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ARCHAEOLOGY: HALIFAX CITADEL
FALL - WINTER 1977

by John J. Connolly

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Abstract

Archaeological excavations were initiated in the fall of 1977 on the west front of the Halifax Citadel and completed in early 1978. Features or areas were excavated for their potential as sources of information not substantiated by historical documentation or because they would be destroyed in the process of restoration. Consequently, work was done in casemate nine, sallyports three and four, on the exterior and interior of the south magazine and on the ramparts of the southwest demi-bastion. Pits were grided on the basis of available documentation or by testing prior to excavation. Work was limited by many factors including construction activity, manpower, and weather. As a result of these limited excavations more definitive information about the construction details of gun emplacements, parapet configurations, drainage systems and interior structural details was obtained.

Introduction

The structure that now exists on Citadel Hill in Halifax, Nova Scotia is a result of the application of the method of designing fortifications standardized by Sebastion Le Prestre de Vauban in the seventeenth century. The system was adequate for military technology up until the middle of the nineteenth century but improvements to artillery superceded his designs. The Halifax Citadel was structurally completed in 1846 and armed by 1856, but subsequent changes in artillery made the Citadel obsolete almost as soon as it was finished. Consequently, the next fifty years were spent trying to resolve the inadequacy of the fortifications.

The Citadel was in British hands up until 1906 when it was transferred to the Canadian government. Over the sixty year period as a functioning fortification under British direction the armaments were revised and changed three times. There were numerous changes to casemates, new structures were built within the perimeters of the fort and the ramparts were radically redesigned to accept the new artillery. This process of change continued into the Canadian period. The fort was adapted to many uses throughout the first and second world wars.

This constant evolution as a fortification presents an opportunity to show, through restoration, the development of fortification technology through the nineteenth century. Documentation can provide a great deal of information on these changes but many of the sources are vague and do not provide the precise data that is now required.

Until recently, it was presumed that historical information was the only source of information that was available because of the large amount of disturbance and destruction that has occurred on the Citadel. Archaeology had been relegated to a minor role, functioning only as a salvage tool excavating immediately prior to or after the backhoe. Excavations that have been done in the past (Lane, Coleman, Parmenter) have been sporadic and were not a result of an on site, planned program.

However, considering the limited scope of these excavations, most recently Parmenter, a fair amount of structural detail and artifacts had been recovered. Given this impetus and the lack of information about critical elements of the fortification, further limited excavations were programmed in the area of the southwest demi-bastion. This area is considered one of the most disturbed areas of the Citadel but an attempt to locate and detail features had to be made. A program of excavation was planned utilizing existing historic documentation and plans.

The possible data to be recovered and features located by an archaeological process will have significant implications for structures that have to be reconstructed. The potential amount of information that can be obtained in this limited excavation is significant, even considering the presumed amount of disturbance to the fabric. There also exists a greater opportunity to find more data about the Halifax Citadel that is directly related to the restoration in other areas that are far less disturbed than the sections of the fort that have been minimally excavated to date.

The South Magazine

The south magazine was one of two identical free standing structures located behind the retaining wall in the western half of the Citadel. Construction of the magazine began in 1843. It consists of a brick arch supported by two side walls of granite, with each open end of the arch closed in by walls of granite. The gable roof was slated and access to the magazine was gained through porches in the north and south ends.

The magazine was protected from cannon fire by granite walls on three sides which formed the retaining wall of the southwest demi-bastion. The fourth side was protected by a granite blast wall which was erected on the parade side of the magazine. To protect the magazine from its most persistent enemies, lightning and dampness, an elaborate system of drainage was devised in conjunction with a series of lightning conductors.

Operation 2B18: Interior South Magazine

Excavations were initiated in the south magazine of the Halifax Citadel to investigate material pertinent to the restoration work. The archaeological investigation had two specific purposes. First, the remains of the original wood floor and asphalt sub-floor were to be located. Second, information relating to the levels of the various floors was to be obtained to check its correspondence to historic sources.

The south magazine was one of the few areas in the

Halifax Citadel that had not been structurally altered, with the exception of the interior floor area. The magazine, since its completion circa 1847, has had at least three documented new floors, two of which were major alterations. The first alteration, between 1853 and 1882 (Greenough, 1977) removed all remains of the original floor and central supporting structure. An asphalt sub-floor was installed on which the new floor was presumably constructed. The second alteration, possibly during World War Two, consisted of pouring a concrete floor which is still in use today. It was necessary to determine the consequences of these alterations to original fabric.

The original floor was made of pine joists and planks resting on a plate,which was shown on all plans, supported by a stone ledge along the east and west walls. On earlier plans there was a central support wall running the full extent of the magazine along a north-south axis. This wall was presumably removed in the first alteration.

The documentation that was available on the floor was cursory and did not provide precise locations or dimensions. Plans that did exist varied a great deal and were subject to a wide range of interpretations.

The south magazine, post 1945, has been utilized for many purposes. The latest use was as an art gallery. An arrangement to have the magazine vacant for a period of one month between exhibits was made to facilitate excavation. This time element and the fact that we would have to jackhammer and remove concrete of at least fifteen centimeters thickenss defined the size of the excavation. A limited excavation in the southeast corner of the magazine was planned, approximately two by four meters. This location would give the maximum information about the south and east walls and their respective floor connections in the minimal amount of area.

Considering the degree of destruction and rearrangement

in the floor area of the magazine, a simple tabulation of the strata that were encountered is sufficient explication.

Strata	
1. Concrete	Portland cement and crushed gravel. Material mean depth 0.18 meters with a range of $\pm$ 0.05 meters.
2. Crushed gravel	Forms a bed for the poured concrete with a mean depth of 0.10 meters and a range of $\pm$ 0.05 meters. Mean diameter of the gravel 0.05 meters.
3. Ironstone rubble	This material filled the balance between the sub-floor and the gravel in Strata 2. Extreme variation in size and weight. Mean depth 0.16 meters $\pm$ 0.05 meters.
4. Asphalt	This sub-floor extended for the entire area of the excavation and exhibits the same characteristics as seyssel asphalt and therefore is not of modern origin.

It was apparent that the historic floor had been extremely altered due to modern disturbance but three observations were made about the floor area based on the information gathered during excavation.

The plans that were available from the first proposal for the magazine until 1882 showed a ledge incorporated into the east and west walls for support of the floor joists. Estimates taken from the plans showed it to be approximately .10 to .13 meters wide. However, excavations did not reveal any indications of this support structure. The east wall did not

exhibit any characteristics such as mortar or an irregular surface to suggest that the ledge was removed. There were two alternatives. First, the ledge was not permanently installed because ironstone support blocks discovered on top of the asphalt adjacent to the wall were not mortared to the wall. Second, the ledge was at a lower level than the asphalt indicated by measurements extrapolated from the 1836 plan showing the top of the ledge to be 2.436 meters from the spring of the arch. The plan from 1882 gives no measurements below the floor level and any features below are probably based on estimates since the magazine floor was complete, possibly as early as 1859. Ledge heights extrapolated from the plan would therefore be inaccurate. The present level of the asphalt floor is 2.402 meters from the spring of the arch. This would suggest that the asphalt was laid over the ledge and central support structure, while the ironstone blocks were added on top of the asphalt for support and ventilation of the 1882 plan wood floor (Figures 2,4). The original ledge could still be under the asphalt. The fact that the asphalt floor and ironstone were not installed until ca. 1859 indicates that the original floor was at a lower level than the later floor.

Among the ironstone rubble in stratum three there emerged lines of ironstone blocks and mortared bricks all of approximately the same height (mean 0.135 meters $\pm$ 0.005) above the asphalt sub-floor and in some cases mortared to the floor. These blocks were apparently supports for the joists which held up the wooden floor and provided ventilation, a critical factor in a powder magazine. These blocks could not be remnants of the original support structure, a single rubble wall down the centre of the magazine, due to the layer of seyssel asphalt underneath the present ironstone blocks.

The alignment of the ironstone blocks and the bricks (Figure 3) suggested a north-south orientation of the joists

due to their irregularity on an east-west axis. This orientation were supported by the historical plans of 1882. However, the number of supports in situ varied from the plan. The plan showed two central supports in conjunction with the two ledges on the east and west walls. The pattern in the excavation indicated that there were four supports with centres of approximately 1.2 meters and in addition there were ironstone blocks along the east and west walls in lieu of the stone ledges. The additional supports would make sense considering the weight the floor would carry and the fact that it had collapsed in the past (Greenough, 1977: 23).

In addition to information obtained by direct excavation there were data gained through the removal of the modern wall covering of plywood and 2.0 in. by 4.0 in. boards. This was done to facilitate the removal of the concrete floor adjacent to the south wall in order to expose the complete corner of the magazine. When the modern wall covering was removed and the original was exposed the wainscotting was still in situ. It consisted of horizontal pine boards fastened to studs by copper nails and painted a gray-green colour. At the base of the wainscotting there were indications that it was modified to accept different floor levels (Figure 4). The studs to which the wainscotting was nailed extended to 0.23 meters below the last section of planking which exhibited signs of being roughly cut and did not have the tongue and groove joints like the balance of the planking. The fact that the wainscotting was still there had a direct bearing on the information that was obtained through excavation. The bottom levels of the wainscotting will establish the uppermost parameters of the historic floors.

The objectives of the excavations in the south magazine were to determine floor remains and levels. Excavation has revealed that the wooden floor was removed with each renewal and destroyed with the installation of the concrete floor

sometime in the twentieth century. Therefore no evidence of wood floors was obtained. The only indicators of the floor levels were the ironstone and brick materials used to support the floor by 1859 and the two levels of the wainscotting.

It would seem likely that the ledge under the asphalt and the bottom of the studs behind the wainscotting would represent the floor parameters pre 1859 (0.04 meters below the granite sill of the south door) whereas the altered height of the wainscotting and the top of the ironstone blocks (0.185 meters above the sill) would represent the post 1859 floor parameters.

Operation 2B19: South Magazine Exterior

The south magazine has had two lightning conductor systems (Greenough, 1977: 43). The first system was installed when the magazine was completed circa 1848 and removed in 1850. A new system was installed in 1859 (Figure 13). It consisted of lightning rods located on each end of the gable roof and cables ran from these points to the ground at their respective corners.

To ascertain how the conductors were connected to the ground a series of three pits were excavated on the west side of the magazine, one at each corner and one at the midpoint. This allowed for maximum coverage of all possible areas on this side of the magazine.

Only one sub-operation yielded any information. The conductor on the southwest corner of the magazine was the only one that remained and it consisted of a copper strip embedded in mortar. The strip ran on an east-west axis away from the magazine and protruded from the mortar approximately 0.45 meters. The copper was 0.075 meters wide and 0.002-0.003 meters thick. The end which received the down cable was curled and drilled (Figure 14). (Subsequent excavations

by a bulldozer for the construction of drains revealed similar strips on the remaining corners). The copper was buried in unstratified ash and mortar which gave no verification of their date of construction.

The lightning rod system protected the magazine from lightning and the drainage systems protected it from water. There was an overriding problem within the Citadel dealing with dampness and moisture. The ground was so impermeable that water had nowhere to go. To counteract this problem an elaborate system of drains was devised within the Citadel proper, channeling water into holding cisterns or into the city sewer system. A plan from 1852 shows a drainage system approximately 0.45 meters below the surface, encircling the south magazine, draining into a catchpit on the west side of the blast wall. It was most likely installed at the same time the magazine was built (Razzolini, 1978). Approximately six years after the magazine was completed asphalt was used to cover the area around the magazine and to form a surface gutter to drain off the water. A plan from 1882 showed it existed at the mid-point of the blast wall. The wooden floor in the magazine had to be replaced due to rotting in 1853 (Greenough, 1977), so it is evident that a method to prevent dampness became a priority.

The locations of the drains on plans from 1852 and 1882 were consolidated and a pit was initiated where the drains exited under the blast wall and flowed into a catchpit. The original excavation was two meters square and was later enlarged to accommodate a secondary feature.

The excavations did not reveal any traces of the surface drains or the asphalt. These were probably removed during the Second World War or the late 1950s. The fill in the exterior area was rubble, gravel, ash, cobbles and fragments of asphalt. This indicates that the area was at some time disturbed to a great degree. Documentation stated that the

base for the asphalt was laid in specific strata of shale concrete in accordance with the asphalt supplier's instructions (Greenough, 1977: 20).

Amongst this agglomeration of material a pattern of cobbles laid in a regular pattern emerged in a position close to where the catchpit for the surface drain should have been. Upon close inspection and excavation a feature of bricks and cobbles, whose top surface was level with the footing of the blast wall, became evident. The catchpit is composed of a central core of mortar with an opening of 0.40 meters square on which cobbles and bricks have been laid to support a grate or capstone of some form. The interior dimensions of the cobbles are .81 meters square with exterior dimensions of 1.5 meters (Figure 7). The grating, if it rested on top of these cobbles, would probably be slightly below the level of the asphalt that formed the surface gutter, which would be approximately 0.10 meters below present ground level 67.34 meters above sea level (ASL). There was a granite capstone 0.80 meters square extant on the west side of the magazine unrelated to the drain but its physical size and shape would indicate it could have fitted inside the cobbles and served as a support for the grate.

