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Historic Building Recording

Site & Landscape Survey

Geophysical Survey

Western Breakwater, Granton Harbour, Edinburgh

Archaeological Watching Brief & Standing Building Survey

Report No. 1581

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CFA ARCHAEOLOGY LTD

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1. INTRODUCTION

1.1 General

1.1.1 This report presents the results of an archaeological watching brief undertaken by CFA Archaeology Ltd (CFA) between May 2008 and November 2008 during construction works for the strengthening of the current breakwater at Granton Harbour, Edinburgh (NT 2365 7760, Figs 1 and 2). It also documents the results of a standing building survey conducted on the upstanding structural remains of the eastern tip of the breakwater, including a length of the original 19th century harbour wall. The work was commissioned by Forth Property Developments Ltd.

1.1.2 A Written Scheme of Investigation was produced to fulfil the requirements of the City of Edinburgh Council Archaeology Service (CECAS). Previous work on the Category B Listed Western Breakwater includes desk based assessment and archaeological survey work (Cressey 2003, 2004a, 2004b & 2005) and an archaeological watching brief during preparatory groundwork for service infrastructure (Kirby 2005).

1.2 Background

Historical Context

1.2.1 Granton Harbour lies on the Firth of Forth between Cramond and Newhaven. The *New Statistical Account* of 1845 mentions that construction of the harbour began in 1835 by Walker Burgess Engineers of London for the Duke of Buccleuch. The harbour enclosure was designed by Robert Stevenson and Sons and was completed by 1845. The account also mentions that there were ten jetties, two low water slips, eleven warehouses and sixteen cranes. Stone was supplied from a quarry less than a mile from the pier and the timber for the jetties was imported directly from Memel, now Germany.

1.2.2 The Western Breakwater was first constructed in 1849. The harbour expanded as exports of coal increased. This expansion required larger shipping berths and the incorporation of larger machinery to cope with demand, including two 25 tonne steam cranes added later. By 1863 a timber wharf was constructed which lined the inside face of the stone breakwater (Fig. 3a). The wharf was a composite timber construction built on an A-frame arrangement secured by iron bolts (Cressey 2005). The wharf was continually modified, and accommodated electric travelling cranes along sets of broad gauge railway lines set into the timber deck (Fig. 3b). A major renovation was carried out in 1937 (Hannay-Thompson 1937) which included the incorporation of new piles and timber bracings.

1.2.3 During the 20th century harbour exports and imports declined rapidly and by the 1970s the Western Harbour had largely been reclaimed.

1.3 Aims and Objectives

1.3.1 The objectives of the project were as follows:

- to carry out a series of targeted watching briefs to provide a representative sample of the construction techniques used along the length of the 19th century Western Breakwater in order to enhance the previous archaeological work carried out by Kirby (2005);

- to undertake a standing building survey on the upstanding 19th century section of the Western Breakwater;

- to produce an illustrated report on the findings of the watching brief and standing building survey.

2. WORKING METHODS

2.1 General

2.1.1 CFA Archaeology Ltd follows the Institute of Archaeologists Code of Conduct, Standards and Guidance for Archaeological Watching Briefs.

2.2 Watching Briefs

2.2.1 After discussions with John Lawson of CECAS, the watching brief targeted a maximum of 14 segments of the old harbour wall that were monitored at regular intervals (Fig. 2). Close attention was paid to areas assessed as being the former locations of structures such as steam cranes, weighing machines and engine houses (Cressey 2004) as well as areas of archaeological interest previously identified by Kirby (2005).

2.2.2 Site visits were undertaken by CFA at regular intervals in order to monitor progress and record any features encountered during the groundbreaking work. Close co-operation with the site contractors ensured that CFA was immediately notified when unexpected features were brought to light and a programme of recording was put in place.

2.2.3 Prior to the main phase of excavation, a series of exploratory test pits were excavated. A total of three test pits were monitored during this preliminary phase.

2.2.4 Each excavation involved the removal of all deposits up to the existing concrete seawall down to a depth of c 4.8m below the existing ground surface. Each trench was approximately 6m in length by 4.6m wide at its base, tapering at an angle of approximately 60° to the ground surface, which in effect increased the width of each trench to c 6m. A sequence of lightweight, reinforced concrete pours strengthened the existing seawall (Fig. 5).

2.2.5 Owing to health and safety reasons, access to the base of the trenches was not always possible. The unstable nature of these excavations was exacerbated by periodic tidal influxes.

2.3 Standing Building Survey

2.3.1 Figure 1 shows the position of the wall section that was recorded. Figure 10 shows the photographic montage of the internal face of the wall. A 150m length of wall was photographed.

2.3.2 The photographic record of the Western Breakwater wall was made using a Nikon D100 digital SLR camera. General architectural characteristics were recorded using standard building recording forms. Detail such as the type of coping stones used, fabric detail and alterations in height were also recorded.

2.3.3 No recording work could be carried out on the seaward side of the wall but photographs were obtained from a safe vantage point.

3. ARCHAEOLOGICAL RESULTS

3.1 Watching Brief

3.1.1 Thirteen trenches and three test-pits were monitored as part of the archaeological watching brief. Numbers in bold and parentheses relate to the context numbers shown in Appendix 2. Fig. 4 provides a section of trench 2A, which was found to have the best preserved archaeological remains of all the test pits and trenches observed. The remains located within trench 2A are discussed below and as such the findings are representative of all the trenches that were monitored during the watching brief.

3.1.2 The watching brief confirmed the presence of an ashlar wall (**005**) in all excavated areas (Fig. 2). It was constructed from large sandstone blocks 1.4m long by 1.1m wide, with a uniform depth of 0.4m. The wall invariably survived to a maximum height of five courses and although the close inspection of deep sections was not permitted, extrapolation of the results of the block measurements revealed the wall survived to a height, below the current ground surface, of approximately 2m.

3.1.3 The width of the wall varied from 1.2m to 1.8m. At the current ground level a shallow pipe slot (**007**) was noted cut into the wall. This slot (Fig. 6 & 7) was in-filled after the pipe had been laid with orangey, medium to coarse grained building sand. The pipe is presumed to have been incorporated during a later phase of alteration sometime after the main construction of the ashlar wall or following its dismantling.

3.1.4 The physical relationship of the base of the ashlar wall (**005**) and the stone pitching (**002**), which would have formed the exterior of the harbour breakwater, was noted in trench 2A (Fig. 4 & 8). The harbour wall was recorded as having a stugged, partially bevelled footing, comprising roughly hewn blocks of sandstone (**004**), 1.5m in length by c 1m wide. Two 0.10m diameter holes in the upper surfaces possibly suggested some form of locating dowels may have been used during the construction process. The bevelled edge was external facing, pitching outside the westerly elevation of the ashlar harbour wall (**005**) at an approximate angle of 30°. The pitching on these blocks continued for 0.20m before a vertical face met a second bevelled block (**003**) which protruded a further 0.25m westward, pitching at the same angle. This arrangement of large blocks created a tapering toe to the exterior of the harbour wall and abutted the stone pitching of the breakwater (**002**).

