of the site Seaview terrace continued to expand eastwards.

The 1948 (Illus 4) and 1958 maps show more detail as the buildings on the extreme east of site are labelled 'Rock lodge', to the west, and 'Rocks ville', to the east, respectively. The two chimneys are labelled on the 1949 map, one to the north of Rock lodge and the second to the north-east of the northernmost building of the girnel. The L-shaped building to the west of the girnel is labelled 'towers' on the 1958 map. Consultation of vertical aeriel photographs held by the NMRS for 1946 and 1947 confirmed map evidence for this period.

Rock Lodge, renamed Rock Cottage, and Rocksville are the only buildings visible in the area on the 1970 Ordnance Survey map. The buildings associated with the salt works were therefore demolished in the period between 1958 and 1970.

Early photographic evidence in the form of postcards of the site show a complex series of buildings most of which seem to be constructed of rubble stone (Illus 5).

Archaeological background

The site was recorded during a coastal survey undertaken by GUARD in 1996. A rectangular rock cut feature measuring 15m by 10m was recorded in the rocks in the foreshore below Joppa Pans House together with an associated channel, possibly rock cut, utilising a natural fissure leading straight to the sea (GUARD 1996).

3. FIELD SURVEY & STRUCTURAL RECORDING

3.1 Methodology

The site was visited in order to verify and augment the results of the documentary research. The aims of the site visit was to identify and record exposed walls/foundations, establish current ground conditions and identify areas of disturbance, variations in topography and any other factors that may affect archaeological potential. Sections of exposed stratigraphy were fully recorded.

In addition, the surviving sections of the sea wall were surveyed. A photographic survey and written description was undertaken in order to record their current condition.

3.2 Results

A structural recording survey (Illus 6) was undertaken on the north-west corner of the seawall that had collapsed due to storm damage (Illus 7 & 8). Additionally, approximately 10m to the east of the area affected by storm damage, a blowhole (Illus 9) had formed where the sea had broken through the base of the sea wall. In this area a hole, measuring 2 x 1.5m had formed behind the sea wall all the way to the bottom. Several deposits and structures relating to the salt works were uncovered.

The west-facing section through the collapsed sea wall showed that the modern sea wall [002] (Illus 10), composed of machine made bricks, was built on a concrete pad directly overlying an earlier stone, sea wall [007]/[008]. The old sea wall was approximately 1.5m wide on the north side [007] and 0.7m wide on the west side [008]. It was constructed from coursed, roughly squared stone and rubble, bonded with lime mortar. Various structures backfilled with cinder, rubble, mortar and pantiles [005], were seen behind this retaining wall, including the face of a north-south aligned, mortar-bonded, rubble wall [009] (Illus 11) and although only partially exposed, a possible east-west aligned wall [010] (Illus 12).

Brick floors [012] and [013] were noted at two levels in this area. Floor [012] was composed of at least three layers of mortared hand-made bricks located close to tide level (Illus 13). Floor [013] was only exposed in section. It was composed of at least two layers of brick. It was located at a much higher level, than floor [012] at the south end, just below wall [011] (Illus 14), and abutted the original sea wall [008].

Floor [012] was surrounded and set within a mid grey, sandy clay loam deposit [017] which seemed to be infill material packed in behind the sea wall, and around sunken floored tanks/chambers of which [012] is a part. Cinders [006] and a layer of rubble [005] overlay the whole area representing the levelling of the salt pans in the 1960s.

N

332020
673430

332080
673430

007

Blowhole

012
(brick floor)

009
(wall)

010

018

013
(brick floor)

Tr. 2

1010

1013

Tr. 3

1014

1015

Tr. 4

1016

1017

Tr. 5

1018

1019

1020

Tr. 1

1005

1006

1004

1003

1002

1001

sand

1025

1024

1023

1022

sand

1021

1020

Tr. 6

MUSSELBURGH ROAD

332020
673370

332080
673370

Key

site boundary

wall

area of colllapsed wall

0 20m

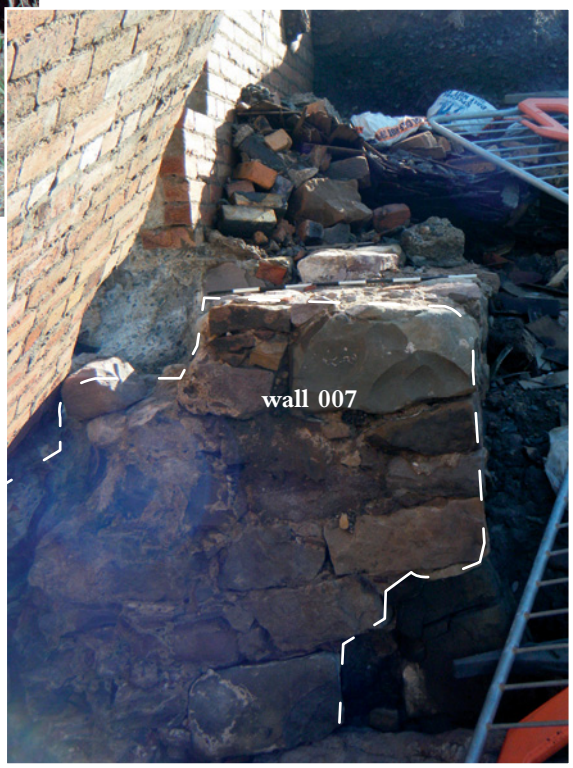
1:300@A3

Illus 6
Trench location plan showing main features recorded

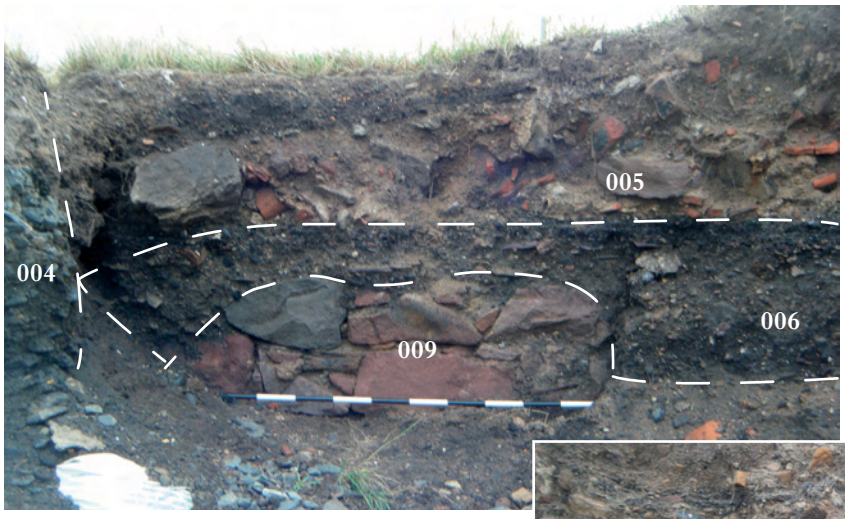
Illus 7
View of wall collapse from the SW

Illus 8
View of wall collapse from the E

Illus 9
View of the blowhole damage from the W



Illus 10
Shot of the exposed sea wall [007]



Illus 11
Detail of stone wall [009] in the collapsed N-W facing section

Illus 12
Detail of stone wall [010] in the collapsed N-W facing section

Illus 13
Shot of brick flooring [012]

Within the 'blowhole', two more stone and rubble walls [014] and [016], bonded with lime mortar were observed, running south from the old sea wall on either side of the 'blowhole'. Wall [014] was truncated by the cut [003] for the modern sea wall [002] (see Illus 9). Wall [016] was bonded into a projecting north to south aligned modern brick wall that bonded into and formed part of the sea wall (Illus 15). The gap between these walls was filled with cinder/rubble deposits [015], similar to deposit [006] that also overlay the top of the walls [014] and [016].