One meter north of this catchpit there is a mortar and brick feature which does not seem to bear any relationship to the drain. It consists of five vertical courses, at maximum, of red brick and follows the natural contours of the terrain (Figure 9). It runs on an east-west axis and is vertical on its south side and bevelled on the north side. It was below the level of the asphalt and above the level of the sub-surface drain. It is not connected to the magazine or the blast wall. No apparent function can be ascertained from the vestiges of brick.

Since evidence was found of the surface drain and only the catchpit remained, excavations were continued to verify

whether the sub-surface drain had ever been installed. Flagstones, on a north-south axis, were uncovered indicating the presence of a drain. The drain assumed a "T" shape with one arm extending towards the blast wall under the location of the catchpit and the other parallel to the magazine.

To facilitate further excavation the balance of the catchpit was removed and it had a base of mortared ironstone with an exterior coating of asphalt (Figure 8). Subsequently, two layers of flagstone capping were removed from the drain and a brick lined drain channel 0.30 meters wide by 0.21 meters high appeared (Figure 11). It was completely silted with clay material and its exit under the blast wall was blocked by three bricks, effectively closing off the flow of water.

The silt was removed from the drain revealing three regular courses of bricks laid on a base of flagstone which formed the bottom of the drain. The drain continued under the blast wall and emptied into a large ironstone catchpit which is connected with the city sewer.

The configuration of the catchpit area is probably the key to understanding what happened with the drainage around the south magazine. During the construction of the magazine the drains were installed in a different pattern than that shown on the 1842 plan. On this plan the exit for the system was a catchpit on the south end of the blast wall which lead to the tanks for collecting rain water. The engineers may have had second thoughts about the quality of the water that would have been collected by this sub-surface drain. Instead of draining the water into the tanks it was diverted to the city sewer system by means of the catchpit at the midpoint of the blast wall.

However, after a few years of operation this drain system began to silt up and eventually ceased to provide adequate drainage around the magazine causing the rotting problems on

the interior. As an alternative the engineers utilized seyssel asphalt to form a surface drain to alleviate the water problem. They connected this with the sub-surface drain at its exit under the wall and blocked the balance of the system with several bricks. This accounts for the super-position of the ironstone, mortar and asphalt catchpit over the flagstone and brick sub-surface drain. As one system failed another was constructed but due to the inherent properties of the asphalt under freezing weather conditions it also eventually failed (Greenough, 1977: 22).

Operation 2B11A: Sallyport #4

The east end of the sallyport was excavated in 1976 (Parmenter: 1976) to expose the casemate 55 latrine drainage system and previous floor levels. The sallyport presently has an earthen floor similar to the one in sallyport 3 so excavations were initiated in the western sloping section to determine whether there was a wooden floor or steps. One sub-operation was positioned at a point half way up the slope to be sure to encompass as much evidence as possible.

The excavations did not reveal any evidence of a wood floor or steps. The pit revealed only two strata. The underlying strata was a grey-brown clay encountered in the 1976 excavations, which was only fill and yielded few artifacts. The top strata was an accumulation of brick sandy-ash soil and this contained a mixture of nineteenth and twentieth century artifacts, which cannot conclusively date the ramp.

The only indication of the floor level in the sallyport was the change in the surface of the north wall. The smooth surface of the wall was unbroken for its entire height with the exception of the fifteen centimeters below the present surface level where a ledge of mortar and ironstone protruded 0.20 meters into the sallyport. This change in the surface of the wall was at an angle of four to one (14^{o}), which corresponded to the angle of the vaulted roof.

The changed surface of the north wall was 0.20 meters wide and could have possibly supported angled wooden floor or supports for stairs. This wall deviation did not occur in the south wall due to its removal when a power line was

installed. If there was a wooden floor or stairs, it was pre-1890, because all evidence was removed when the drainage system was re-excavated and the latrines installed (Parmenter 1976: 16).

Operation 2B17: Sallyport 3

Construction of the sallyport was initiated in 1830 but was not completed until 1838 due to construction problems. It consisted of a vaulted, brick ceiling supported on rubble ironstone walls, sloping from the parade level on the interior of the Citadel to the ground level in the ditch. When sallyport 3 was originally proposed by Nicolls, it was intended to have granite steps in all the sallyports on the west front (Young 1976: 72). The contemporary configuration of the interior is only an earthen ramp. The sallyport remained in its original condition until 1879 when two doorways for access to a cartridge store and lamp passage were cut in the east end at the head of the stairs. This addition of the two doors required a change in the floor level of the sallyport. Consequently, when the doors for the casemates were cut, the floor was sloped from the sill of the sallyport door to the new elevation (Young 1976: 78). Excavations in 1976 in sallyport 4, which has a similar slope, did not uncover any stairs, therefore it was presumed stairs had not been built in sallyport 3 (Parmenter 1976: 18).

When earth was being removed in June 1977 from the lower drains in the sallyport, a stair was discovered. The remaining stairs were subsequently excavated by the construction crew without the presence of an archaeologist. Recording of the excavation were minimal: a few photographs were taken, one drawing was done and field notes were made by the extant recording staff. No artifacts were recovered. The lack of historical documentation and the lack of artifacts leaves open to conjecture why the ramp was placed over the stairs.

In the process of removing the soil from the sallyport, a section of wood flooring was uncovered at the head of the stairs below the doors to casemate 53 (Figure 16). The wood was left in situ and covered over pending the arrival of an archaeologist.

Given the amount of disturbance in the area and the encroaching construction activity, a single sub-operation was positioned at the head of the stairs to cover the complete landing area. A small section of the landing, near the sill of the door, was left unexcavated because it was covered by concrete.

The initial section of the wood flooring exposed by the construction crew was at an elevation three centimeters below the first granite stair (72.16 meters ASL). The flooring consisted of badly rotted pine or spruce boards, approximately 0.10 meters wide and 0.02 meters thick. The boards ran on an east-west axis parallel to the walls of the sallyport. These floorboards were removed and the supporting structure was exposed. It consisted of wooden sleepers running on a north-south axis 0.92 meters apart. The wood was of a softwood variety, pine or spruce, 0.10 meters square.

Any material that existed prior to this floor had been removed to accommodate the change in the level of the landing. Therefore, the sleepers rested on a yellow-brown clay which is the fill material for the sallyport. Interspersed between the sleepers was a black, sandy-ash material which contained the majority of the artifacts. The most significant attribute of the artifacts, besides their high degree of fragmentation, was the fact that there was a mixture of wire and square nails indicating a certain amount of disturbance.

It is possible that the ash was placed between the sleepers to support the floorboards. This was probably done around the turn of the century because wire nails had come into common usage by that time (Nelson: 1968). There was

some indication that square nails were used in the construction of the landing because there were remnants imbedded in the sleepers. The floorboards were fastened with wire nails, indicating that the sleepers were reused at least once.

The most probable explanation of the landing area is that it was constructed at the same time as the casemate doorways were cut, in 1879, and resurfaced as needed at a later period. This was later covered with earth to form the ramp in the sallyport and left untouched until the present. It is quite possible that the ramp over the stairs was not installed until after the turn of the century.

The sleepers have been left in situ until the balance of the landing can be excavated and the relationship between the floor and the sill of the door can be determined.

Operation 2B16: Casemate Nine

This casemate was constructed for the defence of the west ditch and was equipped with a 24 pound smooth bore gun. It was completed in 1848 and was deemed fit for habitation (Greenough 1974: 276). The gun was fired through a porthole in the west wall of the casemate, and was mounted on a wooden platform of an unspecified type (Johnston 1977: 81).

The purpose of the excavations in this casemate was to determine the method of floor support, the existence of supporting ledges along the north and south walls and the remains of the wooden floor. The present floor in the casemate is concrete. Prior to the arrival of an archaeologist, a section of the floor was jackhammered to facilitate excavation. This had an unfortunate effect on the underlying stratigraphy.

When the concrete was removed an area 4.0 by 0.5 meters was exposed on a north-south axis eight meters from the east wall. Excavation was difficult because restoration was going on in this area and the casemate flooded during heavy rains because of a broken drainage pipe.

Excavations revealed a central support wall, 0.5 meters wide, of rubble ironstone and masonry 72.20 meters (ASL). This wall was probably the original construction and was used in conjunction with the ledges, similar to the casemate floor shown in plans for the 1848 proposals (Figure 15). The ledges were not found in the excavation due to intrusion by the privy and drain modifications to the casemate. The space in the casemate between the central support wall and the north and south walls was filled with brown clay soil.

It is not possible to determine the precise temporal span of this soil because no artifacts were found in the limited space of the excavation. Its date would only be determined relative to the age of the overlying stratigraphy. Remnants of a wood floor were found overlying this strata and were compressed below the height of the support wall by the weight of the concrete floor. There may have been an air space, but any evidence of this was destroyed by the inappropriate use of the jackhammer by the construction crew.

Historically this casemate had staunching and dampness problems, along with most of the casemates in the Citadel. This problem was partially rectified by a system of horizontal and vertical internal drains (Greenough 1974: 141). One of these horizontal drains was discovered along the north wall and consisted of a brick lining approximately 0.20 meters wide and 0.10 meters deep with a slate capstone. Little information could be obtained due to the destruction of fabric by the jackhammer. Documentation indicated this drain was added six years after the casemate was considered habitable, circa 1854 (Greenough 1974: 146).

Along the south wall there was a large masonry block extending 1.5 meters into the excavation, presumably covering the ledge on that side. It seemed to be more modern and could be related to the washroom facilities installed in 1906 (Dunn 1977: 82). The section of masonry along the south wall was not covered with asphalt indicating that the masonry was intrusive.

Overlying the features in this excavation and underlying the concrete there was some evidence of a seyssel asphalt floor. Fragments of asphalt were adhering to the chunks of concrete that were removed. The asphalt was truncated by the masonry intrusion. If this is the case the asphalt was installed sometime between 1850 and 1906.

The most interesting characteristics of the casemate were the floor support construction. Defence casemates (in the northwest demi-bastion) which supported a similar cannon have a system of masonry walls built from side to side (Figure 17) which are still extant with fragments of the wood floor in situ. This system seemed to be more logical than a single wall down the middle, as in casemate nine, considering the weight of the gun it supported (2640 KG). The wooden floor in casemate nine may have rested directly on the earth with the ledges north and south and the central support to take the weight. If most of the floor rested on earth this would have created a dampness problem which would have been overcome by applying a thin layer of seyssel asphalt directly over the wood floor.

Operation 2Bl5: Southwest Demi-bastion

This section of the Citadel was one of the first areas to be structurally completed, but not without problems. The escarp walls were constructed by contractors whose work was not up to engineering standards, a problem which was compounded by the fact that the walls were under-designed for the climate. This resulted in the walls collapsing by 1830. Consequently, various sections were redesigned and rebuilt by the military engineers (Pulsifer, 1978). These and other problems delayed the completion of the entire Citadel until the early 1840s. It was not until 1846 that an acceptable proposal for ordnance was formulated, and the first guns were mounted in 1853 (Johnston, 1977: 67). The placement of the ordnance on the ramparts of the southwest demi-bastion was derived from this proposal. There was an eight inch smooth bore (S.B.) en barbette at the salient and two 32 pound S.B. on each face, all mounted on traversing platforms. The gun at the salient was mounted with the pivot in the intermediate position with the trucks on a segmented semi-circular granite racer. The other 32 pounders had front position pivots with semi-circular granite racers.

British artillery improved after 1853 and this resulted in a rearmament of the Citadel. To accomplish this rearmament on the southwest demi-bastion the entire emplacement was changed at the salient in 1865 to accommodate a seven inch breech loading Armstrong gun and one of the two 32 pound S.B. guns on each face of the bastion was dismounted (Johnston, 1977: 122).

This was not the end of the ordnance changes at the

Citadel. Problems with the Armstrongs and advances in rifled muzzle loaders (R.M.L.) made most of the ordnance at the Citadel obsolete. It was decided that 64 pound and seven inch rifled muzzle loaders would be mounted on new emplacements at various locations within the fort. Work commenced in 1873 with the removal of the 32 pound S.B. emplacements and the construction on the east front of the new emplacements for the rifled guns. At some point the seven inch Armstrong gun at the salient of the southwest demi-bastion was replaced by a 64 pound R.M.L. This was the last major change to the ordnance at the Citadel.

The current inventory of emplacements at the Citadel shows that there are extant R.M.L. emplacements on the northeast front and in the ravelins. The southwest demi-bastion has only the rebuilt emplacement at the salient still partially visible, indicating that the smooth bore emplacements have been virtually obliterated.

Excavation in this area was oriented to several specific goals and problems. The first problem was to determine the exact location of the smooth bore emplacements on the faces of the bastion. Plans that were available from 1852 and 1856 were only proposals and are not the final approved plans. Locations were therefore only approximate.

The second problem was the actual construction of the emplacements. Engineers had three specific factors to work with: type of platform which would determine the size of the emplacement, available materials and money. These parameters were used in conjunction with the Aide Memoire giving individual engineers much leeway in the shape of the emplacement. The lack of documentary material on the smooth bore emplacements, lack of comparative emplacements and individual variations from fort to fort provided only a very vague idea for reconstruction purposes prior to excavation.