3.1.5 The breakwater pitching (**002**) was noted to continue up to the existing concrete sea wall (**008**) for c 2m, and comprised on average four blocks. The individual blocks measured 0.56m by 0.54m. It was found that the concrete wall (**008**) rested directly on top of the stone pitching (**002**), and had not truncated it.

3.1.6 The construction of the 20th century concrete wall to the outside of the existing harbour wall created a 3m wide void that needed to be filled. A series of sequential deposits were noted which are interpreted as belonging to this phase

of construction. Deposit **009** comprised layers of rounded stone cobbles with an estimated depth of 0.8m. This in turn was covered by **010**, **011** and **012**, comprising mixed deposits of banded sands, gravel and rubble, with deposit **012** interpreted as a tip of material. This infill of the void behind the breakwater uses an assortment of material to provide a working surface for harbour activity and to strengthen the internal elevation of **008** from wave hammer.

3.1.7 The concrete sea wall (**008**) comprises un-reinforced shuttered concrete, with beach shingle and rounded cobbles. The structure had a maximum height of 8.15m AOD (3.2m above the current ground surface).

3.1.8 Between the concrete sea wall (**008**) and the original breakwater (**005**) was a series of steel fuel pipes (**013**) encased in a mass of concrete up to 1m thick. Evidence of this parallel arrangement of services was noted in all the observed trenches. A deposit of compacted demolition material, mixed gravels and stone fragments (**014**) further elevated the ground surface by covering the remains of **005** and **013**.

3.1.9 The material upon which the harbour wall and wharf were constructed was a layer of made ground (**001**). However, owing to health and safety reasons closer inspection was often difficult and the clarity of horizon was poor due to the collapsing backfill. It was possible to ascertain that the pitching (**002**) on the seaward side was of single block thickness, with the central mass of made ground apparently constructed of angular and fragmented stone blocks, with a dark and presumed sandy-gravel surrounding matrix.

3.1.10 A large mass of angular rubble infill was noted to the interior of the ashlar wall (**006**). This deposit corresponds with the central infill of the internal and external ashlar walls in Fig. 3a.

3.1.11 The above deposits were capped by a layer of tarmac, providing a surface 0.2m in depth. This was in-turn covered by a layer of recent overburden of similar thickness. Deposits **014** and **015** (Fig. 4) are both of modern surfaces associated with the last phase of commercial activity on the breakwater (c 1960s).

3.2 Standing Building Survey on the Breakwater Wall

3.2.1 This section describes the building survey of the upstanding part of the 19th century ashlar breakwater wall. Important architectural features were given unique context identification numbers and these are shown in bold and parentheses and on Fig. 10. The feature numbers are listed in Appendix 1. A list of all the photographs taken are provided in Appendix 5.

3.2.2 The upstanding remains of the original 19th century breakwater measure 150m in length. The wall is made up of two sections, the principal sandstone ashlar wall and the remains of a stone and brick building at the extreme end of the wall. The first section was 147.8m long and measured 2.63m high. The main build (**001**) was of coursed blocks of ashlar sandstone with ridged coping stones (**002**). The blocks had been laid horizontally, respecting the geological 'bedding plane' of the stone. This technique was used by stone masons in order to limit the amount of delamination and therefore erosion (Maxwell 2007). In the case of the breakwater wall, this technique has helped to reduce natural erosion, and there is little sign of weathering on the majority of the stone.

3.2.3 The main build (**001**) comprises sandstone blocks laid in regular courses with fine joints and an even face. The blocks measured 1.16m long by 0.62m high and the coursing overlapped. Longer stones, measuring 1.37m long, were used every second course. The upper three courses of stone were bonded together with a pink shell-tempered mortar. The lower courses were not mortar-bonded, allowing the toe of the breakwater to 'breathe' and thus reduce the pressure of wave action on the structure. The width of the wall was 0.70m. The ridged coping stones were used throughout, with the exception of a 14.5m long section where a single course of red brick (**020**) had been used. At the northern end of the wall, the coping had been replaced by a concrete cap (**003**).

3.2.4 The wall was fixed together by the use of basalt keystones and metal cramps. The keystones measured 0.1m square by 0.2m high and were held in their corresponding slot, which was typically found in a central location, by a pink shell-tempered mortar (Fig. 17). The keystones were used to bond the wall between courses. The stone blocks in the same course were held together using metal cramps. These cramps were set in a groove and mortice at the end of each stone (Fig. 19). It appears as if a partial joggle joint (Fig. 18) may have been used on the upper course of stone, although this was only recorded in one instance and may not be part of the original character of the wall.

3.2.5 The wall includes the scars of a number of fixtures and fittings including modern posts and wooden notice boards (Appendix 1). The remains of five lamp stands (**007**, **010**, **013**, **015**, and **018** Fig. 10) were recorded. Part of an iron post survived in groove **013** (Fig. 11) and contained a hollow lead pipe. It is unclear whether these are the remains of gas or electrical lamps, but the associated brackets survive on the southern extent of the wall. Three other grooves (Fig. 12) cut into the wall (**008**, **011** and **017**) are probably associated with other service pipes being attached to the wall. A large arched horizontal cut (**012**) with an associated vertical groove (Fig. 16), very similar to that

noted for the lamp stands, was observed within the face of the wall. The function of this cut is unclear, although its shape suggests it was associated with a circular or hinged feature that had to move within this space. At a later date, and for reasons unknown, the centre was blocked with red brick (Fig. 16). A carved recess (**004**, Fig. 13) at the northern end of the wall is associated with a curved area of stone on the pier. This feature is likely to have been the remains of a small stone building, possibly a beacon at the end of the pier, although its function remains unknown (Fig. 14).

3.2.6 At the end of the breakwater, the remains of a stone (**005**) and brick (**006**) structure (Fig. 13) were recorded. The structure measured 2.3m long by 1.38m high by 2.3m wide and contained a concrete floor (Fig. 15). The northern gable contained a cavity, 0.06m wide, and the outer portion was probably a later extension.

3.2.7 These walls are probably all that remains of the buildings visible on an aerial photograph from 1971. These remains probably encompass at least two separate phases of construction at the tip of the Western Breakwater, and cover the partially visible remains of a presumed circular housing for a light beacon depicted on the 1899 Admiralty map (Cressey 2003a).

4. DISCUSSION

4.1 Watching brief

4.1.1 The results of the watching brief and the standing building survey carried out on the Western Breakwater have provided a record of its construction. The sandstone ashlar wall (**005**), which was observed in all excavated trenches, is the remains of the 19th century harbour wall. The stone pitching (**002**) was also observed in several trenches, of which 2A provided the best example. The watching brief confirmed the pitching was a single layer of stone blocks set against a compacted mass of rubble, which provided the central core of the breakwater. The stone pitching at the base of the breakwater wall was designed to deflect wave action as well as lending structural support for the breakwater itself. The base of the ashlar wall (**005**) was found to incorporate large bevelled blocks (**003** & **004**), which protruded to the exterior.