Illus 14
Shot of brick floor [013] at the base of the section

Illus 15
View of wall [002] above wall [016] in the blowhole

4. GEOPHYSICAL SURVEY (APPENDIX 3)

By Dr Steven Openshaw, Bentham Geoconsulting Limited

4.1 Methodology

A geophysical survey by means of single directional (east-west) Ground Penetration Radar survey was undertaken in order to inform subsequent stages of archaeological intrusive works. The GPR survey was conducted using a GSSI SIR 3000 radar system.

The current site is short, flat grass with no surface evidence present to suggest what remains of the former buildings and structures. At the north of the site erosion and undercutting of the seawall has lead to partial collapse and as such any remains may be in some danger if erosion continues. Headland Archaeology requested a Ground Penetrating Radar (GPR) Survey to attempt the documentation of any remains. Our outline proposal and background on GPR surveys at such sites was submitted on 14th September 2010. The survey was completed by Bentham Geoconsulting Ltd on 21st September 2010.

The survey at Joppa was performed using a GSSI SIR 3000 radar system. A digital radar control unit powered a 400MHz antenna which would be expected to have a depth penetration of maximum 3m under optimum site conditions. Optimum site conditions are rarely met and as such common depths of penetration are around 1–1.5m. Optimum site conditions would be damp sand. At this site an initial assessment of the site was provided which included building rubble and the ubiquitous 'made ground' which can comprise rubble, ash, metal fragments and other demolition and historic materials.

Within radar data a target such as *in situ* foundations would typically be expected to show a clearly defined area of high amplitude returns caused by the radar energy returning from a continuous target with a good contrast over surrounding materials. If the foundations are surrounded by mixed materials then the radar returns can be weakened.

Ground radar data processing

In our offices the data were reviewed using Radan 6.5. Radan is specifically designed to process data obtained from GSSI radar systems. The data were processed to a point where the data were sufficiently clear for the purposes of the survey interpretation. This involved choosing an appropriate colour scale and applying filters to remove unwanted high and low frequency noise and to remove flat lying ringing caused by multiple reflectors. In this case processing involved background removal, exponential gain, high and low frequency band-pass filtering and migration.

Survey layout

Radar surveys must be completed within a clearly defined grid of survey lines. Lines are orientated parallel to one another and must be related to baselines on both *x* and *y* planes. At this site we used a section of the kerb on the southern edge of the grass as one baseline with a second baseline laid at 90° running to the north into the northern section of the site. Illustration i (found at the back of this report) shows the location of these baselines. Survey lines were laid out at 0.5m intervals from the *y* baseline. Due to the shape of the site, the first survey block ran from the *y* baseline 58m to the west. The second survey block ran from the *y* baseline 47m to the east. During processing the two survey blocks were joined and processed as one. To maintain the alignment of each survey line guide marks were placed at regular intervals along each survey line using spray paint, canes and cones.

4.2 Results

The results of the survey are presented in plan form. Processing software allows the individual profiles to be combined into a composite data block and this block can be viewed from a variety of angles. In plan form we have the option of showing the data at a depth of choice. This depth of choice shows only the data at a specific centre depth and over a specified depth range. To illustrate the pattern of sub-surface anomalies we show the processed data from Joppa at depth intervals of 0.1m to 1.25m which is our estimate of the maximum effective penetration at the site. As there is no topographic survey at the site we have chosen to overlay our GPR data upon Google Earth overhead imagery which is a useful means to show its relationship to surface structures and also for relocation.

Illustration ii shows 12 panels of GPR data from 0m to a depth of 1.25m. Note that GPR data always require calibration for absolute depths. In this case depths remain estimates. It is clear that there are no anomalies within the GPR data that indicate a clear network of linear anomalies which might indicate the location of *in situ* foundations or walls. However we note the following points from the data.

Anomalies labeled 'A' on Illustration ii are circular and part circular and are also visible in the grass on the current site surface. We have no means to provide a firm identification for these since the historic OS mapping contains no evidence for their presence. Instead they may be related to some post-demolition development on the site, perhaps flower beds? These anomalies are noted between 0 and 0.2m in depth.

Anomalies labeled 'B' on Illustration ii are noted from surface to a maximum of 0.3m. These appear to be good examples of localised anomalies. They are not linear and therefore may represent *in situ* structures or areas of structural remains.

Anomalies labeled C on Illustration ii form an extended zone running parallel to the fencing erected around the recent collapse. This may represent some voiding or possibly an ash layer noted in the open collapses. This zone is noted from surface to an estimated 0.2m depth.

Anomalies labeled D on Illustration ii are seen in the vicinity of the intact sea walls. Some evidence for subsidence was noted in the very north of the site and therefore this

may represent the returns from some voiding or a change of materials associated with sea wall construction.

Anomalies labeled E and F on Illustration ii are seen best over the depth range between 0.3m and 0.5m. They are associated with an area of higher amplitude radar returns which can be clearly made out in the depth slices between 0.3m and 0.7m. Anomalies E and F have a vague linear extent and therefore may represent some *in situ* foundations. Comparison with the historic OS mapping suggests a close coincidence with walls north and south of a central yard area.

Anomalies labeled G are noted most clearly at a depth of 0.3m. These are very narrow linear high amplitude targets which may be related to the location of the walls of a former tank after reference to the OS mapping.

Anomalies labeled H form two narrow linear targets which run north from the pavement and run parallel to one another. Linear targets such as these are frequently found to be *in situ* foundations although excavation will be required for confirmation. These targets are noted best between 0.3m and 0.6m and may correspond to an entrance to the works noted on the OS mapping between 1896 and 1949.

Anomaly I is seen best at 0.7m depth and is a small area of high amplitude return within the area of anomaly C. The nearby collapse reveals walls *in situ* at around 0.5–0.6m and the proximity to anomaly I may suggest a relationship which may confirm the continuation of this wall. On Illustration ii we have outlined an area where the general amplitude of radar returns is high.

Without excavation it is difficult to confirm why this is other than to say this area may indicate some differing materials forming the bulk of the ground compared with those in the north. Note the service running alongside the pavement at the south of the site. This area should be avoided or hand dug during any excavation works. There is also a service running to a ductile cover in the east of the site (Illustration ii).

4.3 Conclusions

The GPR survey performed by Bentham Geoconsulting Limited at the request of Headland Archaeology Ltd has covered the large proportion of the site formally occupied by the Joppa Salt Works. The purpose of the survey was to attempt to define *in situ* foundations and other potential targets of interest in order to both document their sub-surface layout and to provide a means to design the trial trenching exercise. The results from the survey do not indicate any clearly defined pattern which might be as expected from *in situ* foundations. Comparisons with the historic OS mapping make this very clear. However this does not mean that foundations are not present. Instead the composition of the ground may preclude their resolution or the depth penetration required to detect them. There are after all clear glimpses of walls in the recent collapses at depths of around 0.5m. These collapses also reveal the presence of ash or slag layers which would essentially block the penetration of radar energy below that layer as they are highly conductive. The layers noted in the collapses are above the depth of the visible walls. These then are reasons why GPR may not be able to image the walls as clearly as hoped. However, there are also no records as to how the site was demolished in the 1960s and it is also perfectly possible for demolition to have largely destroyed many of the historic walls and the site be filled with demolition debris. In this case the walls visible in the collapses may be small remnants. Excavation will remain the most effective method for confirmation at this site. Despite the lack of a clear network of *in situ* walls being indicated by the GPR survey, the data does indicate some areas where there may be some targets. These have been described in the results section. Illustration iii summarises the location of the targets and provides OS coordinates either directly over them or indicating their orientation in the case of linear targets. We would recommend a number of trenches are dug to intersect some of these to determine the state of preservation of the former Salt Works. We would suggest the following in no particular order based on the limited target information provided by the GPR survey. Anomalies labeled B are smaller point targets and some pits to investigate these may yield useful data. B3, B4 and B5 (Figure 5) may be prioritised since B1 is more of a zone of high amplitude radar returns which may be associated with construction of the current wall. Anomaly D is formed by two parallel linear targets which correspond to an entrance noted on the OS historic mapping. A trench here might intersect a pathway and walls which could be traced into the former works. Anomalies E and F may be possible walls within an area of mixed infill. As this is the centre of the site and spans the divide between low amplitude radar returns in the north and higher amplitude returns in the south then some useful data about the site may be gathered in this location.