The final problem revolved around the profile of the parapet. The actual configuration of the parapet from the smooth bore period was not conclusively known due to the lack of documentary evidence. Once again the plans available from 1848, 1849, and 1852 were only proposals and there was no extant fabric which gives any idea of the profile of this period. This was due to the fact that the configuration of the parapet was changed with the advances in artillery from smooth bore to rifled ordnance.

Due to the lateness of the excavation season only the guns on the right face to the southwest demi-bastion and the profile from this area were slated for excavation. Extrapolating the locations of the ordnance from the plans, a series of sub-operations were opened ninety degrees to the face 41.0 meters from the salient and excavations began. They did not work out as planned. The series of pits grided over the most northerly emplacement (Figure 18) were continued for over a month without results. Work to a depth of almost three meters yielded few artifacts and no gun emplacement. The only consolation from this work was that it gave a complete cross-section through the rampart from which a profile could be obtained. To add insult to injury, while these excavations were in progress a backhoe operating in the vicinity of the location of the other emplacement managed to accomplish what we had not.

It uncovered a masonry feature near the assumed location of the emplacement (Figure 19). Operations were shifted to this area, but still things did not go our way. The weather began to close in. We were still working in the month of November and the excavations had to be completed by the next spring due to construction activity. This necessitated building a shelter and excavations were completed on a cold day in January.

32 Pound Emplacement

Stratigraphy overlying the feature was not normal in the sense that it was built up of successive layers laid down at intervals. Instead it was an accumulation of masses of backfill deposited in varying amounts and locations since the turn of the century until the late 1950s. Arbitrary levels of fifty centimeters were utilized as a means of control. A small test pit 1.0 by 3.0 meters was excavated to verify that this feature was actually the gun emplacement and to locate the pivot area.

A layer ranging from one to two meters thick of alternating lenses of clay, sandy loam or buried sod were encountered. This material overlaid a stratum of ungraded beach gravel and sand, which completely covered the feature to an average depth of one meter. This beach material had been found in pits at other locations along the right face.

Underlying the beach gravel at a depth of 2.5 meters below the surface the first signs of the emplacement were encountered. It consisted of a masonry feature of ironstone and mortar 1.5 meters long and 0.5 meters high. At this point excavations were stopped because the test pit had served its purpose. Complete excavation of the structure was to begin.

To facilitate excavation the top strata of overburden was removed by backhoe until the layer of beach gravel was encountered. At this point a sub-operation four meters square was grided to encompass the pivot area of the emplacement. Excavations continued until the entire feature was exposed. Arbitrary levels of fifty centimeters were again utilized because of the homogeneous layer of sand and beach gravel.

Most of the artifacts in the sub-operation occurred in this beach material and consisted of broken pipe stems, military buttons and ceramic and glass fragments. No

concentrations or activity patterns were observed from the artifacts. Their only relationship to the emplacement is that they all date from the latter half of the nineteenth century. They were deposited with the fill and do not represent an in situ cultural deposition.

When the features were completely exposed it was evident that it was not in original condition. The feature we had been excavating was not the actual emplacement, which would have consisted of cut granite, but was the foundation which supported the granite.

Direct comparison between the in situ emplacement and the proposal for the eight inch S.B. (Figure 27) was not possible because of their inherent design differences. (The plan for the eight inch gun was the only one available for the smooth bore period). However, the basic construction methodology of the proposal could be extrapolated to the foundation that was excavated and some characteristics of the 32 pound emplacement's original configuration could be derived. Both pieces of ordnance had to undergo similar types of stress in working situations, so their construction would relfect similar characteristics.

General maximum dimensions of the emplacement were 3.4 meters wide by 2.3 meters long by 1.1 meters high. A cross section of the emplacement (Figure 26) detailed the variation in the construction of the foundation. The emplacement was situated 5.30 meters east of the escarp wall and its maximum height was 1.40 meters (73.29 ASL) above the coping stone of the escarp wall. Construction materials consist of ironstone ranging in size from a cobble to large slabs and lime motor. The ironstone in its present condition was still in place due to sheer weight. The majority of the lime had leached out of the mortar rendering the foundation unserviceable for reconstruction purposes. The square hole for the pivot was located 1.15 meters back from the front

(escarp side) of the emplacement. The hole was 0.25 meters ± .02 square and 0.30 meters deep. The size corresponded to a pivot of the same type used for 32 pound S.B. platforms, one of which was embedded in concrete at the main entrance of the Citadel. Its base measured 0.22 meters on a side, conforming to the hole in the emplacement, leaving enough room to be leaded into place.

The section of the emplacement around the pivot was excavated in the winter of 1977 but due to weather conditions the racer for the emplacement was not excavated until the spring. The size of the original excavation did not encompass the racer area so an additional sub-operation was grided on the east side. The pit was only 1.5 by 3.0 meters, enough to give a cross section of the racer. The balance of the racer will be uncovered in the summer of 1978.

According to documentation the racer was a multi-segmented granite curb without an iron track for the trucks of the platform (Johnston, 1977: 73). The segments of the racer were joined by iron cramps seated in slots in the granite and leaded into place. The plan of the eight inch S.B. cannot be used as an example of the distances from the pivot to the racer of the 32 pound S.B., but the dimensions of the granite on the racer and pivot areas should be the same as well as the foundations underneath. The granite would have to undergo similar stresses in both cases.

Given the fact that all the cut granite had been removed from the pivot area it was not anticipated that any of the cut granite would be found on the racer. However, excavations revealed the granite still in situ. Two of the segments were partially exposed along with their joint within the sub-operation (Figure 24). This would give the exact elevation of the gun, its radius and the detail of the cramp. The cut granite was dressed on the top surface for 0.30 to

0.31 meters and on the sides for 0.04 to 0.07 meters from the top surface. The balance of the granite was roughly cut. The total maximum dimensions of the stone are 0.41 meters high by 0.52 meters wide. Longitudinal distances were unobtainable until the balance of the racer was excavated. The top surface of the granite was 73.27 ASL. The lead covering the cramp that holds the joint together covers an area 0.10 by 0.40 meters. The granite was bedded on an ironstone and mortar foundation 1.10 meters wide by 0.75 meters high. Complementing the foundation were masses of ironstone located to the east and west sides to provide additional support and drainage.

There were two basic construction factors that deviate from the original proposal for the eight inch gun emplacement. The first is the actual size of the pivot area. Although the eight inch gun that was mounted on a semi-circular emplacement was 3-400 kilograms heavier (Johnston, 1977), the foundation for the emplacement was almost half the size of the 32 pound S.B. emplacement that was excavated. The second was the size of the granite on the foundation of the racer and the pivot area. The specifications for the eight inch gun calls for racer granite of 0.30 meters thick and 0.30 meters wide whereas the granite on the excavated emplacement was more than 0.40 meters thick and more than 0.50 meters wide.

These differences cannot be attributed to an individual engineer's construction methods. Although the emplacements that were proposed in 1846 were of the semi-circular variety with intermediate position pivots and this would account for the variance in the diameters of the platforms (6.10 versus 7.62 meters) it did not account for the disparity in the sizes of the ironstone foundations or the granite. It would seem more practical that a larger piece of ordnance would have had a more substantial emplacement.

The weight differences of the ordnance can be compensated by the addition of the weights of the platforms and carriages. The common traversing platform of the type that was used at the salient weights 1100 kilograms, whereas the dwarf traversing platform used for the 32 pound S.B. weighs 1500 kilograms. The weight of both carriages used on the platforms was 630 kilograms. The sum total of the mass (platform, carriages and gun) that each racer must carry was 4680 kilograms for the eight inch gun and 4675 kilogram for the 32 pound gun. The five kilogram difference was definitely not reason enough to require a massive change in racer size especially when the weight disparity is in favour of the eight inch gun. An alternative reason for the change in emplacement size must be found other than load bearing characteristics. A more logical explanation for the differences was a change in the type of platform.

The accepted proposal for the armament of the Citadel was drafted by the Commanding Royal Engineer, Lt. Col. Patrick Calder, in March 1846. At this time in England revisions were being made to improve ordnance systems in the British empire and new instructions were issued in April of 1846, after Calder had submitted his proposal.

The ordnance revision included the type of dwarf traversing platforms installed on the 32 pound S.B. emplacements at the Citadel. These revisions were published in the Aide Memoire and superceded all other existing plans. The Aide Memoire did not specifically explicate new construction methods or what improvements were made over the old pattern, but if general improvements were made, they may have affected the foundation of the emplacement. At the very least the CRE may have taken some inspiration from the need to improve the emplacements and made substantive changes.

It is impossible to discover the motivation which prompted Calder to install the smooth bore emplacement the way he

did, but with the remains that have been excavated, the documentation and photos it is possible to reconstruct a composite picture of what an emplacement looked like. Available examples of smooth bore emplacements in the Atlantic Region show extreme variability in the engineer's interpretation of the pattern for the platform. Racers exhibit different characteristics according to their date of installation within the smooth bore period. No continuity can be established to apply to the emplacements at the Citadel. Therefore, comparative material can only be limited to within the Halifax Defence Complex.

The emplacement, when reconstructed from available materials, should resemble the form represented in Figure 26. It is a composite of the excavated ironstone foundation and the granite racer (See Figure 26), the granite for the eight inch emplacement extrapolated from the 1846 plan, the embrasure wall or genouillère as it appears in the photo from 1879 of the northwest demi-bastion showing an in situ 32 pound emplacement, and the pivot which is partially extant at the entrance of the Citadel.

The granite surrounding the pivot should be at the same level as the racer, but its size is conjectural until an emplacement is excavated with granite in place. Given the factors that the foundation and the granite of the racer are larger than the plan from 1846, the granite around the pivot should be of a similar enlargement.

The granite that forms the genouillère is drawn from the configuration of the granite in the embrasure shown in an 1879 photo. Fortunately the soldier in the photo is holding a ten foot scale. Measurements taken from the photo approximate 0.75 meters high for the genouillère. The wall is not straight across but is formed of three sections: two angled wings and one straight in front of the pivot. The two wings are in the vicinity of 0.60 meters wide and the front section

is 0.90 meters wide. The excavated foundation indicates the ironstone under the genouillère of the embrasure is sufficiently large to support the added weight and dimensions. The front section of granite would probably abut the back of the pivot because the extant pivot in the entrance of the Citadel has a flush back designed to accommodate a wall. The wall is sufficiently low to allow for maximum depression of the gun but high and strong enough to support the earth in the parapet. The Aide Memoire recommends that the sole of the embrasure, the area under the muzzle, be 1.35 meters high and of sufficient angle that the gun when depressed does not come into contact with the sole. The sole depicted in the 1879 photo is only 0.75 meters high. There are two possibilities for this discrepancy.

The genouillère may have been higher and the granite forming the peak of the sole and the genouillère may have been removed at some time. An alternative hypothesis is that the sole was constructed at a lower height to allow the 32 pound S.B. to be sufficiently depressed to cover the low angle of the glacis. The design of the 32 pound emplacement in the Aide Memoire is for a depression of only five degrees, but the normal angle of the glacis ranges from seven to twelve degrees depending on the location on the hill. The disparity in angles would negate the effectiveness of the guns at close range and leave the Citadel undefended. Colonel H.I. Savage, who replaced Calder as CRE, noted this point in February 1849. He suggested that the carriages should be altered to accommodate the largest angle of depression. This would not necessitate depression carriages because they are only required for angles greater than fifteen degrees. The change in the angle of depression would require a structural modification of the embrasure, which is reflected in a lower genouillère.

It is evident from this composite picture of the 32

pound emplacement that more factual information is needed. Archaeological investigation of the remaining emplacements can provide additional structural information and define any individual variations. The composite plan of the emplacement is based on estimates and general plans which were subject to interpretation by engineers. The one emplacement that has been excavated to date may be one of many variations.

Parapet Profile

The most conspicuous element of the ramparts, besides the gun emplacements, was the parapet. Providing protection for men and material, it extended completely around the fort. During the smoothbore period the parapet had a configuration that was designed to accommodate a particular military strategy and artillery capability. When artillery technology advanced the parapets were altered to reflect these changes.

The Halifax Citadel, because of its life span, bore the brunt of technological change. Its evolution as a fortification followed the changes in guns. It became the engineer's task to design and re-design the ramparts as new requirements had to be met. The methodology for building a parapet was part of basic engineering training and any documentation on parapet design researched to date assumed prior knowledge. This leaves very little material, in terms of documentation, for reconstruction purposes. Most of the general information is on soil types and slope parameters. Specific documentation about the Citadel is only plans, which vary according to their date of production.

This leaves a major feature of the Citadel reconstruction relying on varying documentation due to the fact no section of the ramparts is in original condition. Therefore,

to try and define any of the parapet profiles, archaeological investigation was deemed necessary. The series of pits that were to locate the 32 pound S.B. gun emplacement on the right face of the southwest demi-bastion provided an excellent section through the existing mound of earth on the ramparts.

The profile of the earth on the rampart in no way resembled the typical design of a parapet (See Figure 28). Excavations revealed that the majority of the material that was extant on the ramparts was a recent deposition. The maximum depth in any pit of this deposition was 2.5 meters. There were five basic stratigraphic levels of alternating buried sod and sandy loam but all of a modern nature. The soil contained artifacts relating to the twentieth century mixed with yellow, English bricks indicating at least some of the refuse may have come from a British brick building located within the fort that was demolished in the 1950s by Parks Canada.