4.1.2 A series of steel pipes encased in concrete (**013**) lay between the modern and old walls. The pipes probably date to the mid-20th century and were installed to carry fuel oil to the ships berthed on the timber wharf within the harbour.

4.2 Standing building survey

4.2.1 The building survey recorded a 150m section of upstanding ashlar wall towards the end of the breakwater. The wall stood at a height of 2.63m and was constructed of square hewn blocks, the largest examples of which were in the region of 1.37m in length by 0.62m in height. The blocks were secured by basalt keystones and metal cramps with shell-tempered mortar. The construction techniques described here are in accord with the findings on the Middle Pier (Cressey 2004).

4.2.2 The wall contained a range of fixings associated with lighting and cable support. These include the remains of lamp standards that were fixed into vertical grooves. A series of iron brackets carried service pipes along the length of the wall. A large arched groove was interpreted as the remains of a blocked recess to accommodate a circular or hinged feature.

4.2.3 At the northern end of the wall were the remains of a stone and brick structure, with at least two phases of construction. This is interpreted as the surviving remains of a building noted on aerial photographs from 1971. Field observations in this area noted several surviving archaeological features, including the surface remains of a light beacon and stone surface which were partially obscured by a later concrete surface.

4.2.4 Access to the stone pitching of the outer breakwater and the seaward elevation of the ashlar wall was not permitted due to health and safety considerations. Observations from several vantage points appear to confirm that the current state of preservation on the seaward side is good.

5. CONCLUSION

5.1 The archaeological watching brief carried out on the Western Breakwater has provided a permanent record of its construction, and the type of materials used in its construction are now better understood.

5.2 The standing building survey carried out on the 19th century upstanding breakwater wall has provided a permanent record of its architectural character and construction techniques.

5.3 In order to disseminate these results to a wider audience, a summary statement will be submitted for publication in *Discovery and Excavation in Scotland 2009*, a copy of which is attached as Appendix 6. An OASIS Scotland entry has also been completed.

5.4 The final decision on any further mitigation measures lies with the City of Edinburgh Council Archaeology Service (CECAS).

5.5 An archival record will be deposited in the NMRS and the City of Edinburgh Council SMR.

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6.2 Aerial Photograph

Granton Harbour 1971 www.scran.ac.uk.

APPENDIX 1: STANDING BUILDING SURVEY CONTEXT REGISTER

Context	Component	Element	Summary description
001	Breakwater wall	Main build	Ashlar blocks of wall. Coursed sandstone and fixed with pins. Upper course smaller than those below.
002	Breakwater wall	Coping stones	Ridged coping stones of dressed sandstone, each 1.14m long by 0.28m high. The central section of coping is surmounted by a single course of red bricks, the ridge having been partially removed.
003	Breakwater wall	Concrete capping	Concrete Capping, replaced coping stones in northern area of wall, 0.09m high. Some of the bond from the original coping stones survives.
004	Breakwater wall	Main build	Inset cut into northern area of 001. Has a small plinth at base. Inset 0.48m wide by 0.1m deep, cut into ashlar wall.
005	Breakwater wall	Main build	Blocking at end of ashlar wall. Some sandstone but mainly limestone.
006	Breakwater wall	Main build	Brick wall at end of pier. Associated with wall footings and concrete floor.
007	Breakwater wall	Scar	Groove cut into wall probably for holding lamp stand. Measured 2.42m high by 0.04m wide by 0.03m deep, sockets 0.006m by 0.1m by 0.05m deep. Contains the same fixings as 013.
008	Breakwater wall	Scar	Groove in lower half of wall, had halo of wooden pegs at top. Measured 1.34m high by 0.05m wide by 0.05m deep.
009	Breakwater wall	Drain	Drain through base of wall, 0.14m in diameter, has a flat bottom and has been cut through the wall.
010	Breakwater wall	Scar	Groove cut into wall probably for holding lamp stand. Measured 2.45m high by 0.04m wide by 0.03m deep, sockets 0.006m by 0.1m by 0.05m deep. Contains the same fixings as 013.
011	Breakwater wall	Scar	Groove and four sockets, sockets not evenly spaced, 2.45m high by 0.04m wide by 0.03m deep. Sockets 0.09m deep by 0.1m by 0.06m and one is cut into the coping stones.
012	Breakwater wall	Scar	Groove and arched recess, recess blocked with brick.
013	Breakwater wall	Scar	Groove cut into wall probably for holding lamp stand. Measured 2.42m high by 0.04m wide by 0.03m deep, sockets 0.006m by 0.1m by 0.05m deep. Contains the remains of a metal pole with a lead pipe inside.
014	Breakwater wall	Main build	Hole through wall, 0.16m diameter, uneven and irregular within.
015	Breakwater wall	Scar	Groove cut into wall probably for holding lamp stands.
016	Breakwater wall	Scar	Concrete scar, possibly wall or division scar.
017	Breakwater wall	Scar	Groove and four sockets, sockets not evenly spaced, 2.63m high by 0.04m wide by 0.03m deep. Sockets 0.09m deep by 0.1m by 0.06m and one is cut into the coping stones. The groove and sockets are in-filled with concrete, reducing the size of the void.
018	Breakwater wall	Scar	Groove cut into wall probably for holding lamp stand. Measured 2.42m high by 0.04m wide by 0.03m deep, sockets 0.006m by 0.1m by 0.05m deep. Contains the same fixings as 013.
019	Harbour wall	Scar	Square cut in wall, measured 0.25m by 0.23m by 0.08m deep.
020	Harbour wall	Coping	Single course of red brick on top of coping.

APPENDIX 2: WATCHING BRIEF CONTEXT REGISTER

Context no.	Description
001	Rubble mass made ground
002	Stone blocks comprising breakwater pitching
003	Large bevelled blocks under ashlar wall (005)
004	Bevelled blocks under ashlar wall (005)
005	Ashlar sandstone wall
006	Rubble infill of central void between parallel ashlar walls
007	Pipe trench filled with sand infill
008	Present day concrete sea wall
009	Rounded cobble infill
010	Deposit of mixed sands
011	Deposit of material forming made ground
012	Dump of material between ashlar wall (005) and concrete sea wall (008)
013	Concrete mass encasing steel pipes
014	Made ground
015	Tarmac surface covered by accumulation of overburden

APPENDIX 3: WATCHING BRIEF PHOTOGRAPHIC REGISTER

Shot	Description	Taken from	Conditions
Film 1			
1-2	Ashlar wall (001) exposed in trenches 11A and 7A	S	Overcast
3-4	Ashlar wall (001) exposed in trenches 11A and 7A	SE	Overcast
5-6	Profile of ashlar wall (001) exposed in trenches 11A and 7A	W	Overcast
7-8	Fragmentary remains of ashlar wall (001) in trench 8A	N	Overcast
9-10	Fragmentary remains of ashlar wall (001) in trench 8A	NE	Overcast
11-12	Ashlar wall (001) seen in plan, exposed in trench 10A	SE	Overcast
13-14	Ashlar wall (001) seen in plan, exposed in trench 2A and 11A	NW	Rain
15	void	-	-
16-17	General shot of trench 10A after ashlar wall demolition	N	Rain
18-19	General shot of stone blocks after excavation in trenches 7A and 9A	-	Rain
20-21	Excavated section of trenches 9A and 7A	N	Rain
22-23	Trench 7A during mechanical excavation	N	Rain
24-25	Interface between trenches 9A and 7A, northeast facing section	N	Rain
26-27	Working shot of excavation in trench 8A	SE	Rain
28-29	Trench 10A and 8A northwest facing section	N	Overcast