Anomalies labeled G may represent walls of the tanks noted on the OS mapping. We suspect targets identified as 'A' on Figure 5 are related to structures installed after demolition and reinstatement. A limited trial pit could confirm this rapidly. Additional trenches would be best located based on the historic OS mapping data alone since there is insufficient clarity in the GPR data to provide more input. The OS coordinate for each target identified on Illustration iii is shown in the Table 4.3.1.

There are services running within the site boundary. The first is a service running along the southern boundary. The second is a service running to a ductile cover from the pavement. See Illustration ii for their location.

This report represents a present-day snapshot of the character of the site provided by GPR. Any geophysical investigation should be viewed as only a part of a full site investigation and should be combined with suitable intrusive methods to form a definitive model for any site. Geophysical methods rely on changes in materials properties. Where there are complex geometries, unsuitable materials or where there are gradational changes in materials, the detection of subsurface targets may lie beyond the capabilities of current instrumentation.

A copy of all the illustrations can be found in Appendix 3 at the rear of this report.

Illus 16
Stone wall [1004] in Tr.1

5. EVALUATION

5.1 Methodology

Linear trial trenches were excavated across the available area targeting the footprint of the former works. Trial trenching covered approximately 5% of the site amounting to 105m^2 of trench or 64m (x 1.6m wide). These trenches were laid out according to an indicative trench plan agreed with CECAS and were designed to provide coverage across the site and target specific anomalies recorded by the geophysical survey.

A JCB suitably equipped with a flat bladed ditching bucket was used to remove modern overburden and/or topsoil under archaeological control. Excavations continued until clean geological sediments, significant archaeological deposits or structures were encountered or until the limit of safe excavation was reached. Only trenches less than 1m deep and considered safe were entered by site staff. Deeper sections were excavated but these were only inspected from the surface. No stepping or shoring of trenches took place during this phase of work.

Further excavation required to satisfy the objectives of the evaluation was continued by hand. On completion of machine excavation, all faces of the trench that required examination or recording were cleaned using appropriate hand tools. The stratigraphic sequence was recorded in each of the trenches. All identified features were investigated and recorded. All the trenches were backfilled but not re-surfaced.

Recording

All aspects of the recording were undertaken in accordance with the codes of practice of the Institute for Archaeologists.

All trenches were given individual numbers, a full detailed description of each trench can be found in Appendix 1. Each context was given a unique number and recorded on pro forma record sheets a full list of which can be found in Appendix 1. Colour transparencies and digital photographs were taken; a graduated metric scale was clearly visible. A full list of these can be found in Appendix 1. An overall site plan was recorded using Total Station survey and related to the National Grid. OD levels for the present ground surface were approximately 10m across the site.

Reporting and Archive

The results of the works are presented below. A summary report has been prepared for submission to *Discovery & Excavation in Scotland* (Appendix 2) and the OASIS database.

The complete project archive will be deposited with the National Monuments Record of Scotland (NMRS) within six months of the completion of the project. The records (paper and digital) will be archived according to best practice guidelines set out by the Archaeological Archiving Forum.

5.2 Results

Six trenches were excavated in total (see Illus 6) amounting to an approximate 5% sample of the area under investigation. A summary of relevant results is presented below.

The initial trench was positioned over a circular anomaly recorded on the geophysical survey data. This circular pattern could also clearly be seen as a mark on the ground. The trench was aligned approximately north-south and excavated to a maximum depth of 1.2m. No evidence of the circular feature was observed during the excavation and it was presumed this must have been a grassed over flower bed. The 11m long trench revealed part of a brick manhole/vent

Illus 17
Tr. 2 showing wall base [1010]

Illus 18
Wall [1014] in Tr.3

Illus 19
Stone wall [1017] in Tr.4

[1002] 0.8m below the surface cutting a light brown sand which was thought to be a natural alluvial deposit. At 6m from the south end of Trench 1 the corner of a substantial rubble stone wall [1004] bonded with lime mortar was recorded (Illus 16). The 0.7m thick wall was aligned north-south turning to the east at the south end. Only the bottom two courses of the wall survived. To the outer side of this wall a deposit of coal and charcoal rich sand [1006] was found.

The second trench located close to the sea wall was only 3.1 x 2.5m in size. It was excavated to a maximum depth of 0.35m through 0.1m of topsoil and thin layers of demolition material and made ground. The trench revealed part of a substantial east-west aligned rubble stone wall (Illus 17) with a lime mortar bonding [1012]. A further north-south aligned section of wall ran off the south side of the main wall possibly forming a buttress although it was unclear if this section of wall then turned to the east as the demolition material surrounding it made it difficult to interpret. The wall was cut into a dark brown sandy silt material [1013] with frequent coal and charcoal lump inclusions.

Trench 3 was aligned north-south and was positioned in order to explore the distinct change in the geophysical readings between the north and south side of the site below a particular depth. The trench was excavated to a maximum depth of 1.7m and comprised 0.3m of topsoil overlying *c.*1.4m of demolition material including large stone blocks, bricks and timber. Due to health and safety issues the trench could not be entered although two walls were visible from the trench edge. The two walls were approximately 7.5m apart both aligned east-west through the trench. Wall [1014] (Illus 18) located to the north end of the trench comprised large rubble stone blocks bonded with lime mortar, 0.7m thick and 0.7m below the surface. The second rubble stone wall [1015], bonded with lime mortar located close to the south end of the trench, was 1m below the surface. To the south side of this wall a mid-brown sand with frequent coal lump inclusions was recorded at 1m depth. An area of dark grey silt was also recorded in the section between the two walls although it was unclear if this was dumped material or contaminated ground.

Illus 20
Brick wall [1018] in Tr.5

Illus 21
Stone wall [1020] at the east end of Tr.6

Illus 22
Stone foundation [1021] in Tr.6

Illus 23
Stone wall [1024] in Tr.6

The fourth trench was positioned in order to see if any of the walls of the water tank associated with the salt pan works survived. The east-west aligned 11m long trench revealed a substantial east-west aligned stone wall [1017] (Illus 19) running along the southern side of the trench and only 0.3m below the surface. The wall was at least 1.5m high (the base was not revealed due to health and safety issues) and comprised rubble stone bonded with lime mortar with demolition material abutting the north face. At the west end of the wall (8m from the east end of Trench 4) the wall turned to the south. Immediately to the west of this wall an L-shaped brick wall/foundation [1016] was recorded 0.3m below the surface. This wall was aligned at an oblique angle to the tank wall and was clearly a later phase.