A strata of ungraded sand and beach gravel of the same type encountered in the lowest layer in the excavation over the S.B. gun emplacement underlaid the sandy loam. As in the other excavation most of the artifacts relating to the nineteenth century were found in this layer. The sandy material did not conform to any parapet profile and therefore it must be assumed that it was fill deposited at an earlier date. This is supported to a certain extent by a reference to a pile of earth on the southwest demi-bastion in 1866 (Johnston, 1977: 112). When the guns on the right face were finally removed this sand and gravel may have been used to cover the remnants of the emplacements.

The only indications of the original parapets were two layers of clay under the strata of beach gravel. At a point 9.2 meters from the escarp wall a strata of dark brown clay with a mean depth of 0.20 meters took an upward climb at an

angle approximating 30.0 $\pm$ 0.5 degrees towards the escarp. It rose to a peak of 1.2 meters 2.2 meters from the point of origin. The second layer which underlies the dark brown clay was a red-brown silty clay which follows the profile of the first layer. It orriginated at a point 8.9 meters from the escarp and rose to its maximum height of 1.0 meters 2.0 meters from its origin. These two distinct strata clearly defined a change, in the form of an addition, to the configuration of this section of the parapet. These two layers were truncated at their most extreme height by the removal of earth along the front of the parapet. They extended throughout all the pits in an eastward direction towards the dwarf wall where modern disturbance had obliterated their relationship to the drains.

The exterior slope of a parapet normally had a very high angle which did not correspond to the low angle of the slope that presently exists. Excavation through this section indicates that a layer of topsoil, in the form of loam, was deposited on the clay, probably for sodding.

This leaves very limited material to define the parapet. To orientate these layers of clay, dimensions of the the parapet have been tabulated (Table 1) for comparative purposes. The distances of the angles' points of origin fall within the distances of the interior slope of the banquette.

The underlying strata of silty clay approximated the distances extrapolated from the 1836 and 1849 proposals for the smoothbore parapet. The width of the slope (G) approximated the width of the slope on the plans within 0.30 meters. The angle of the slope on the plans was 27.0 degrees and the angle of the profile was 30.0 degrees $\pm$ 0.5. The height of the banquette on the plans was 0.60 meters high but the maximum height of the excavated slope was 1.0 meters. However, the height of the parapet above banquette was the critical height. It should not exceed 1.4 meters above the banquette

to allow gunners clear access over the parapet. A combined height of 2.4 meters for the banquette and parapet was not excessive and fell within some of the maximum heights on the plans.

The overlying strata of dark brown clay could reflect a change in the smoothbore parapet or an addition to form the banquette for the rifled bore parapet which was a radical change in design. The 1.2 meter banquette would have made the height of the parapet 2.8 meters high, which was excessive. A banquette of this height would make access to the parapet more awkward in addition to the fact 1.4 meters exceeded all estimates on the plans. The significance of the banquette diminished during the rifled bore period because the emphasis was on heavy artillery and less on small arms fire. The higher strata of clay indicated less concern for the banquette as an operational feature. The banquette was eliminated in certain circumstances. There are no sectional plans for the rifled bore parpaet but a photo from 1879 shows the design changes and there is no banquette. However, a ground plan from 1879 showed various sections of the parapet with a banquette and some without. The relationship of the two strata to their respective parapets cannot be determined until there is further research. The configuration of the banquette wlll have implications in the design of the parapet because of minimum design characteristics in relation to heights.

The lowest section of the clay strata should be the terreplein level if the sloping section is considered the interior slope of the banquette. On all plans the terreplein ran on an angle towards the granite gutter in front of the dwarf wall, where run off water was channeled through drains into the tanks. The width of the terreplein and the angle it formed related directly to the width of the ramparts at any given point. Elevations taken on the granite

gutter are 73.05 meters ASL and elevations taken on the clay strata at the nadir of the interior slope were 73.39 meters ASL and 73.29 meters ASL. The distance from the nadir of the slope to the granite gutter was 15.54 meters. This would give an angle of slightly over one degree to the terreplein.

There were no indications of the type of covering used to hold the earth in place on the parapet or on the walking surface of the terreplein. There did not seem to be a definite layer of buried sod to indicate a grass covering nor is there gravel of any type on any walking surfaces. Part of these deficiencies can be attributed to modern destruction, but undisturbed sections should exhibit some characteristics of sod coverage but they were not apparent.

The information that was obtained from these excavations was very minimal. A more intensive excavation of less disturbed areas on the Citadel would probably reveal more data and provide comparative material for the profile obtained thus far. The lack of documentation and the significance of the parapet, in terms of visual impact, would merit a more thorough investigation.

Conclusion

Excavations were initiated on the Halifax Citadel for the specific purpose of salvaging what little information remained about the southwest front. The restoration of this area was a high priority but there were gaps in the information necessary for restoration. Extremely important was the profile of the parapet and the smoothbore gun emplacements. Virtually nothing was known about the construction details of the configuration of the gun emplacement. Proposals only gave general locations, if in fact the guns were ever installed. The form of the parapet, although generally detailed by plans, was not known because with each set of proposals the dimensions changed. These two features which would compose a large portion of the rampart reconstruction were virtually unknown. It was also assumed that the destruction and deposition that had gone on in this area over the last one hundred years had obliterated much of the fabric.

Excavations revealed, however, there was more to the site than previously thought. Substantive information was recovered about features which contribute to the restoration. Besides very visible features, specific information was gained about other material such as floor levels and drainage systems. These would not be so visible as parapets and gun emplacements but the information was nonetheless, important.

The most significant result of this year's excavations was the simple fact that material beneficial to the restoration was found despite the fact that this area was extremely

disturbed. There are other areas in the Citadel, mainly in the north, where there seems to be a minimal amount of destruction. If these areas can be programmed well in advance of the backhoe and excavated without the constant threat of destruction the future volume and quality of information could be very significant and contribute necessary information for an accurate restoration.

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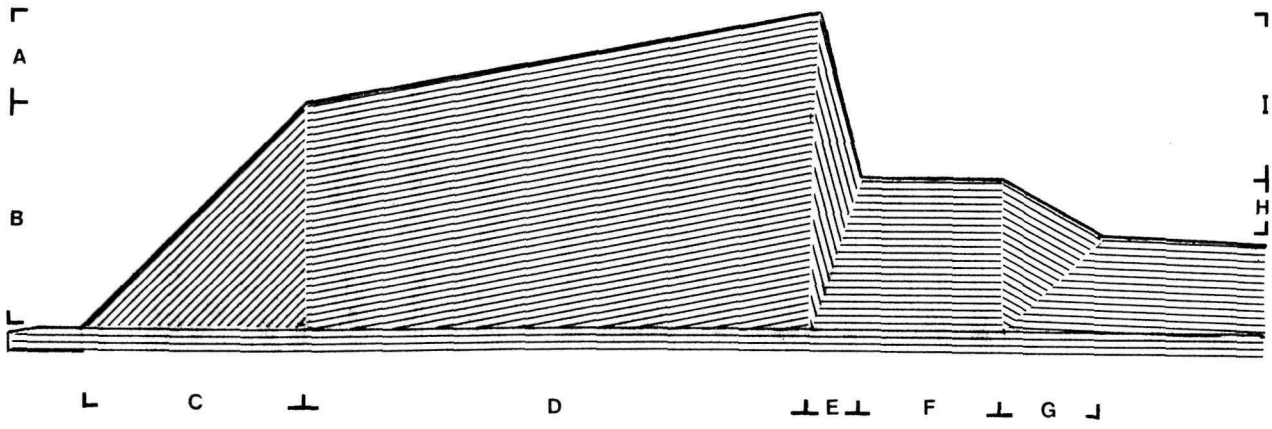
Table 1

Comparative dimensions of smoothbore period parapets taken from plans and excavations.



	1831	1836	1846	1848	1848	1849	1852	1977	1977
	meters								
A	1.2	1.2	1.2	1.2	1.2	1.2	1.2	–	–
B	1.8	1.8	1.2	1.8	1.8	1.7	1.8	–	–
C	1.8	1.8	1.8	1.8	1.8	1.5	1.8	–	–
D	4.5	4.3	4.3	5.2	3.7	4.6	5.4	–	–
E	0.3	0.3	0.3	0,2	0.3	0,5	0.0	–	–
F	1.2	1.2	–	1.2	1.2	1.2	2.3	–	–
G	1.9	1.7	–	1.4	1.5	1.7	2.1	2.0	2.2
H	0.8	0.6	–	0.8	0.9	0.6	1.2	1.0	1.2
I	1.3	1.3	1.4	1.2	1.4	1.5	1.5	–	–

Figure 1

Area of excavation in the interior of the South Magazine.
(Scale = 1.0 meter)

Figure 2

Cross section of the South Magazine detailing the relationship of the floor levels (scale 3.0 cm. = 1.0 m.)

a. spring of the arch
b. central support
c. earth subfloor (1836)
d. east wall
e. ledge
f. asphalt subfloor (1882)
g. ironstone floor support
h. concrete floor level

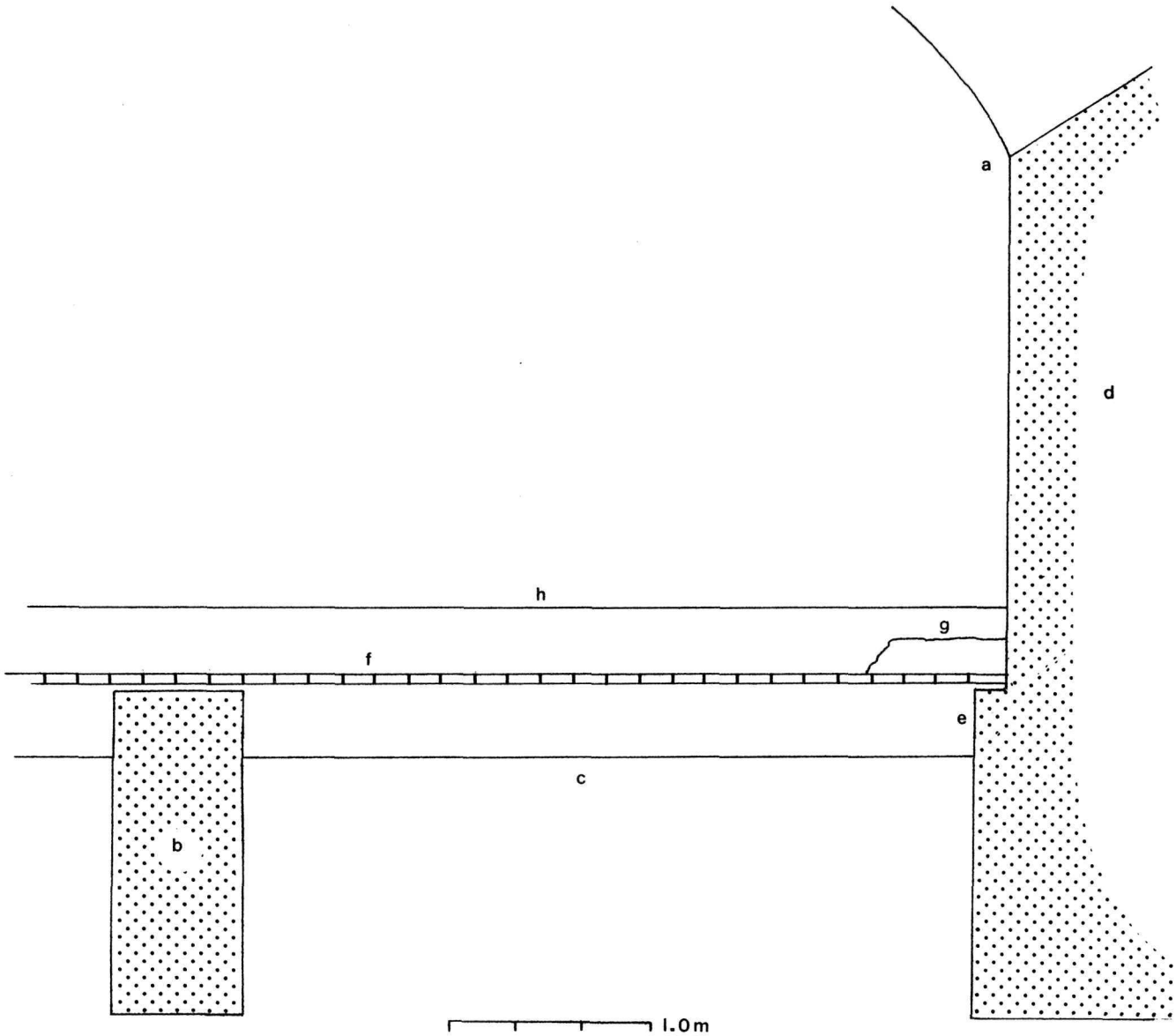

a
d
h
g
f
e
c
b
1.0m

Figure 3

Overview of excavation in the South Magazine showing ironstone and bricks used to support 1882 floor (scale 4.0 cm. = 1.0 m.).