APPENDIX 4: WATCHING BRIEF DIGITAL IMAGES

Shot	Description	Taken from	Conditions
1	Ashlar wall (005) exposed in trenches 11A and 7A	SE	Overcast
2	Profile of ashlar wall (005) exposed in trenches 11A and 7A	W	Overcast
3	Fragmentary remains of ashlar wall (005) in trench 8A	N	Overcast
4	Ashlar wall (005) seen in plan, exposed in trench 10A	SE	Overcast
5	Ashlar wall (005) seen in plan, exposed in trench 2A and 11A	NW	Rain
6	General shot of trench 10A after ashlar wall demolition	N	Rain
7	General shot of stone blocks after excavation in trenches 7A and 9A	-	Rain
8	Trench 7A during mechanical excavation	N	Rain
9	Interface between trenches 9A and 7A, northeast facing section	N	Rain
10	Working shot of excavation in trench 8A	SE	Rain
11	General shot of trench 10A and 8A during excavation	N	Overcast
12	Shot of tidal influx in trench 9A	N	Bright
13	Interface between trenches 11A and 9A northeast facing section	N	Cloudy
14	General shot of trench base after excavation	-	-
15	General shot of site and Western Breakwater	-	Cloudy
16	Interface of trenches 6A and 4A southwest facing section	SW	Cloudy
17	Interface of trenches 5A and 7A northwest facing section	NW	Bright
18	General view of site and Western Breakwater	N	Bright
19	Northwest facing section of partially demolished ashlar wall (005)	-	-
20	Northeast facing section of ashlar wall in trench 10A	NE	Sunny
21	Ashlar (005) wall partially exposed in plan in areas 4A and 2A	S	Sunny
22	Northwest facing section of partially demolished ashlar wall (005) in fully excavated trenches 12A and 10A	NE	Sunny
23	Northwest facing section of partially demolished ashlar wall in trench 10A showing modern cut for services	NW	Sunny
24	General shot of plinth removed adjacent to concrete wall (008)	-	-
25	General shot of plinth removed adjacent to concrete wall (008) with embedded steelwork	-	-
26	Shot brick sample “NIDDRIE”	-	-
27	Sandstone blocks removed during excavation	-	-
28	General shot of removal of overburden (014 & 015) along Western Breakwater	NE	Overcast
29	General shot of exposed concrete mass (013) after removal of overburden	NE	Overcast
30	Ashlar wall revealed during excavation of a test pit	-	Overcast
31	General shot of exposed concrete mass (013) during spoil removal	NE	Overcast
32	Exposed services in test pit BW5	-	-
33	A general shot of a fully excavated test pit	-	Overcast
34	General shot of tip of Western Breakwater inc. Original ashlar wall	N	Bright
35	Shot of brick sample “PRESTON GRANGE”	-	-
36	Exposed ashlar wall (005) and rubble infill	SE	Sunny
37	Exposed ashlar wall (005)	NE	Sunny
38	Exposed ashlar wall (005) south facing section	S	Cloudy
39	Sandstone blocks after excavation	SE	Sunny
40	Sandstone blocks after excavation	-	Sunny
41	Bevelled sandstone block after removal by excavation	-	-

Shot	Description	Taken from	Conditions
42	Bevelled sandstone block (004) after removal by excavation	-	-
43	Sandstone blocks after excavation	-	-
44	Sandstone block with smooth depression with central drilled hole	-	-
45	Shot of ashlar wall (005) and pipe trench (007) curving on Western Breakwater	S	Cloudy
46	Shot of ashlar wall (005) and pipe trench (007) east facing section	E	Cloudy
47	Shot of ashlar wall (005) and pipe trench (007) curving on Western Breakwater	N	Cloudy
48	Circular feature in top of ashlar wall (005)	-	-
49	Shot of exposed ashlar wall (005) west facing section	W	Sunny
50	Shot of exposed ashlar wall (005) west facing section	W	Sunny
51	Two courses of exposed ashlar wall (005) west facing section	W	Sunny
52	Shot of ashlar wall (005) in plan	S	Sunny
53	Shot of ashlar wall (005) in plan	N	Sunny
54	Shot of ashlar wall (005) and pipe trench (007) exposed in plan	N	Sunny
55	Shot of removed sandstone blocks	-	-
56	Exposed steel pipe (013)	S	Overcast
57	Exposed steel pipe (013)	N	Overcast
58	Exposed ashlar wall (05) and pipe trench (07) north facing section	N	Overcast
59	Exposed ashlar wall (005) north facing section	N	Overcast
60	Exposed ashlar wall (005) and steel pipes (013)	N	Sunny
61	Exposed ashlar wall (005) and steel pipes (013) north facing section	N	Sunny
62	Exposed ashlar wall (005) and steel pipes (013) and stone block (003) north facing section	N	Sunny
63	General shot of exposed ashlar wall (005)	NW	Sunny
64	Eastern elevation of exposed wall	N	Overcast
65	General working shot showing exposed steel pipes (013)	N	Bright
66	General working shot showing exposed steel pipes (013)	N	Bright
67	General working shot showing exposed ashlar wall (005) and steel pipes (013)	N	Bright
68	General shot of tidal flooding in TP1	SE	Overcast
69	Shot of exposed ashlar wall (005) stone pitching (002) and steel pipes (013)	N	Overcast
70	Close up shot of exposed ashlar wall (005) and bevelled blocks	N	Overcast
71	Close up shot of the remains of stone pitching (002) at base of concrete wall (008)	E	-
72	General shot of an excavated trench in preparation for concrete pour	N	-
73	Exposed ashlar wall (005) steel pipes (013) and rubble infill (06) northeast facing section	NE	Overcast
74	General shot of western tip of breakwater	SE	Sunny
75	Close up shot of overhang of Esparto Wharf	-	Sunny
76	General shot of internal harbour wall, Esparto Wharf	SW	Sunny
77	General shot of western tip of breakwater at high tide	SW	Sunny
78	General shot of trench 13A post excavation	NE	Clear
79	Working shot of excavations in trenches 4A and 2A	NE	Clear
80	The removal of exposed ashlar wall in trench 2A	-	Clear
81	Shot of fully excavated trench 13A northeast facing section	NE	Clear
82	General shot of gap between concrete wall (008) and original harbour wall and pitching at the tip of the Western	SW	Sunny