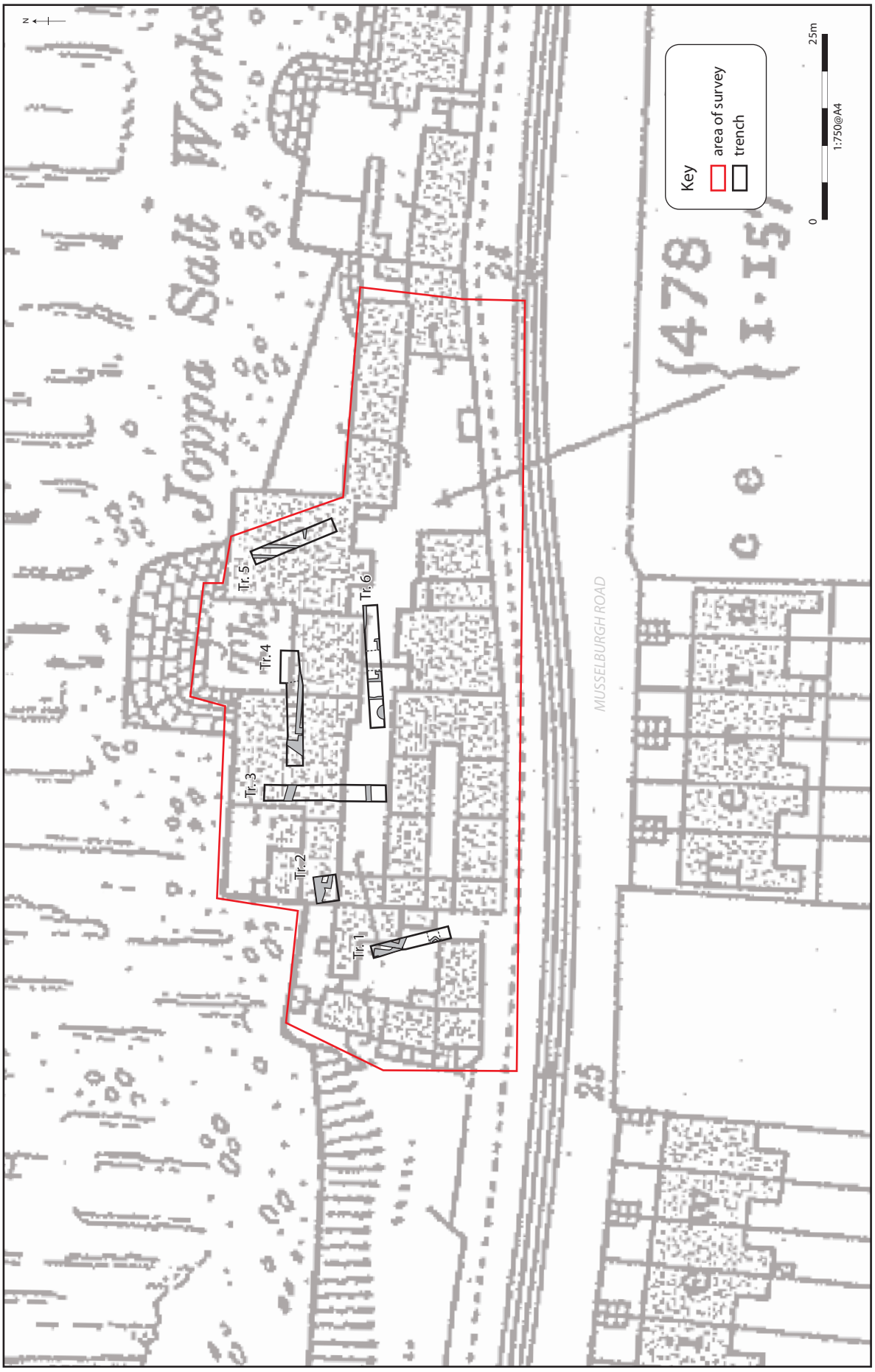
As with Trench 2, due to health and safety issues we could not enter Trench 5. The 10m long trench was aligned northwest-southeast close to the sea wall. Below the upper 0.3m of topsoil the trench was full of demolition material including large stones and frequent firebricks. Two parallel lines of firebrick walls [1018] aligned north-south were revealed at the northwest end of the trench at a depth of 1.3m (Illus 20). These may represent the base of a brick flue. Towards the south end of the trench a more substantial east-west aligned brick wall [1019] ran into the trench but stopped midway across. This wall was 1m below the surface with five courses visible although the base was not revealed.

The final trench was aligned east-west located closer to the south side of the site. Although the trench was only excavated to a maximum depth of 0.9m a number of features were revealed. At the east end two courses of a rubble stone wall [1020] could be seen in the south facing section (Illus 21). Further to the west two areas of rubble stone foundation [2021] & [2023]) bonded with lime mortar were recorded 0.5m below the surface (Illus 22). Between these stone foundations an area of very compact ash and stone [2022] material formed a solid surface. To the west of foundation [2023] a north-south aligned stone wall [2024] ran across the trench (Illus 23). Again the top of this wall was 0.5m below the surface and comprised rubble stone bonded with lime mortar 0.4m wide. The wall was bounded by dark brown sand with frequent coal lump inclusions to the west and a slightly firmer ash and sand deposit to the east. The sand deposit to the west of the wall included a 1.2m diameter pit filled with slightly darker brown coal lump rich sand [1025].

6. DISCUSSION

The results of the evaluation in conjunction with the building recording along the damaged sea wall seem to indicate that although much of the salt pan works were demolished a significant number of the foundation walls survive below the topsoil. Some of the walls exposed during the evaluation align closely to buildings depicted on the 1896 Ordnance Survey (Illus 24). These include wall [1004] in Tr. 1, wall [1017] in Tr. 4 and wall [1020] in Tr.6. The results also seem to indicate that the ground level on the northern part of the site was significantly deeper than that seen to the south with much more demolition material recorded across this area and at a much greater depth. These findings substantiated the results of the geophysical survey undertaken prior to the evaluation. The geophysical survey showed a distinct division of activity between the north and south halves of the site. The surviving tank wall [1017] recorded in Trench 4 and the upstanding stone walls recorded during the historic building recording phase also indicate a greater depth of archaeology across the northern half of the site as well as providing proof that a number of substantial wall remains associated with the salt pan works still survive, although some of these are in poor condition. In comparison the shallow nature and heavy truncation of the walls in Trenches 1, 3 and 6 indicate limited survival of the buildings across the south side of the area.

None of the trenches provided evidence of floor surfaces or old ground surfaces. It may be that some surfaces survive across the northern half of the site at a deeper level than it was safe to excavate during the trial trenching, although given the amount of demolition material recorded in a number of these trenches it is as likely that they have been removed along with the majority of the rest of the works. It was clear across the southern half of the site that no floor surfaces survived and that these were probably truncated by the demolition process leaving only the foundation levels of the walls.



Illus 24
View of features superimposed on to the 1896 Ordnance Survey

Target ID	OS Easting	OS Northing	Notes
A1	332028.7681	673395.1943	Centre point of circular feature visible at surface.
A2	332065.2387	673405.4313	Part circular feature visible at surface
A3	332040.4118	673402.4087	Part circular feature visible at surface
B1	332014.2325	673399.2775	Zone of high amplitude radar
B1'	332018.1580	673407.7704	Returns adjacent to wall.
B2	332101.9640	673399.0600	Single point target.
B3	332029.2032	673406.4500	Single point target.
B4	332029.4759	673403.2922	Single point target.
C1	332053.5713	673418.1007	Zone of high amplitude radar
C1'	332040.1555	673409.8170	Returns adjacent to collapse.
D1	332064.1921	673420.8937	Possible voiding near bench?
D2	332079.4901	673417.6276	Zone of high amplitude radar
D2'	332084.3368	673401.8479	Returns adjacent to wall.
E1	332065.5226	673402.9812	Possible *in situ* wall?
E1'	332081.7718	673402.7893	–
F1	332064.9870	673383.8555	Possible *in situ* wall?
F1'	332065.0095	673398.3877	–
G1	332055.1276	673413.1773	Possible tank wall?
G2	332074.0354	673413.6694	Possible tank wall?
H1	332029.3794	673386.6791	Possible walls in old site entrance?
H1'	332029.6684	673391.9529	–
I	332046.2125	673413.0796	Possible continuation of wall seen in collapse.

Table 1
Ordnance Survey coordinate for each target

7. REFERENCES

7.1 Bibliographic references

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7.2 Cartographic references

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1896, Ordnance Survey, *Edinburghshire, Sheet IV*.6 1:2500.