a. east wall
b. concrete
c. wood floor
d. brick
e. ironstone
f. asphalt

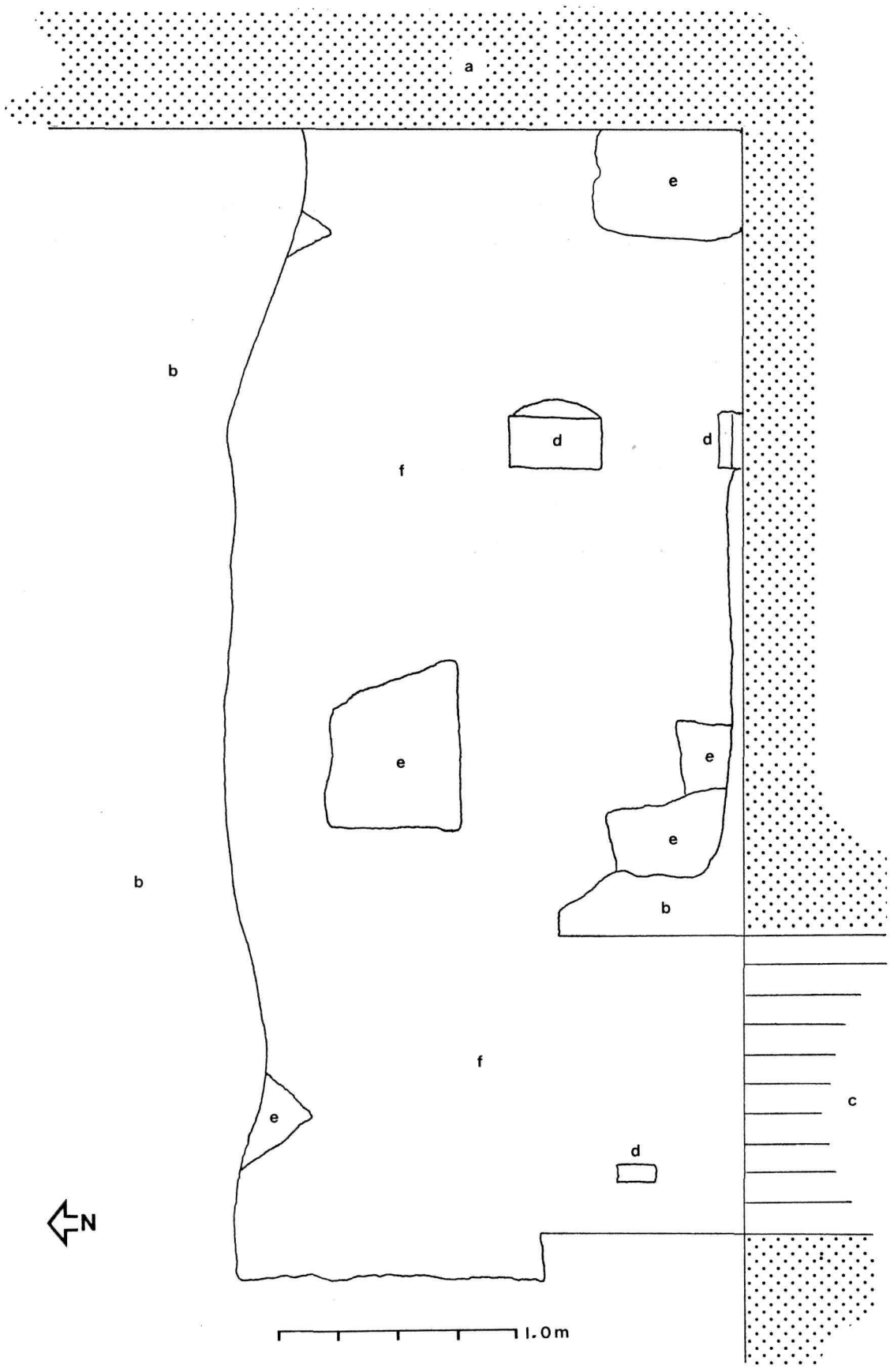

a
e
b
d
d
f
e
e
e
b
b
f
e
c
d
N
1.0m

Figure 4

Detail of wainscotting on the south interior wall of magazine establishing its relationship to the floors (scale 10.0 cm. = 1.0 m.).

a. east wall
b. ledge
c. ironstone floor support
d. asphalt subfloor (1882)
e. level of concrete
f. studs for wainscotting
g. wainscotting

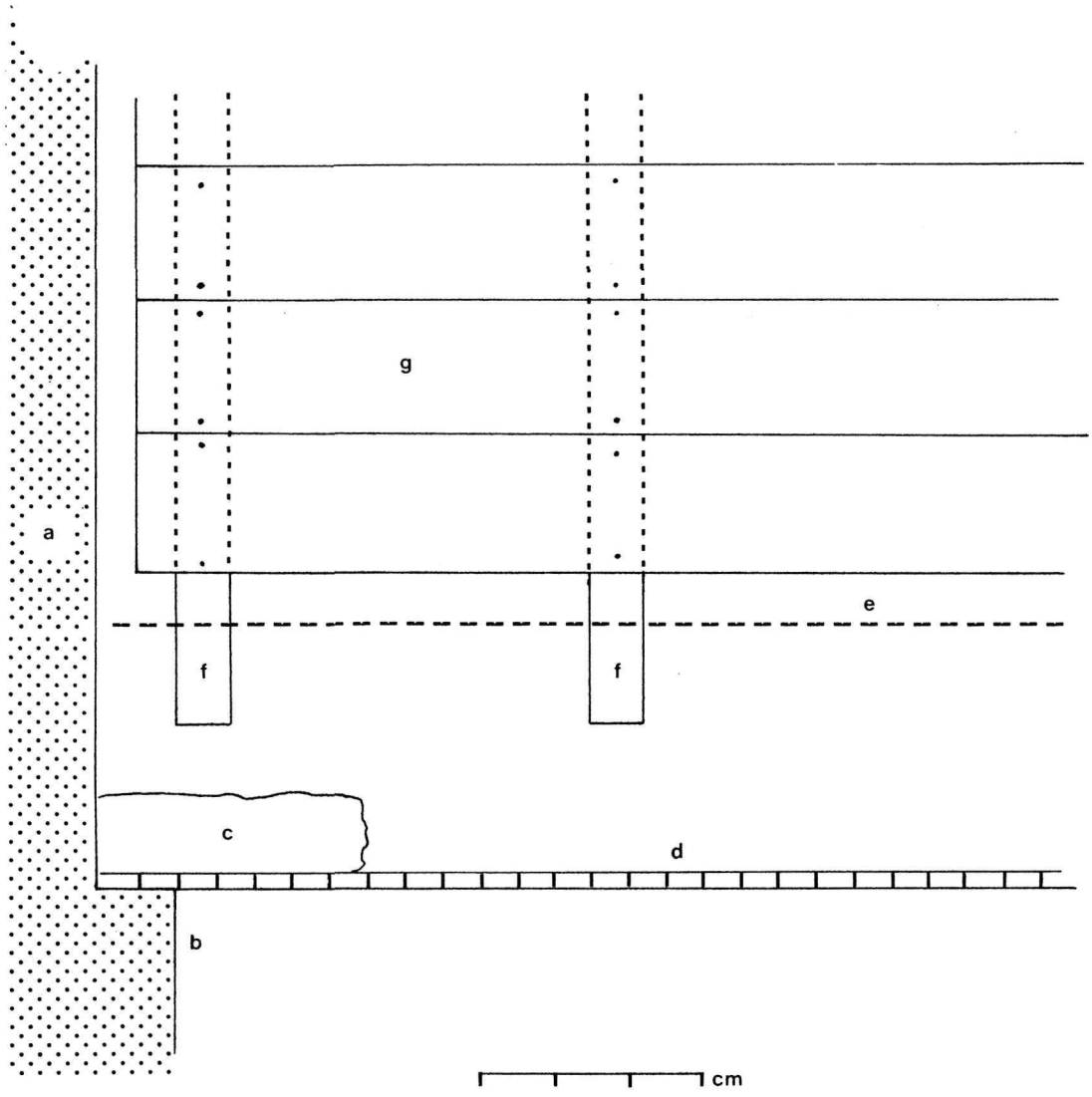

a
g
e
f
f
c
d
b
cm

Figure 5

Section through South Magazine from 1882 plan illustrating the floor design. Note that there are no measurements below the floor due to the fact that the floor was already installed when the plan was drawn. Therefore the supports are mainly assumptions.

Source: Public Archives of Nova Scotia

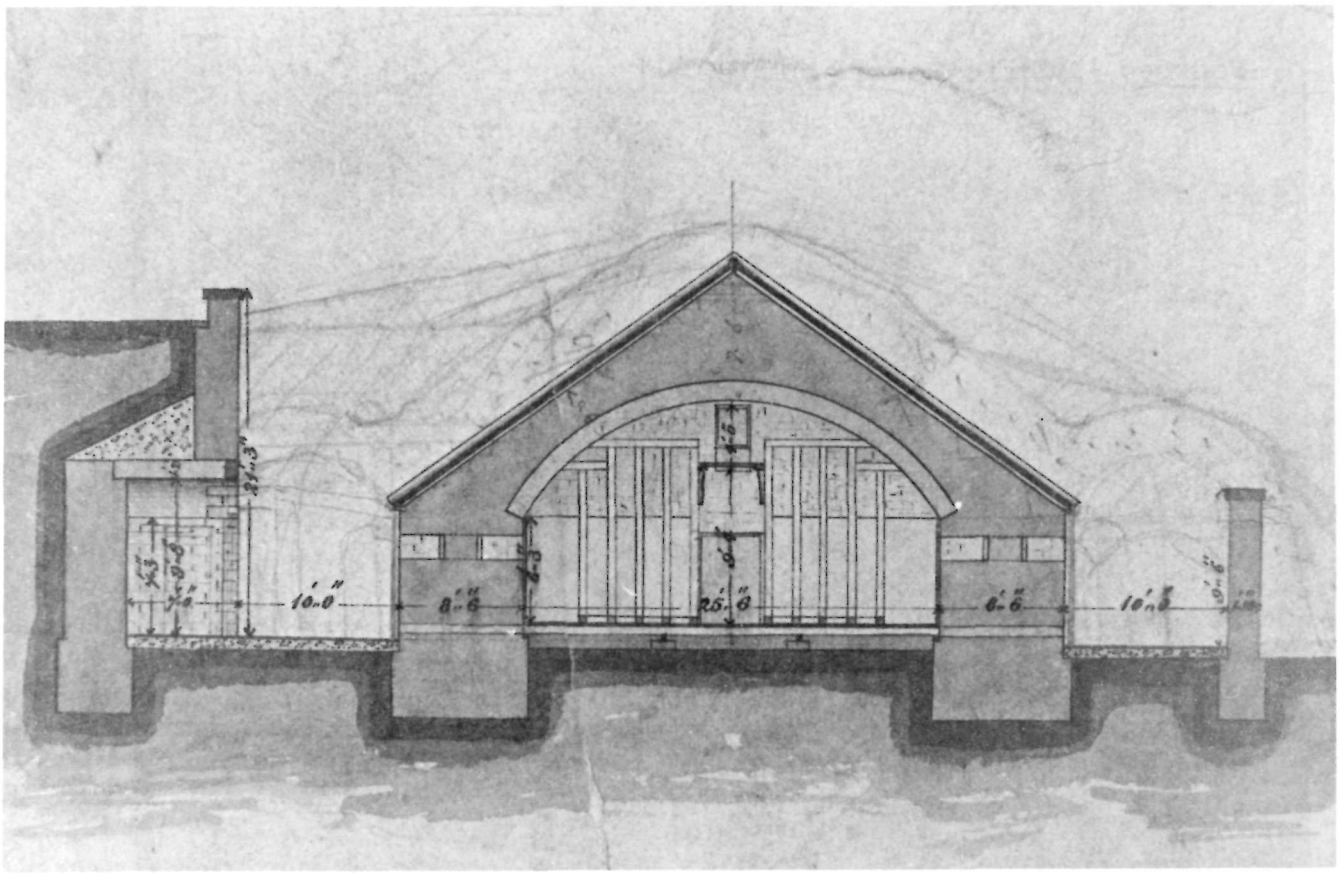

10'-0"
8'-6"
25'-6"
6'-6"
10'-3"

Figure 6

1846 plan of the South Magazine showing catchpit at the south end of the blast wall.

Source: Public Record Office

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Item N°6

Plan of the Proposed flagging to Areas of North and South Magazines

Marked A.D.A.D on General Plan

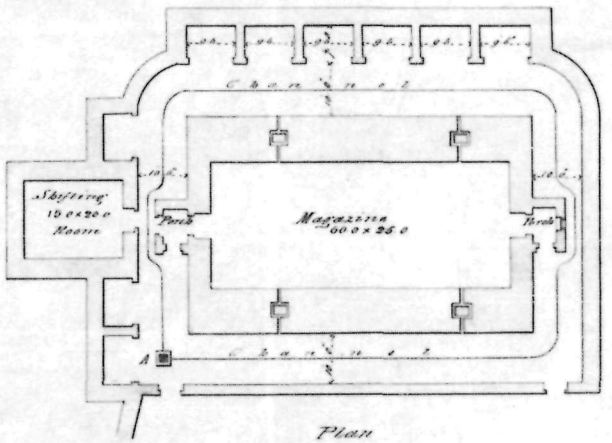
To accompany the Supplementary Estimate

Dated 31st March 1846

Halifax Nova Scotia

Citadel

№ 7



Plan

Scale 20 Feet to One Inch

Figure 7

Overview of the area of excavation on the east side of the South Magazine (scale 1.0 meter).