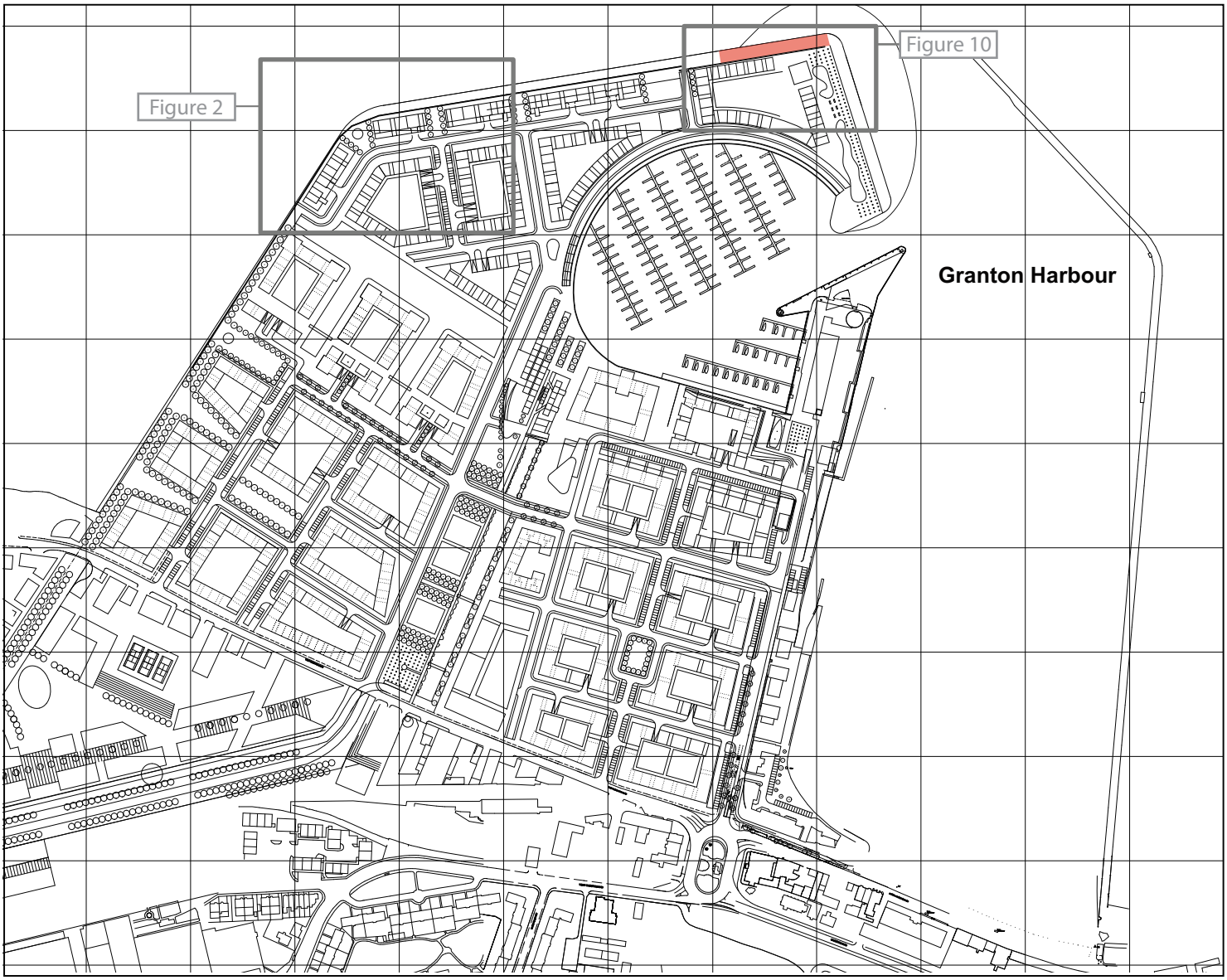
Shot	Description	Taken from	Conditions
	Breakwater		
83	Southwest facing profile of original harbour wall at the tip of the Western Breakwater	SW	Sunny
84	General shot of southwest end of original harbour wall	-	Sunny
85	Close up shot of locating socket and stone pin	-	-
86	Shot of stone pitching and external elevation of original harbour wall at the tip of the Western Breakwater	SW	Sunny
87	Shot of western tip of breakwater with rail tracks in the foreground	SW	Sunny
88	General shot of external elevation of western tip of breakwater at high tide	SW	Bright
89	Upstanding brickwork at the tip of the Western Breakwater	S	Sunny
90	Stone setts in-situ and internal elevation of original harbour wall	SW	Sunny
91	Probable housing for a harbour beacon at the extreme tip of the Western Breakwater	-	Sunny
92	General shot of excavated sandstone blocks	-	Clear
93	Shot of bevelled edges of excavated sandstone blocks	-	Clear
94	Shot of bevelled stones (004)	-	-
95	Shot of bevelled stones (003) and (004) at the rear	-	-
96	Profile of bevelled and worked edges of stones (003) and (004)	-	-
97	Shot of bevelled stones (003) in the foreground	-	-
98	General shot of trench 4A partially excavated	SW	Bright
99	Shot of stone pitching (002) in situ at the base of concrete wall (008) trench 2A	SE	-
100	Shot of stone pitching (002) in situ at the base of concrete wall (008) trench 2A	NE	Bright
101	Close up shot of stone pitching (002) in-situ at the base of concrete wall (008) trench 2A	NE	-
102	Shot of trench 2A showing in situ stone pitching northeast facing section	NE	Clear
103	Excavated block from stone pitching (002)	-	-
104	General shot of external elevation of concrete wall (008) and stone pitching from site entrance	SW	Overcast
105	Close up shot of external elevation of concrete wall (008) and stone pitching from site entrance	SW	Overcast