1908, Ordnance Survey, *Edinburghshire, Sheet IV*.6 1:2500.

1914, Ordnance Survey, *Edinburghshire, Sheet IV*.6 1:2500.

1932, Ordnance Survey, *Edinburghshire, Sheet IV*.6 1:2500.

1947, Ordnance Survey, *Sheet NT36/3273SW* 1:1250. Surveyed 1947, Revised 1949.

1958, Ordnance Survey, *Sheet NT36/3273SW* 1:1250.

1970, Ordnance Survey, *Sheet NT36/3273SW* 1:1250.

7.3 Aerial Photographs

The vertical aerial photographs held by the NMRS and examined in the course of the assessment are summarised below.

Sortie	Frames	Date
106G.UK.011	7286, 7284	15/4/1946
CPE_UK_0276	5405	23/8/1947

8. APPENDICES

Appendix 1 – Site registers

Trench register

Trench	Dimensions	Alignment	Description
1	11m x 1.6m	N-S	Trench was 0.6m deep max. with 0.1m topsoil [1007] over 0.25m of mortar, ash and brick [1008] over 0.25m of mid-brown coal lump rich sand [1009]. At the S end of the trench was a brick manhole/vent [1002] 1m wide and 0.8m below the surface. To the north end was a corner section of stone wall [1004] aligned north-south and turning to the E at the S end and 0.4m below the surface. Both features were cut into the coal lump rich sand.
2	2.5m x 3m	E-W	A small trench excavated to 0.35m comprising 0.1m of topsoil over 0.05m of mixed mortar and ash deposits [1011] above a 0.05m layer of greyish brown sandy silt [1013] over 0.15m of mixed ash, coal and stone [1014] deposits. A stone wall [1010] was recorded in the north half of the trench 0.1m below the surface.
3	13m x 1.6m	N-S	Two east-west aligned walls ran through this trench at 2m from the S end [1015] and 10m from the S end [1014]. Wall [1014] was 0.8m below the surface and comprised a rubble stone wall bounded on both sides by demolition material. Wall [1014] was 1m below the surface and bounded by demolition material to the N side and sand to the S side.
4	11m x 1.6m	E-W	An 8m long length of wall [1017] ran east-west through the trench before turning to the south at the W end. The wall was 0.5m below the surface and stood to at last 2m high. Immediately to the W was a brick wall [1016] on an NE-SW alignment 0.5m below the surface. The trench was filled with demolition material to the north side of wall [1017].
5	10m x 1.6m	NW-SE	A deep trench full of demolition material below the topsoil. 1.3m below the surface was two parallel lines of brick wall [1018] (flue walls?) aligned north-south. At the S end an east-west aligned brick wall [1019] ran halfway into the trench 1m below the surface.
6	15m x 1.6m	E-W	The trench had a maximum depth of 0.9m. At the E end a section of stone wall [1020] was in the south facing section. At 4m from the E end a section of stone wall foundation [1021] was found beyond which was a 2.5m wide section of compact stone and ash [1022] forming a possible surface bounded on the W side by another section of stone wall [1023]. 12m from the E end was a north-south aligned stone wall [1024] bounded by coal lump rich sand on the W side. Within the sand was a 1.2m diameter circular pit [1026] running out of the N facing section filled with dark brown coal rich sand.

Context register

Context	Area	Description
001	NW wall	Topsoil, 0.1m of dark brown silty sand with frequent rubble inclusions throughout
002	NW wall	Modern sea wall constructed of brick
003	NW wall	Cut for sea wall [002]. extends approximately 1.5m behind the wall
004	NW wall	Backfill of cut [003] comprising stone and stone chippings
005	NW wall	Rubble levelling deposit including large sandstone blocks, mortar and pan-tiles
006	NW wall	Layer of cinder including slag fragments
007	NW wall	Old sea wall to S side and below brick wall [002]. 1.5m wide rubble stone wall bonded with lime mortar aligned east-west along the N end of the area
008	NW wall	Old sea wall as [007] but aligned north-south to the south of [007]. Wall was 0.7m wide
009	NW wall	Lime mortar bonded rubble stone wall aligned north-south revealed in W facing section behind the N wall [007]
010	NW wall	A east-west aligned rubble stone wall slightly exposed in the west facing section
011	NW wall	Stone wall aligned east-west behind wall [008]. Only N face exposed. Comprised large stone blocks on the base with smaller stone and handmade brick above
012	NW wall	A floor surface of handmade bricks bonded with a fine mortar and at least three courses thick
013	NW wall	Two layers of brick forming a floor /surface abutting wall [008] at the west end.
014	Tide hole	Stone rubble wall bonded with lime mortar and aligned north-south. Only the west facing side exposed and the N side is truncated by the modern sea wall cut

Context	Area	Description
015	Tide hole	Layer of rubble and cinder as a levelling layer below the topsoil
016	Tide hole	A stone rubble wall with lime mortar bonding aligned north-south and exposed in the small tide hole
017	NW wall	Mid-grey sandy clay with frequent stone inclusions abutting the inner edge of wall [007]. Possibly infill around the tank to the east
018	NW wall	Area of intensely burned brick/stone/mortar rubble. Possibly a demolition deposit
1001	Tr. 1	A layer of fine mid brown sand with little in way of demolition material. Possibly associated with the brick manhole/vent [1002]
1002	Tr. 1	A rectangular brick built structure 1.2m wide projecting out of the east facing section of the trench. The wall was 0.8m below the surface and cut into the natural sand
1003	Tr. 1	A layer of light brown sand 0.3m below the surface and 0.25m deep. Possibly re-deposited material
1004	Tr. 1	Stone wall foundations forming the SW corner of a building. Comprised rubble stone 0.7m thick and two courses high bonded with a course pale yellow lime mortar. Wall is built on a layer of mid-brown sand
1005	Tr. 1	Mid brown silty sand with frequent small coal lumps. Fill of foundation cut for wall [1004]
1006	Tr. 1	A charcoal and coal rich deposit of dark grey silty sand. Possibly levelling material following the demolition phase
1007	Tr. 1	Between 0.1 and 0.3m of topsoil comprising a dark greyish brown silty sand with frequent small stone inclusions and occasional demolition material
1008	Tr. 1	A thin 0.05m thick layer of demolition material comprising brick fragments mortar and stone in a greyish brown silty sand matrix
1009	Tr. 1	A thick layer of mid-brown fine sand recorded in the N facing section of Tr. 1
1010	Tr. 2	An area of stone foundations aligned both east-west and north-south 0.3m below the surface and cutting the coal rich sand [1013] to the south. The rubble stone was bonded with lime mortar and comprised large angular stones bounding a rubble core
1011	Tr. 2	A thin layer of mortar and burnt material with frequent stone inclusions. Possibly a levelling material or layer of demolition close to wall [1010]
1012	T. 2	A 0.05m thin layer of greyish brown fine sand with small charcoal/coal flecks 1m below the surface.
1013	Tr. 2	A layer of dark grey course silt below [1012] and abutting [1010]
1014	Tr. 3	A 1m wide rubble stone wall bonded with lime mortar at the N end of Tr. 3 and aligned east-west. The wall was 0.8m below the surface and bounded on both sides by demolition material
1015	Tr. 3	A rubble stone wall aligned east-west close to the S end of Tr. 3. The wall was bonded with lime mortar and was 0.7m wide and 1m below the surface. It was bounded by demolition material to the N and a coal rich mid brown sand to the south
1016	Tr. 4	A brick floor/foundation bonded with cement at the W end of Tr. 4 abutting stone wall [1017]. The shape is unclear but the area exposed forms an L shape section aligned NE-SW. between the brick feature and the stone wall was an area of concrete and brick which may represent demolition material associated with the brick surface
1017	Tr. 4	Significant rubble stone wall bonded with lime mortar. The wall was aligned east-west through the trench running from the E end for 8m before turning S into the trench edge. The wall was over 2m high with demolition material abutting the N side
1018	Tr. 5	The base of two parallel brick walls approximately 1 m apart and aligned north-south across Tr. 5. These walls were 1.3m below the surface. The bricks were predominantly fire bricks and were bonded with a sandy clay. This was possibly the base of a flue. Bricks stamps included Whitehill and Muir Armadale
1019	Tr. 5	An end section of brick wall aligned SE-NW 3m from the S end of Tr. 5. The wall was 1m from the surface and abutted by demolition material on both sides. Five course of brick were visible but the wall base was not revealed
1020	Tr. 6	The base of a east-west aligned rubble stone wall 0.3m below the surface. Located in the S facing section of the trench at the west end. Only visible for the first 3 m. the wall was only 2 or 3 courses, 0.4m high and bonded with lime mortar and sat over a mid brown coal rich sand