Figure 8

Detail of the drain area at its exit under the blast wall. (scale 1.0 meter).

Figure 9

Detail of the unidentified brick feature adjacent to the drain. (scale 1.0 meter).

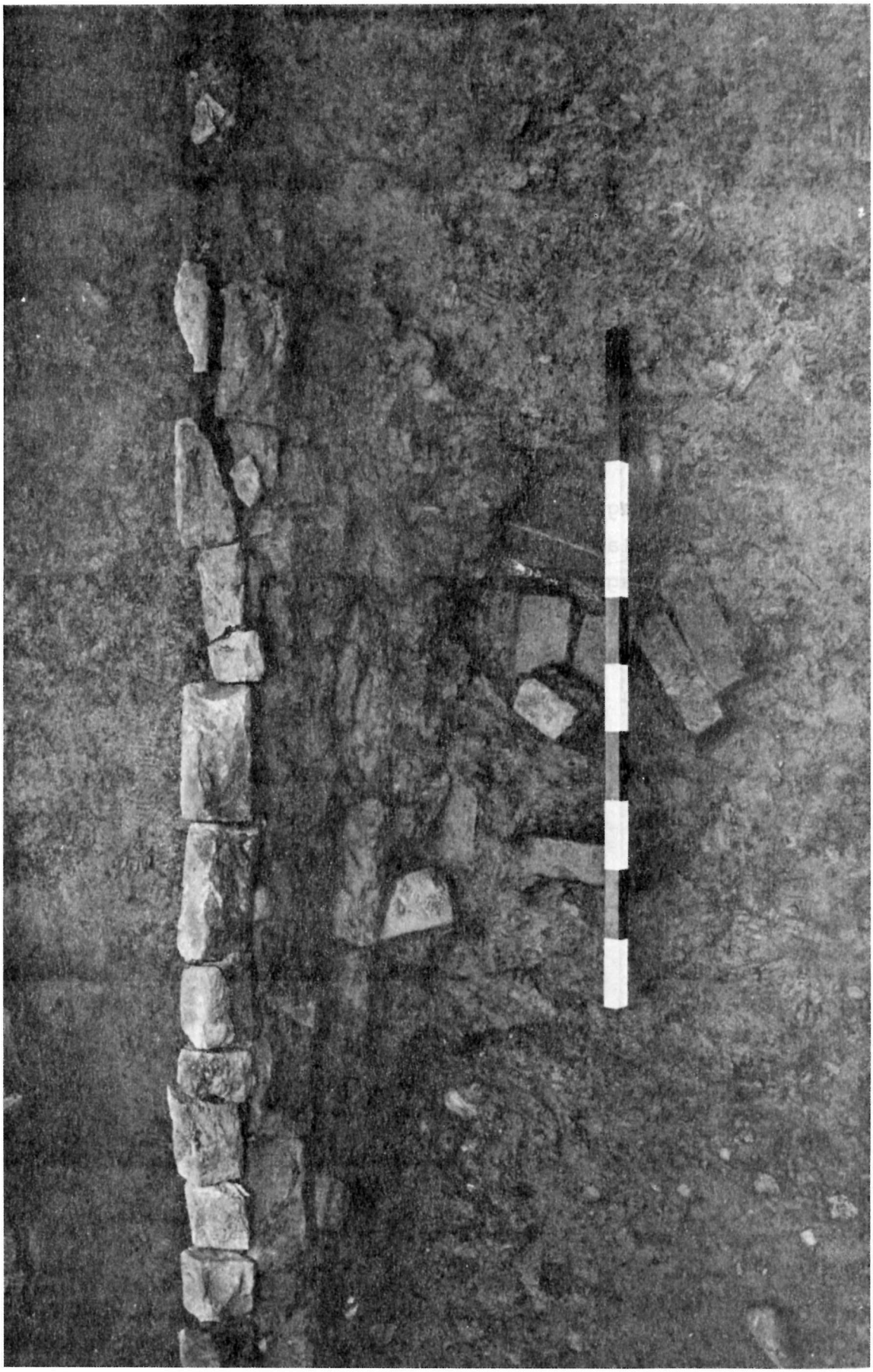


Figure 10

Overview of sub-operation detailing the sub-surface drain and its point of exit under the blast wall. (scale 5.0 cm. = 1.0 m.) (Drawing by J. Gasparac).

a. limits of excavation
b. east wall of magazine
c. blast wall
d. footing of magazine wall
e. footing of blast wall
f. ironstone flagging forming base of drain
g. unmortared bricks
h. ironstone flagging for capstone of drain

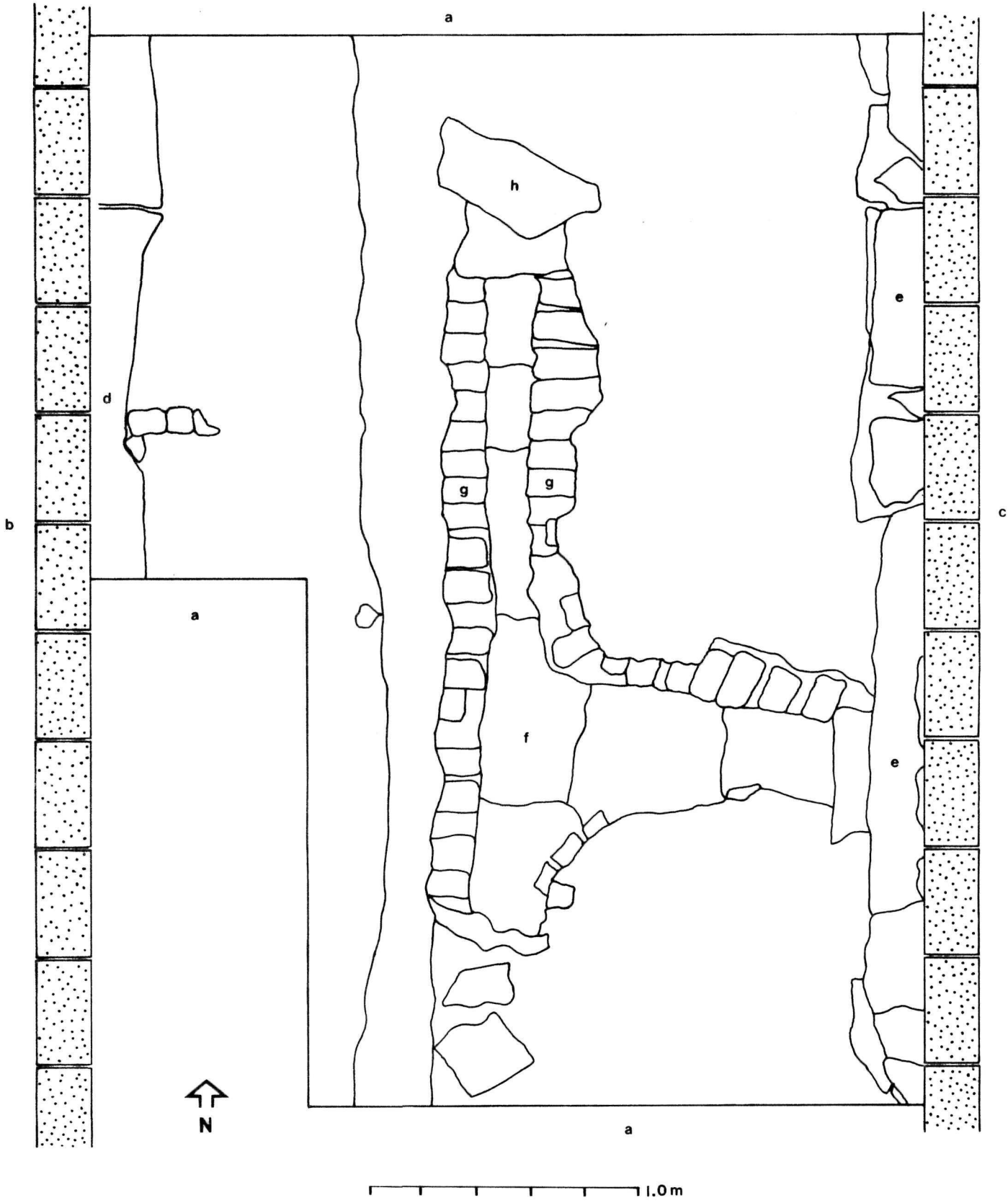

a
h
e
d
g
g
b
c
a
f
e
N
a
1.0m

Figure 11

Overview of the confluence of the drain encircling the South Magazine and the exit under the blast wall. (scale 1.0 meter).

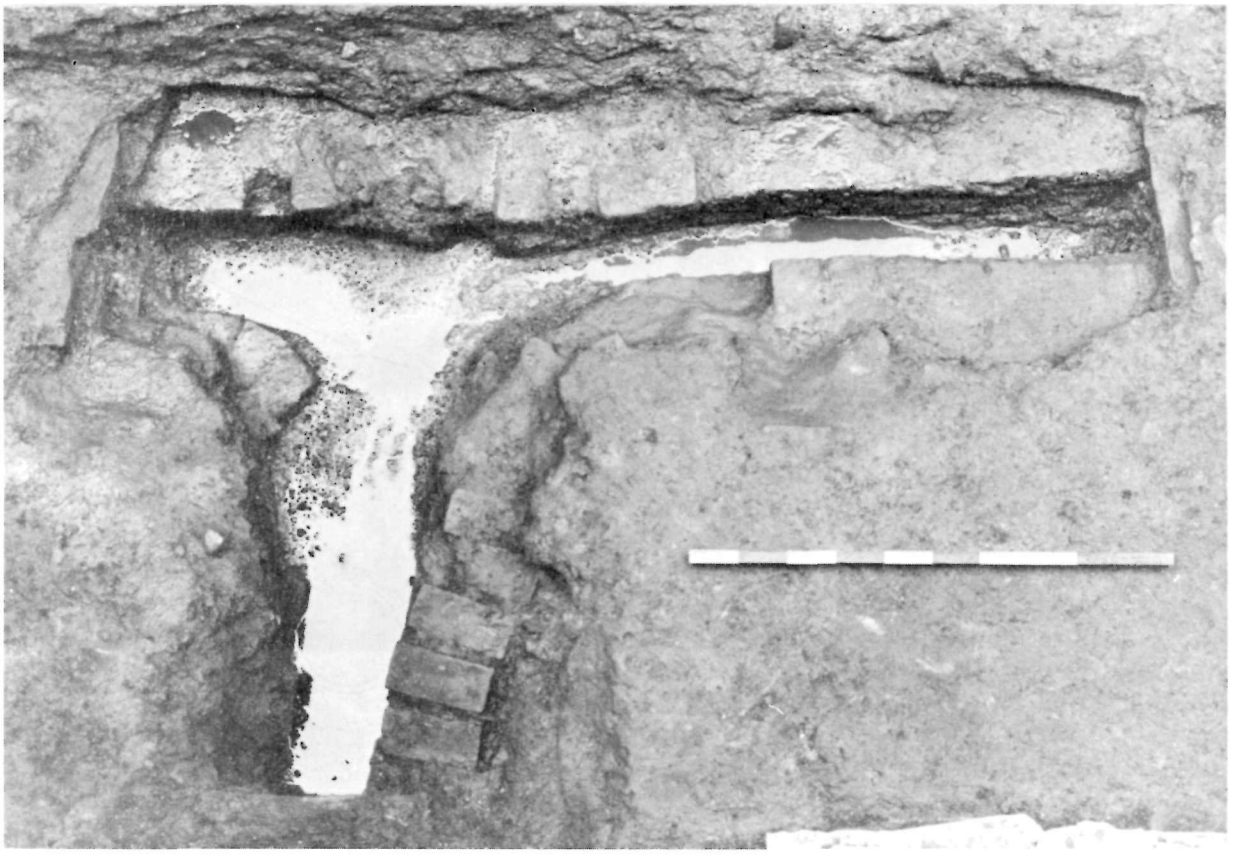


Figure 12

Detailed view of the drain outflow under the blast wall after excavation. (scale 0.50 meter).

Figure 13

Plan illustrating the lightning conductor system protecting the South Magazine.

Source: Public Archives of Canada

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— HALIFAX. —

Projections showing the mode of arranging the lightning conductors to the existing Powder Magazines in accordance with Circular No 260 To accompany the Ordnance Annual Estimate 1869-70 Sheet 4.

References

Fig. 1. — North Magazine Citadel
Fig. 2. — Ammunition Store
Fig. 3. — Naval Magazine
——— — Flat Copper Conductor
— — — — — — Tubular Copper Conductor
——— — Copper Lever Gutter & Down Pipe

Fig. 1.

Fig. 2.

Fig. 3.

Figure 14

Detail of curved section of copper conductor from southwest corner of the South Magazine. (scale 5.0 cm. = 1.0 m.).