APPENDIX 5: STANDING BUILDING SURVEY PHOTOGRAPH REGISTER

Photo No.	Contexts/description	Taken from	Conditions
430	Blocking between Ashlar wall 001 and Concrete wall	W	Windy
431	Blocking between Ashlar wall 001 and Concrete wall	NW	Windy
432	Blocking between Ashlar wall 001 and Concrete wall	N	Windy
433	Detail shot of construction at bottom of seaward wall	W	Windy
434	Detail shot of construction at bottom of seaward wall	SW	Windy
435	Detail shot of construction at bottom of seaward wall	W	Windy
3240-65	Ashlar western breakwater harbour wall running S-N	E	Windy
3266	Scar 007- groove in wall for holding a post	E	Windy
3267	Scar 008- groove in wall with halo of wooden pegs	E	Windy
3268	Drain 009	E	Windy
3269	Scar 010- groove in wall for holding a post	E	Windy
3270	Scar 011- groove in wall with four sockets	E	Windy
3271	Scar 011- groove in wall with arched recess	E	Windy
3272	Scar 013- groove in wall for holding a post	E	Windy
3273	Metal fixing at the top of 013	E	Windy
3274	Hole through wall 014	E	Windy
3275	Scar 015- groove in wall for holding a post	E	Windy
3276	Concrete 003 at top of wall	E	Windy
3277	Scar 016- vertical concrete strip	E	Windy
3278	Scar 017- groove in wall with four sockets	E	Windy
3279	Scar 018- groove in wall for holding a post	E	Windy
3280	Scar 019- square cut into stone	E	Windy
3281	Inset 004 at northern end of wall	E	Windy
3282	Inset 004 at northern end of wall	NE	Windy
3283	Stone blocking 005	E	Windy
3284	Brick wall 006	E	Windy
3285	Brick footings at north of wall	SW	Windy
3286	Brick footings at north of wall	E	Windy
3287	Inset 004 at northern end of wall and stone floor	N	Windy
3288	Inset 004 at northern end of wall and stone floor	N	Windy
3289	Brick footings and stone floor at north of wall	S	Windy
3290	Curve on sea-ward side of northern part of wall	N	Windy
3291	Curve on sea-ward side of northern part of wall	E	Windy
3292	Top of wall inset 004	N	Windy
3293	Wall fixing keystone at southern end of wall	S	Windy
3294	Detail shot of cramp and keystone sockets	E	Windy
3295	Detail shot of cramp and keystone sockets	S	Windy
3296	Profile of southern end of wall	S	Windy
3297	Detail shot of cramp and keystone sockets, showing possible part joggle joint at top of wall	S	Windy
3298	Detail shot of cramp and keystone sockets between courses	S	Windy
3299	Detail of cramp joint between sandstone blocks	E	Windy

APPENDIX 6: DISCOVERY AND EXCAVATION IN SCOTLAND ENTRY

LOCAL AUTHORITY:	City of Edinburgh Council
PROJECT TITLE/SITE NAME:	Granton Harbour, Western Breakwater, Edinburgh
PROJECT CODE:	GRAH
PARISH:	City of Edinburgh
NAME OF CONTRIBUTOR:	Phil Moore and Phil Richardson
NAME OF ORGANISATION:	CFA Archaeology Ltd
TYPE(S) OF PROJECT:	Watching Brief and Standing Building Survey
NMRS NO(S):	N/A
SITE/MONUMENT TYPE(S):	Harbour breakwater
SIGNIFICANT FINDS:	N/A
NGR (2 letters, 8 figures)	NT 2337 7780
START DATE (this season)	May 2008
END DATE (this season)	November 2008
PREVIOUS WORK (incl. *DES* ref.)	DBA, Building and photographic surveys 926, 1084 and Watching Brief 1014.1
MAIN (NARRATIVE) DESCRIPTION: (May include information from other fields)	A watching brief and standing building survey was conducted by CFA Archaeology Ltd between May and November 2008 prior to and during construction works on the Western Breakwater, Granton Harbour, Edinburgh. During groundbreaking for the strengthening of the current sea wall, the remains of the original harbour wall and stone pitching were exposed and recorded. The watching brief was able to determine the construction techniques used, as well as identify a sequence of alterations. The original 19th century breakwater wall, of sandstone ashlar construction, was recorded in all trenches. It was also possible to observe a foundation course of bevelled blocks that formed the toe of the breakwater. The building survey undertook a detailed appraisal of the surviving ashlar wall at the tip of the Western Breakwater. The wall, which was recorded for a length of approximately 150m, was found to have a number of scars and features on its internal, harbour facing elevation. These included fittings for lamp stands, brackets for electric cables. The remains of a stone and brickwork structure were located at the very tip of the breakwater and represent the probable remains of a building.
PROPOSED FUTURE WORK:	
CAPTION(S) FOR ILLUSTRS:	None
SPONSOR OR FUNDING BODY:	Forth Property Developments Ltd
ADDRESS OF MAIN CONTRIBUTOR:	CFA Archaeology Ltd, Old Engine House, Eskmills Park, Musselburgh, East Lothian. EH21 7PQ
EMAIL ADDRESS:	cfa@cfa-archaeology.co.uk
ARCHIVE LOCATION (intended/deposited)	NMRS & City of Edinburgh Council SMRs



Key:

Fig. No: 1

Revision: A

Client: Forth Property Developments Ltd

Title: Location Map

Scale: 1:6000 @ A4

Project: Granton Harbour, Western Breakwater,Edinburgh
Archaeological Watching Brief

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Key:

Trenches monitored during the Watching Brief

Monitored Test-pits

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Fig. No: 2

Revision: A

Title:

Location of Phase II Watching Brief Trenches

Project:

Granton Harbour, Western Breakwater,Edinburgh

Scale:

1:500 @ A3

Client:

Forth Property Developments Ltd

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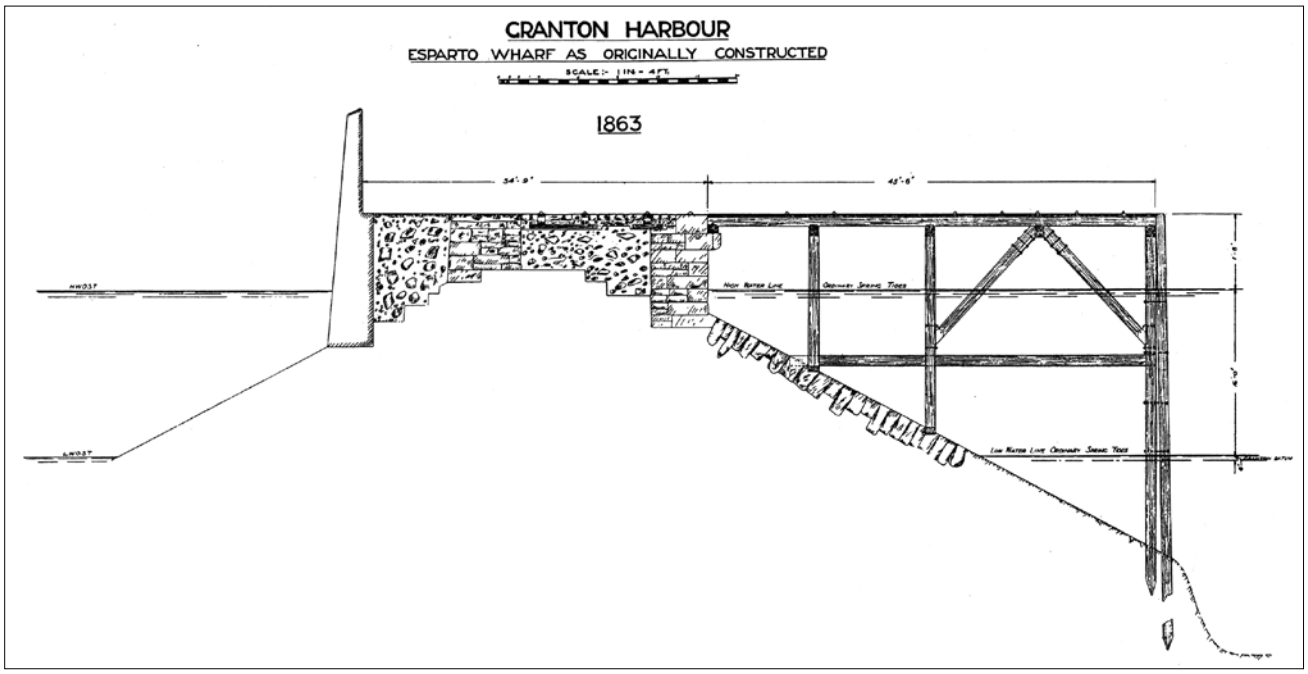
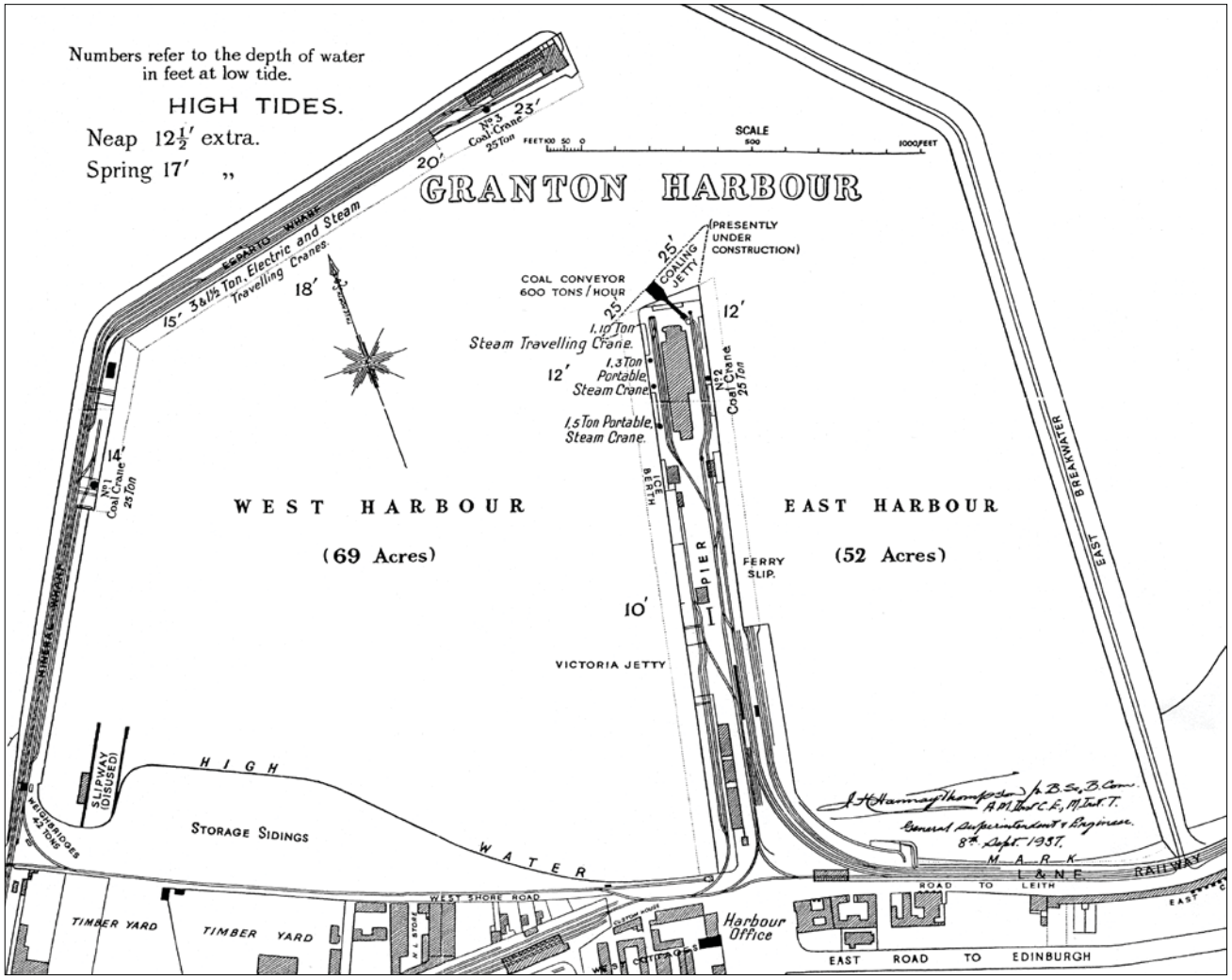


3A



3B

Key:	Fig. No: 3A & B	Revision: A	Client: Forth Property Developments Ltd
	Title: Granton Harbour Esparto Wharf 1863		
Scale:	Project: Granton Harbour, Western Breakwater,Edinburgh		Drawn by: KC
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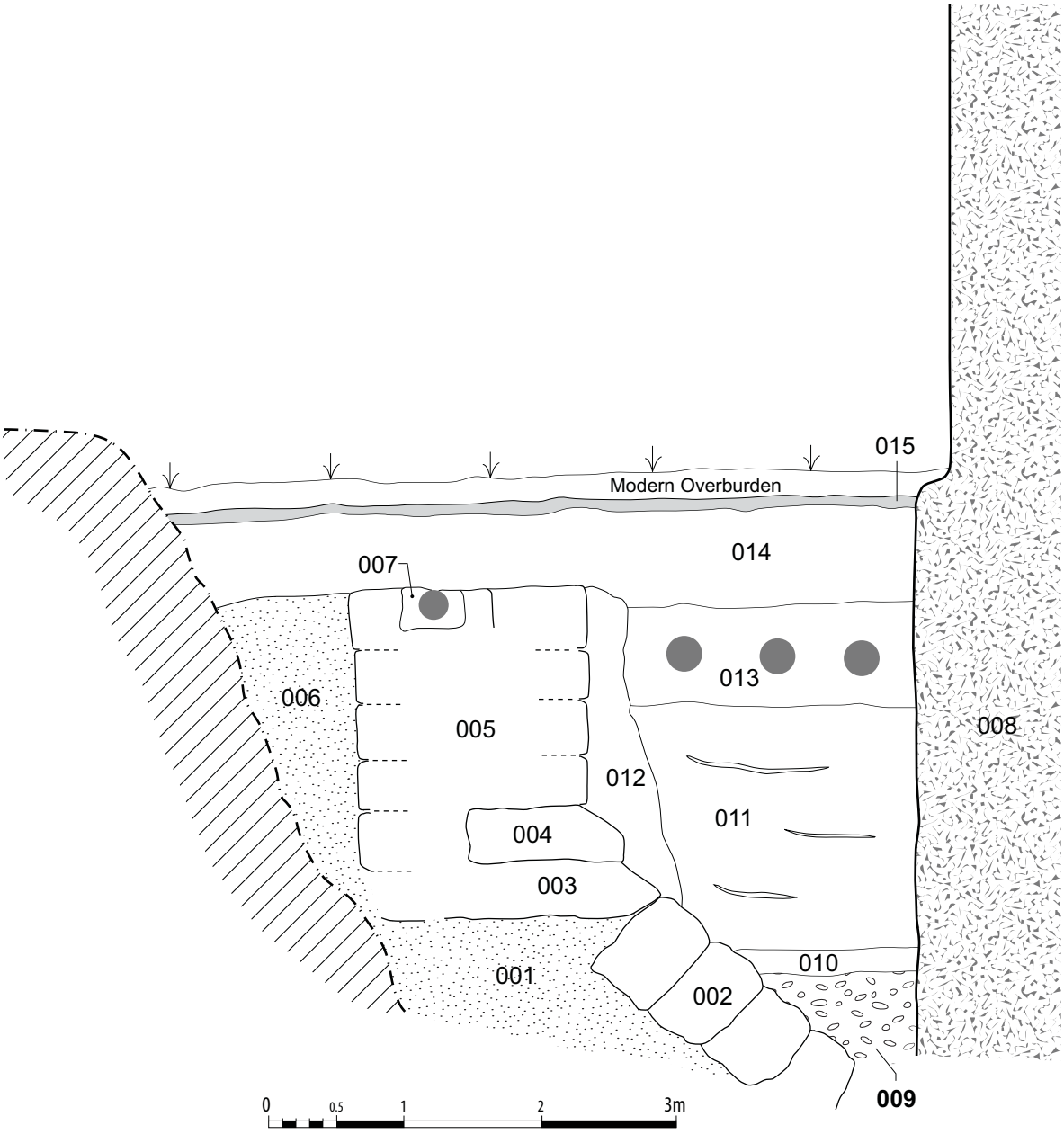