Context	Area	Description
1021	Tr. 6	Section of rubble stone foundation 0.5m below the surface. It comprised a L-shaped section of stone surface bonded with lime mortar projecting from the n facing trench section. It was 1.6m wide and 0.7m into the trench. it cut a coal rich sand to the E and N and was abutted by a stone surface [1022] to the W
1022	Tr. 6	A very firm and compact surface comprising small angular stones, brick fragments and ash deposits 2.6m wide and abutting [1021] to the E and [1023] to the W. the surface was 0.5m below the surface
1023	Tr. 6	A u-shaped stone foundation bonded with lime mortar 8m from the E end of Tr. 6. The foundation was 0.5m below the surface and was 1.36m wide. One section of this feature extended the width of the trench. To the W of this was a thin layer of ash and sand, possibly a floor surface and to the E was the stone floor [1022]
1024	Tr. 6	A north-south aligned stone wall 11.2m from the E end of Tr. 6. The wall was 0.5m below the surface and comprised rubble stone bonded with lime mortar 0.4m wide. The wall was bounded by the ash sand deposit to the e and a coal rich sand to the W
1025	Tr. 6	Fill of a pit cut into the coal rich sand. The fill was a dark brown sand with frequent coal lump inclusions
1026	Tr. 6	A circular pit cut in plan 1.2m diameter extending out of the N facing section of Tr. 6. Cuts the mid-brown coal rich sand which may be natural alluvial deposits. Located at the W end of the trench

Photographic register

Frame No.	C/S No.	Facing	Description
1	–	NE	View of collapsed sea wall
2	–	N	View of collapsed sea wall showing wall [007]
3	–	E	View of ground collapse showing wall [014]
4	–	N	View of ground collapse showing sea wall
5	–	SW	View of sea wall
6	–	SE	View of E side of area
7	–	SW	View of W side of area
8	–	E	View of sea wall collapse
9	1/35	–	Film 1 ID shot
10	1/34	NW	Working shot
11	1/33	NW	View of Tr.1
12	1/32	E	Wall [004] in Tr.1
13	1/31	SW	Sample of Tr 1 section
14	1/30	N	Wall foundation [1010] in Tr.2
15	1/29	S	View of Tr.5
16	1/28	N	View of Tr.5
17	1/27	N	Post ex of Tr.3
18	1/26	E	Wall [1014] in Tr.3
19	1/25	E	Trench 4
20	1/24	SE	Feature [1016] at W end of Tr.4
21	1/23	N	Trench 5 post-ex
22	1/22	S	Trench 5 post-ex
23	1/21	E	Wall [1024] in Tr.6
24	1/20	N	Foundation wall [1023] in Tr.6
25	1/19	E	Pit cut [1026] in Tr.6

Frame No.	C/S No.	Facing	Description
26	1/18	S	Foundation wall [1021] in Tr.6
27	1/17	N	Stone wall [1020] in S facing section of Tr.6
28	1/16	W	Trench 6
29	1/15	E	Trench 6
30	1/14	NE	Working shot
31	–	Various	Backfilled trenches
32	–	Various	Backfilled trenches
33	–	Various	Backfilled trenches
34	–	Various	Backfilled trenches
35	–	Various	Backfilled trenches
36	–	Various	Backfilled trenches
37	–	Various	Backfilled trenches
38	34/2	S	View of walls at the edge of the collapse
39	–	W	General view of the area from the collapsed wall
40	–	W	Working shot
41	33/2	W	View of stone wall
42	32/2	W	View of stone wall
43	31/2	N	View of collapsed brick wall [002]
44	30/2	S	General view of brick floor in collapsed section
45	29/2	S	Detail of brick floor
46	28/2	S	General view of the eastern end of the wall collapse
47	27/2	SE	General view of stone wall [009] in section
48	26/2	SE	Detail of stone wall [009]
49	25/2	SE	General view of section of collapse
50	24/2	SE	General view of collapsed section showing ash deposits and stone wall at the base
51	23/2	SE	General view of collapsed section showing ash deposits and stone wall at the base
52	22/2	SE	View of brick floor [013] and wall [011]
53	21/2	SE	View of brick floor [013] and wall [011]
54	20/2	SE	View of brick floor [013] and wall [011]
55	19/2	S	General view of the collapsed area
56	18/2	S	General view of the collapsed area
57	17/2	E	View of stone wall [014] in blowhole section
58	16/2	E	View of stone wall [014] in blowhole section
59	15/2	N	Brick wall [002] in blowhole section
60	14/2	W	Brick wall [002] and stone wall [016] in blowhole section
61	13/2	N	General view of collapsed sea wall
62	12/2	W	General view of collapsed sea wall
63	11/2	N	View of sea wall
64	10/2	NE	View of sea wall collapse
65	09/2	S	View of bricks floor in section
66	08/2	S	Detail of burnt stone [018] in section

Frame No.	C/S No.	Facing	Description
67	07/2	N	General view of collapse debris
68	06/2	S	General view of collapse debris
69	05/2	E	General view of collapse debris
70	04/2	S	General view of collapsed wall
71	03/2	S	General view of sea wall to the east of collapsed area

Appendix 2 – Discovery and Excavation in Scotland Report

LOCAL AUTHORITY:	Edinburgh City Council
PROJECT TITLE/SITE NAME:	A DBA and Evaluation at Joppa Salt Pan Works, Portobello, Midlothian
PROJECT CODE:	JSPW10
PARISH:	Edinburgh City
NAME OF CONTRIBUTOR:	Donald Wilson
NAME OF ORGANISATION:	Headland Archaeology Ltd
TYPE(S) OF PROJECT:	DBA and Evaluation
NMRS NO(S):	NT37SW 214
SITE/MONUMENT TYPE(S):	18th–19th century salt pan works
SIGNIFICANT FINDS:	none
NGR (2 letters, 8 or 10 figures)	NT 3210 7340
START DATE (this season)	September 2010
END DATE (this season)	September 2010
PREVIOUS WORK (incl. DES ref.)	none
MAIN (NARRATIVE) DESCRIPTION: (May include information from other fields)	Headland Archaeology conducted a programme of archaeological works on the site of the former salt pan works at Joppa after the north western corner of the seawall that had collapsed due to storm damage. The programme of works comprised historic building recording of the walls exposed due to the collapsed sea wall. This was followed by a desk based assessment, and a geophysical survey of the area prior to an intrusive evaluation at the site. This works was undertaken in order to supply Edinburgh City Council and future developers of the extent of the remains. Although the geophysical survey was inconclusive in conjunction with the historical maps it helped to located the position of the trenches. Six evaluation trenches were excavated in total and revealed a number of wall foundations and a poorly preserved tank wall close to the north end of the site. Unfortunately no floor surfaces were revealed and no artefacts associated with the salt pan works survived.
PROPOSED FUTURE WORK:	Unknown
SPONSOR OR FUNDING BODY:	Edinburgh City Council
ADDRESS OF MAIN CONTRIBUTOR:	13 Jane Street Edinburgh EH6 5HE Scotland
EMAIL ADDRESS:	donald.wilson@headlandarchaeology.com
ARCHIVE LOCATION (intended/deposited)	NMRS

Appendix 3 – Ground Radar Survey Plans

PHOTO 1 (above): Aerial photograph showing the survey area in relation to the City of Edinburgh.