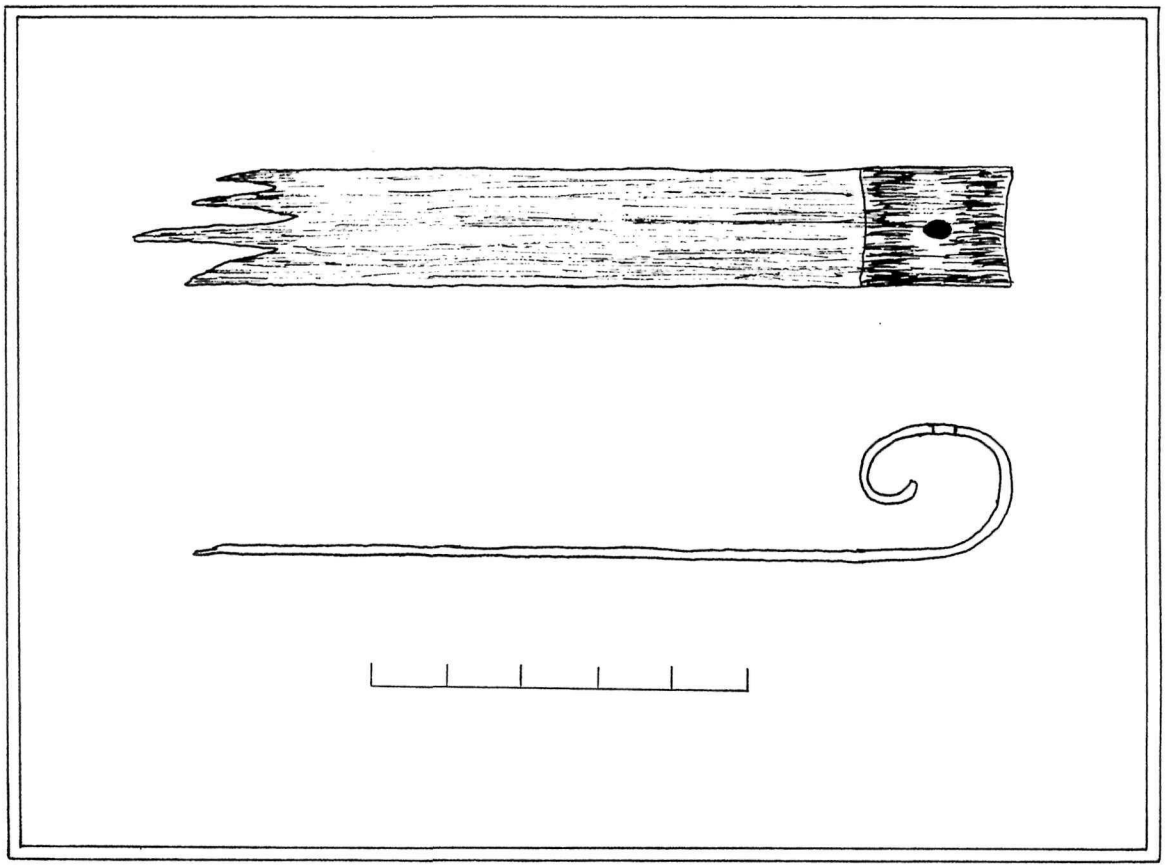
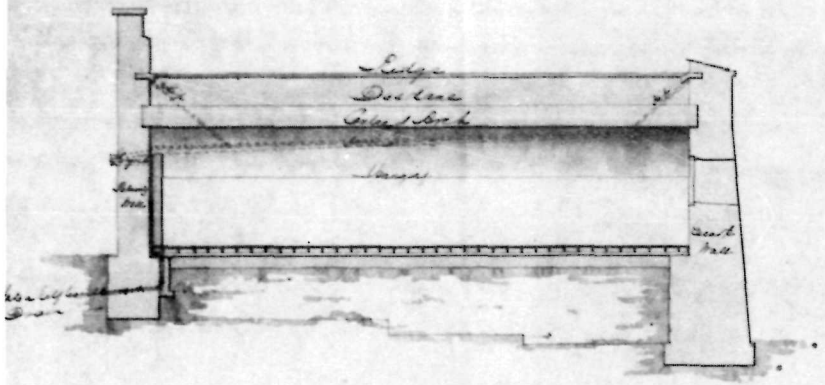


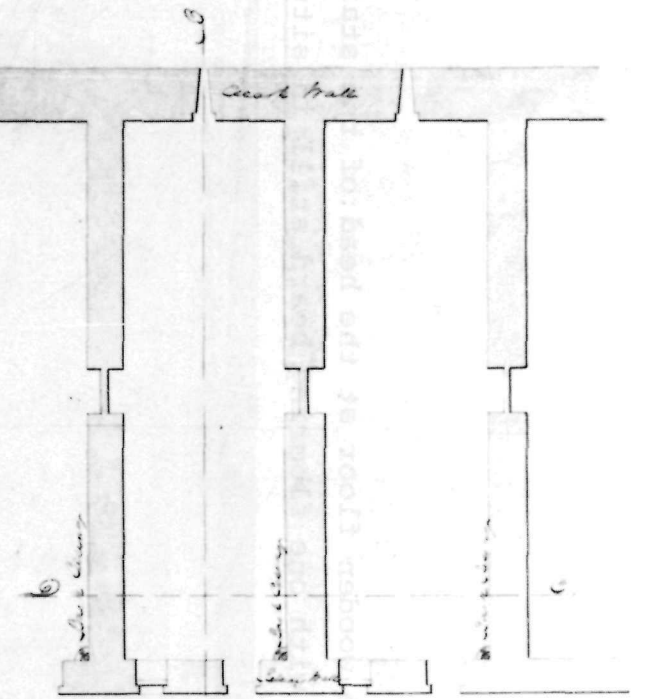
Figure 15

1848 plan of casemate design. Note the floor design.

Source: Public Record Office

N° 4.





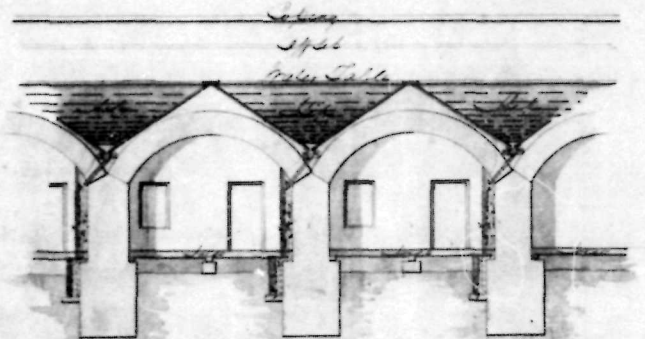


Figure 16

Sleepers for the wooden floor at the head of the stairs in sallyport three with one flooring board still *in situ*. (scale: 0.50 m.).

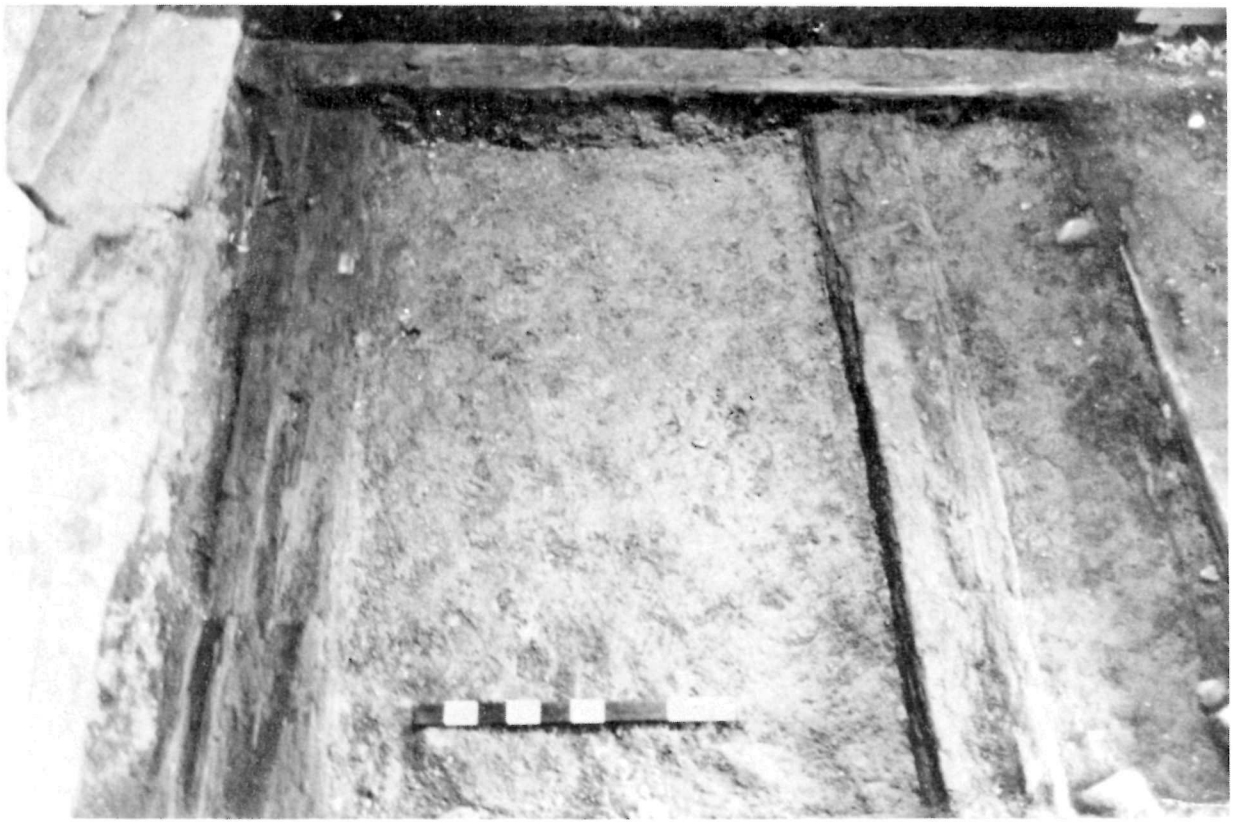


Figure 17

Extant masonry support walls for floor under gun platform in casemate 57. Some wood still in situ. Casemate floor is covered by a deposit of pigeon excrement.

Source: Halifax Citadel Extant Recording Team.

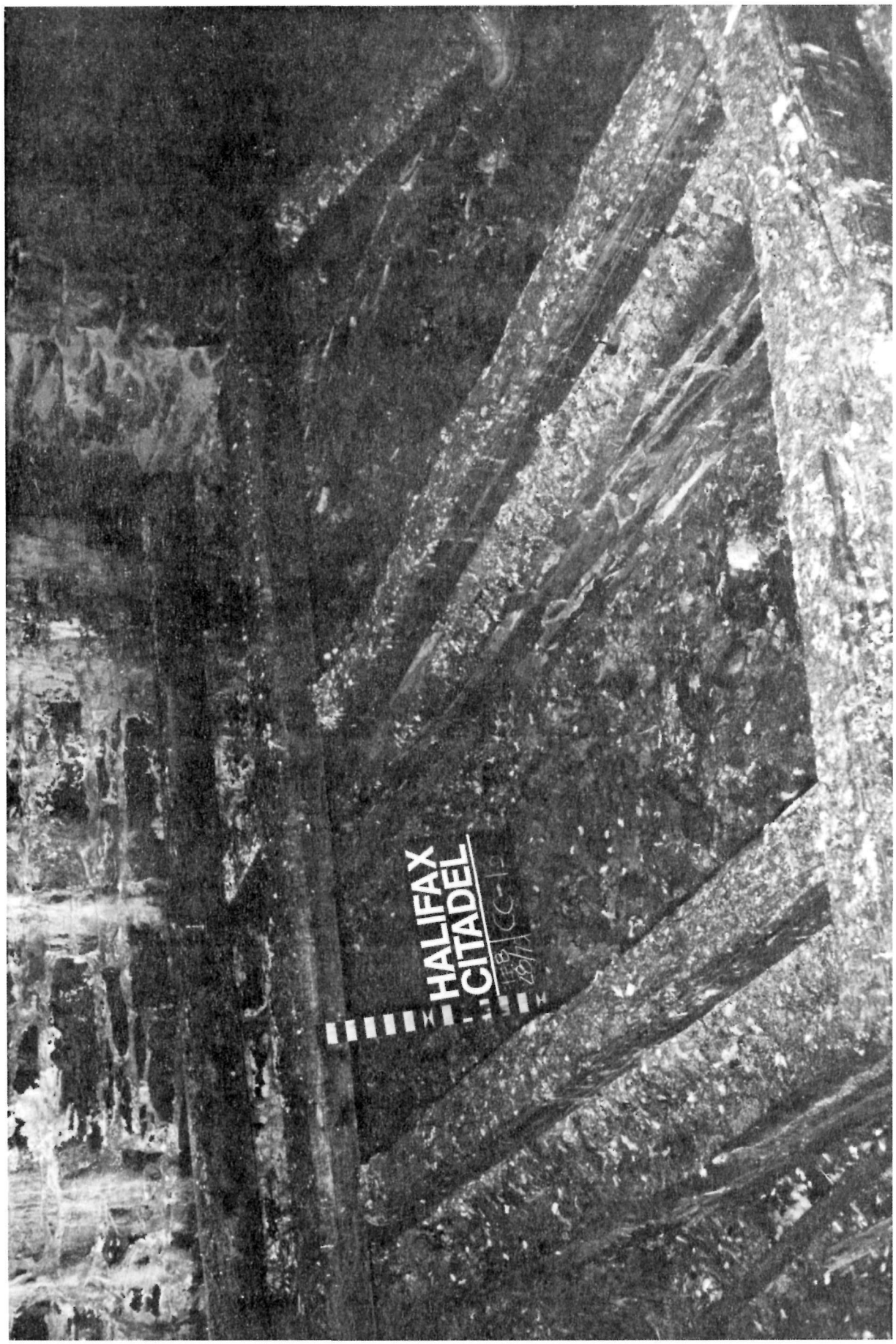

HALIFAX
CITADEL

Figure 18

Overview of area of excavation on the ramparts of the south-west demi-bastion. Observe the large mass of fill that has been deposited.