Fig 4 - Trench 2A: Northwest-facing section

Key: 20th Century Sea Wall, Pipes, Make-up Layer, Infill	Fig. No: 4	Revision: A	Client: Forth Property Developments Ltd
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Scale:	Project: Granton Harbour, Western Breakwater,Edinburgh		

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Fig 5 - Shot of trench 11a post excavation: NW-facing section, showing concrete pour/reinforcement of harbour strengthening works

Fig 6 - Shot of ashlar wall 005 and pipe trench 007 in plan

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Fig 7 - Ashlar wall 005 and fuel pipes 013 after soil removal. North-facing section

Fig 8 - Shot of bevelled stones 004 and 003

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Fig 9 - General shot of external elevation of original harbour wall and stone pitching of Western Breakwater

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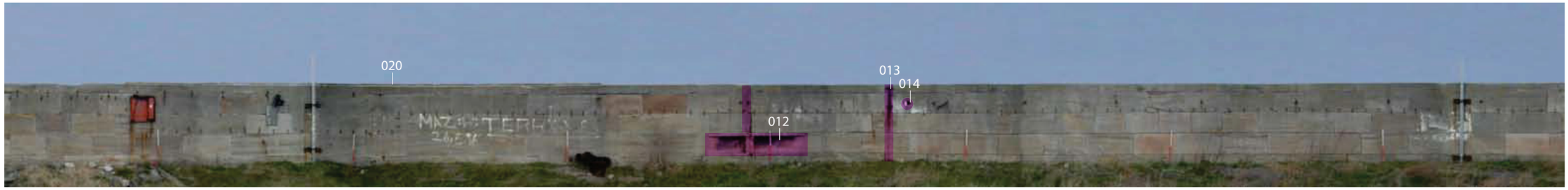

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Key:

Fig. No: 10

Revision: A

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Title: West-facing Harbour Wall

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Scale: 0 5 m

Project: Granton Harbour, Western Breakwater,Edinburgh

Client: Forth Property Developments Ltd

Fig 11 - Groove (013) cut into the wall for a lamp stand

Fig 12 - Groove for a pipe fixture (017) and lamp stand (018)

Key:	Fig. No: 11-12	Revision: A	Client: Forth Property Developments Ltd
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	Project: Granton Harbour, Western Breakwater,Edinburgh		
Scale:			

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Fig 13 - Detail shot of tip of breakwater wall

Fig 14 - Wall remains associated with inset (004)

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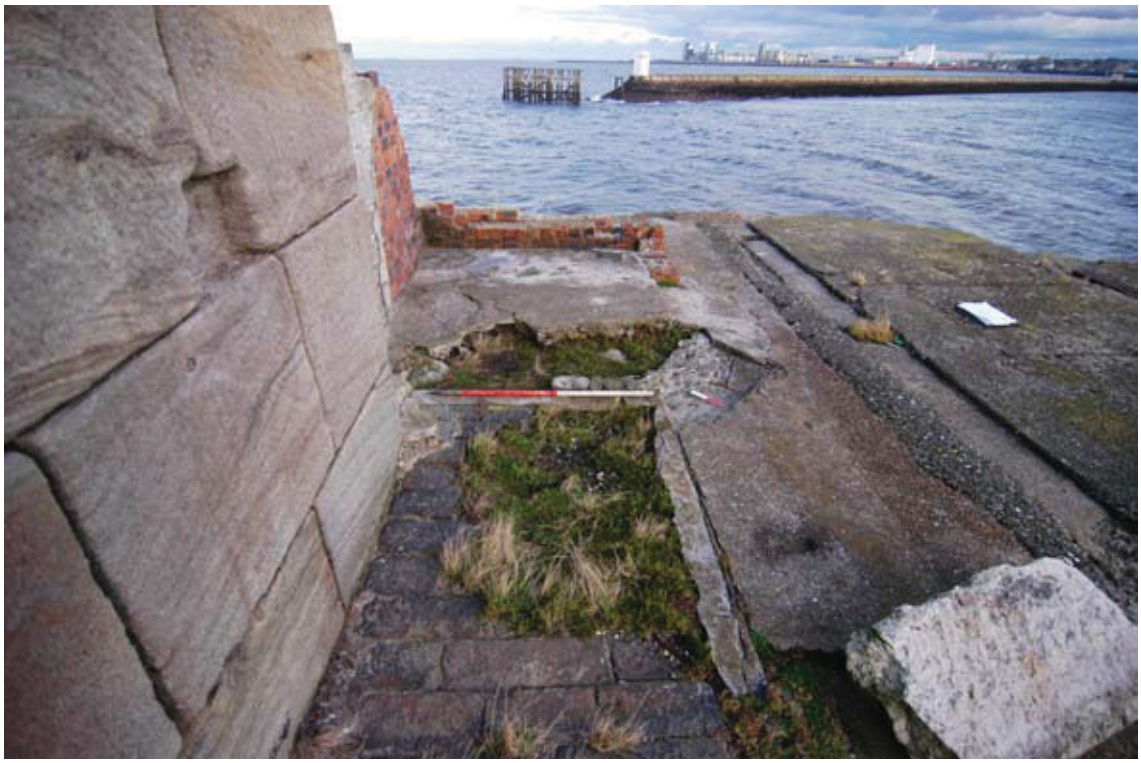

Fig 15 - Brick structure (006) at north of pier

Fig 16 - Arched feature (012)

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	Project: Granton Harbour, Western Breakwater,Edinburgh		
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Fig 17 - In situ keystone

Fig 18 - Profile of wall showing cramp, keystone, and partial joggle joint

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Fig 19 - Close-up of cramp joint

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