Survey area notes.

1) Short flat grass
2) Three benches in survey area
3) 1 gas installation at east.
4) Collapse area in north is fenced off (no survey).
5) Service running east to west in grass at southern site boundary.
6) Service running north-west to ductile cover (northern boundary - east side of site).

North

PHOTO 2 (below): Aerial photograph showing the survey area and key features.

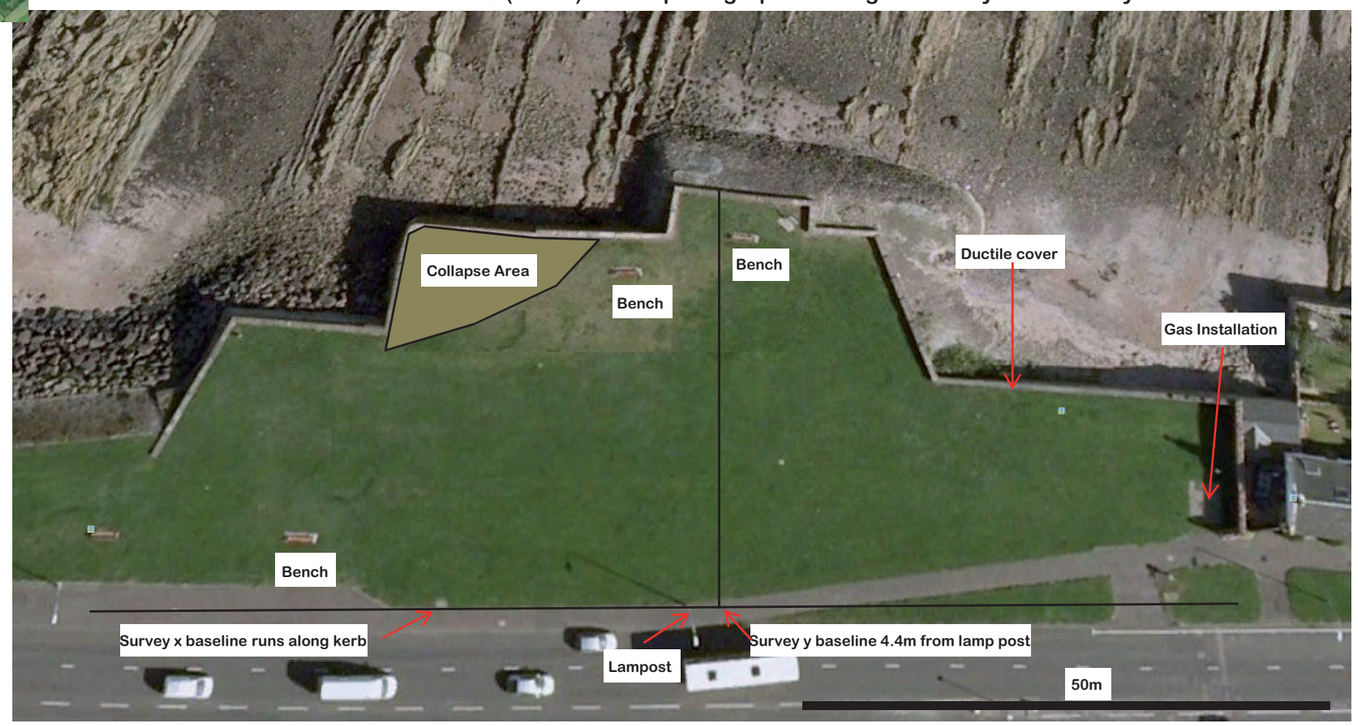

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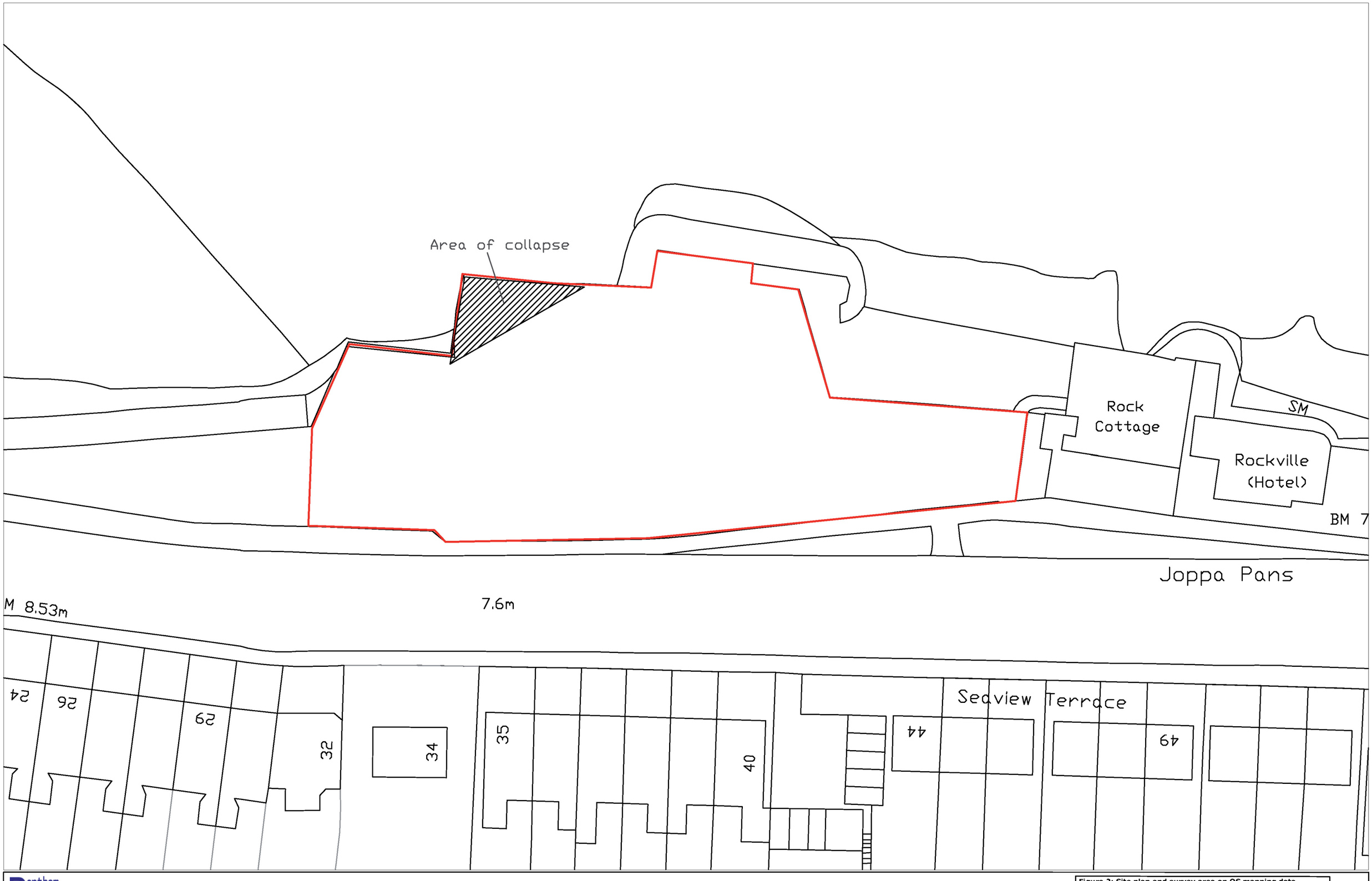
Figure 1: Aerial photographs showing the location of Joppa Salt Pans Survey baselines shown for relocation purposes.
Site : Joppa Salt Pans, Portobello, Edinburgh, UK
Survey Date : 21st Sept 2010



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N

Survey Area Outline

Figure 2: Site plan and survey area on OS mapping data.
Site: Joppa Salt Pans, Portobello, Edinburgh.
Date: 21st September 2010

Scale 1:500 @ A3

PHOTO 1 (above): Looking north at the western end of the survey area.

PHOTO 2 (above): Looking east at the southern boundary of the survey area.

PHOTO 3 (above): Looking north at the collapse area.

PHOTO 4 (above): Materials exposed in the collapse. Note the dark band of ash and the rubble content of the infill.

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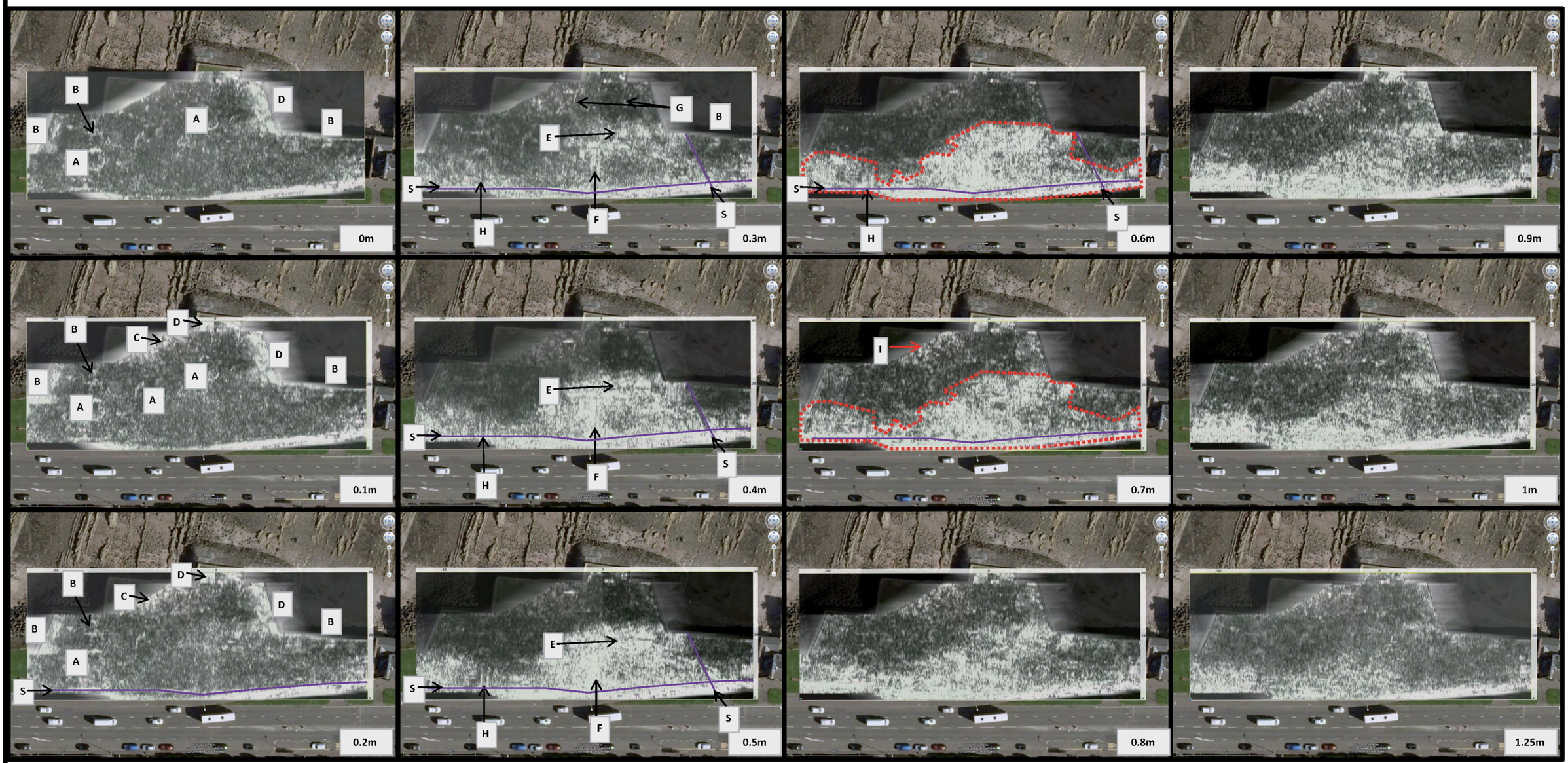
Figure 3: Site photographs.

Site : Joppa Salt Pans, Portobello, Edinburgh, UK
Survey Date : 21st Sept 2010



NOTES:
Each image shows a composite radar plan at increasing depths. This is intended to allow comparisons between the anomalies seen at differing depths and ranges.
Anomalies of interest are marked.
A: Circular anomalies visible between 0 and 0.25m
B: Small targets - possible structures visible between 0 and 0.3m
C: High amplitude near known collapse - walls debris or ash layer? Walls and ash layers are visible in nearby collapses.
D: High amplitude near seawalls - possible fill change or voiding associated with sea undercutting?
E: Vague alignment of high amplitude anomalies - possible buried structure?
F: Linear anomalies - coincide with approximate wall locations on 1896 OS plans
G: Narrow linear anomalies in the approximate location of tank walls seen on OS plans

North

H: Two narrow and parallel anomalies running from pavement side to the north visible between 0.3 and 0.6m depth.
I: High amplitude anomalies near recent collapses. Possible continuation of walls and footings?
S: Services. 1 service running east to west on grass just north of pavement. The scar in the grass is visible in places. 1 service running south-east to north-west from road splay to ductile cover visible in grass near seawall. Take care during excavation
GAS: Area associated with gas installation. Take care during excavation.

Red dashed area. This areas seems to be quite distinct in reflectance amplitude over the northern area of the site and may indicate a distinct type of infilling material. The fullest extent is seen at a depth of 0.5 to 0.6m. In the southern zone (inside red dashes) there are few indications of linear anomalies or of patterns within the anomaly distributions which may allow us to point out possible foundations. Instead we suspect mixed demolition debris and varying amounts of ash/slag. Trench intrusive investigations will be required for confirmation. In the northern zone there are some high amplitude anomalies (I above) which may be indicative of the continuation of the walls seen in the recent collapses.

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Figure 4: Radar depth slices. 0m to 1.25m at 0.1m intervals.

Site : Joppa Salt Pans, Portobello, Edinburgh, UK
Survey Date : 21st Sept 2010

Target coodinates. OS grid

A1,332028.7681,673395.1943
A2,332065.2387,673405.4313
A3,332040.4118,673402.4087

B1,332014.2325,673399.2775
B1',332018.1580,673407.7704
B2,332101.9640,673399.0600
B3,332029.2032,673406.4500
B4,332029.4759,673403.2922

C1,332053.5713,673418.1007
C1',332040.1555,673409.8170

D1,332064.1921,673420.8937

D2,332079.4901,673417.6276
D2',332084.3368,673401.8479

E1,332065.5226,673402.9812
E1',332081.7718,673402.7893

F1,332064.9870,673383.8555
F1',332065.0095,673398.3877

G1,332055.1276, 673413.1773
G2, 332074.0354, 673413.6694

H1,332029.3794,673386.6791
H1',332029.6684,673391.9529

I,332046.2125,673413.0796

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Figure 5: Target location summary.
Locations are Ordnance Survey Grid.
Site : Joppa Salt Pans, Portobello, Edinburgh, UK
Survey Date : 21st Sept 2010