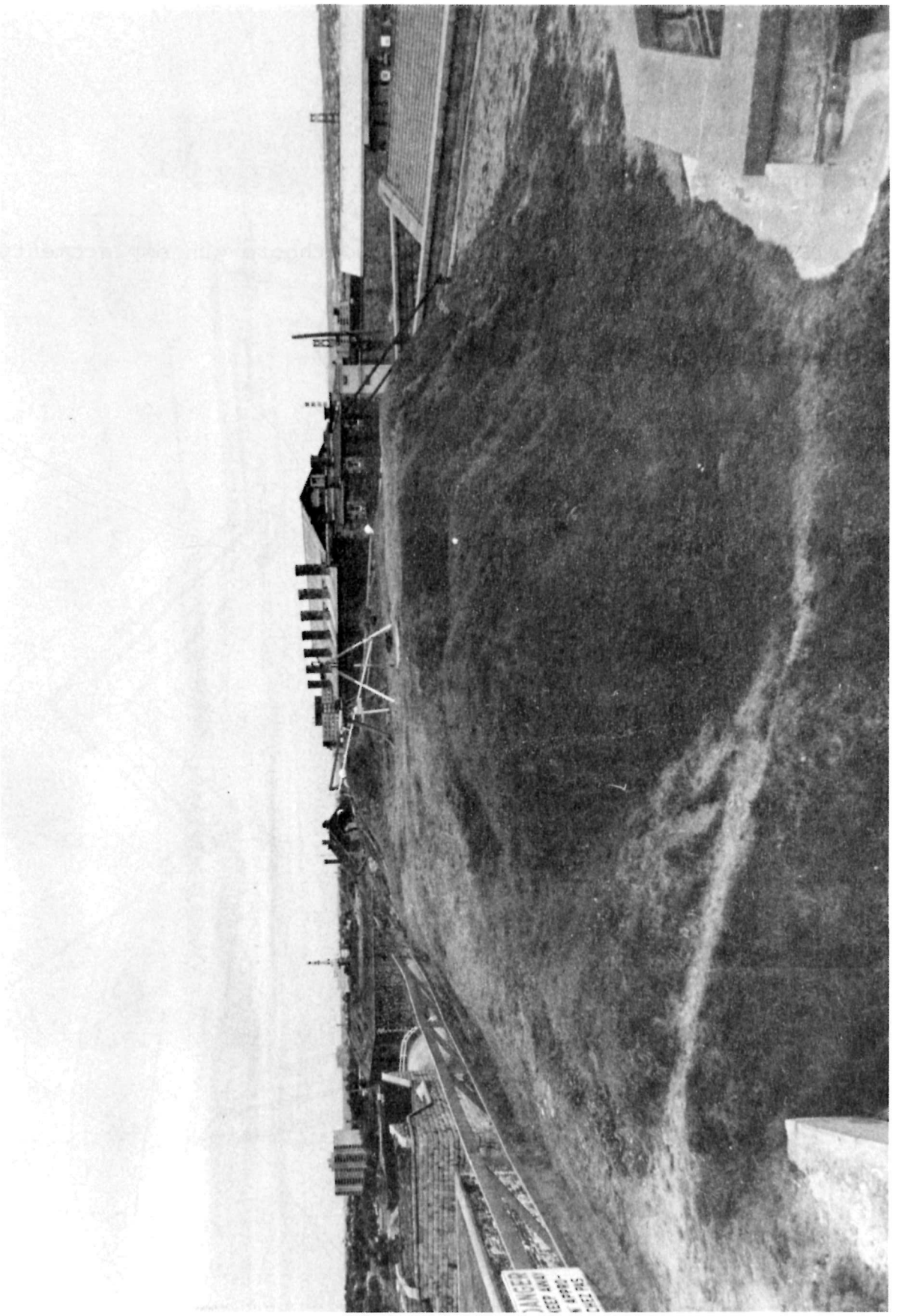


Figure 19

1856 proposal for locations of smoothbore gun emplacements.

Source: Public Archives of Canada

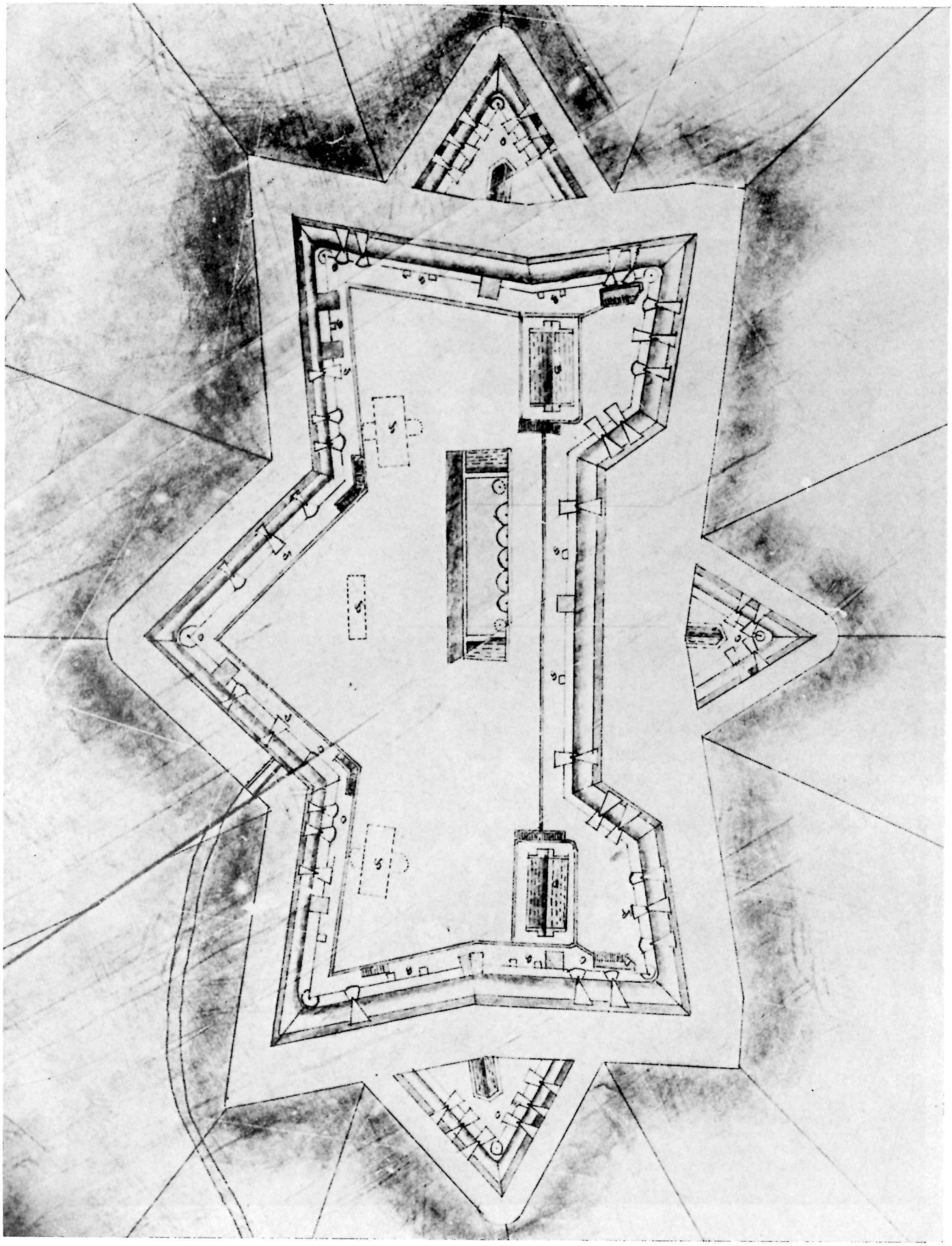


Figure 20

Extant escarp side of masonry smoothbore gun emplacement after exposure by the backhoe. (scale: 1.0 meter)

Figure 21

Overview of emerging masonry feature. Wood at top of photo is part of the shelter constructed so that work could continue on the gun emplacement during the winter. (scale: 1.0 meter)

Figure 22

Overview of excavated feature. This was the foundation of the emplacement constructed of ironstone rubble and mortar. Note the pivot hole in the centre of the feature. (scale: 1.0 meter)

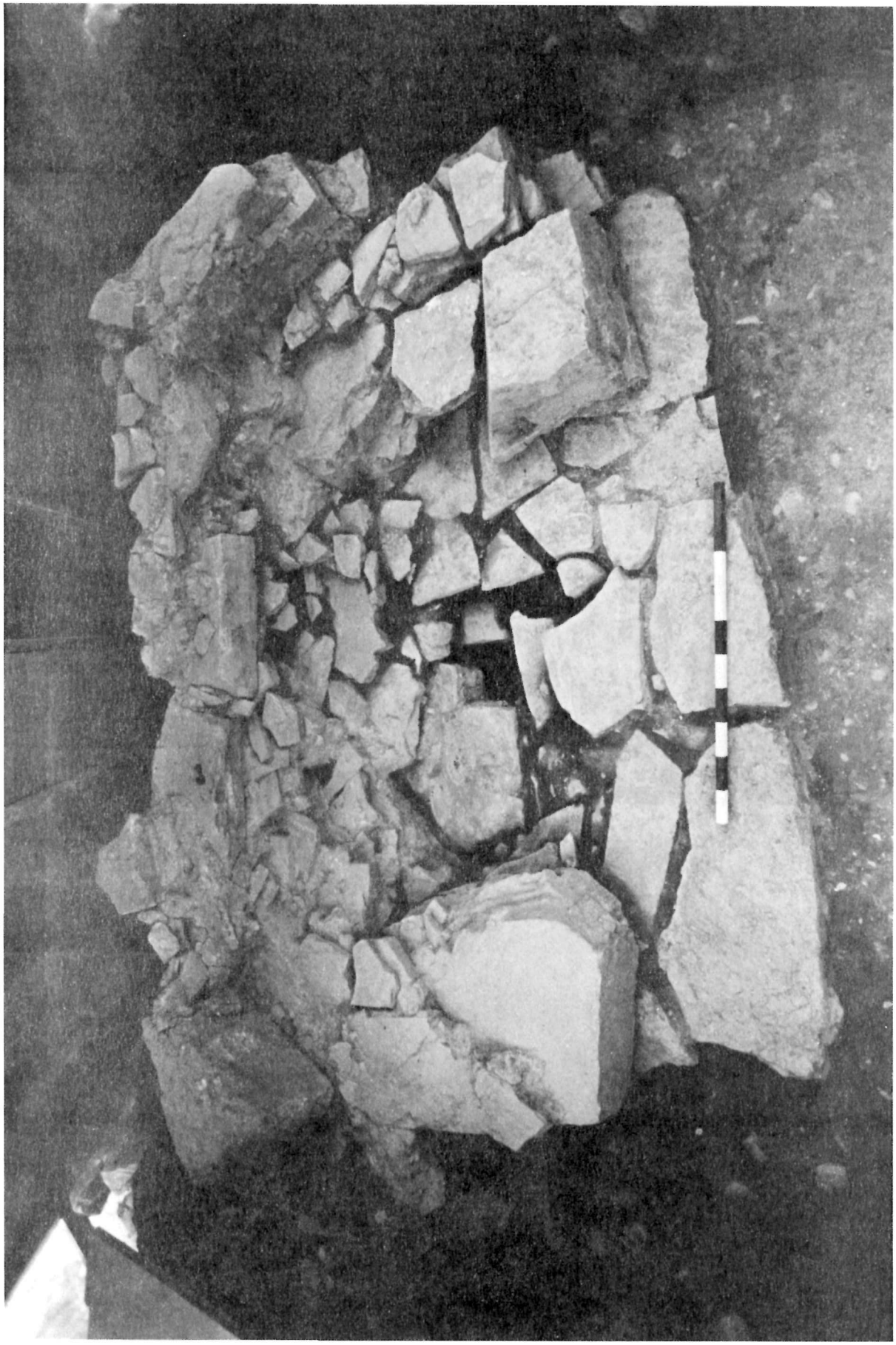


Figure 23

Detailed view of pivot hole. (scale: 0.50 meter)

Figure 24

Detail view of the granite racer and its foundation. Note the drafted, smooth surface of the granite and then the undrafted balance of the granite. Also note the drill holes for the splitting wedges. (scale: 1.0 meter)

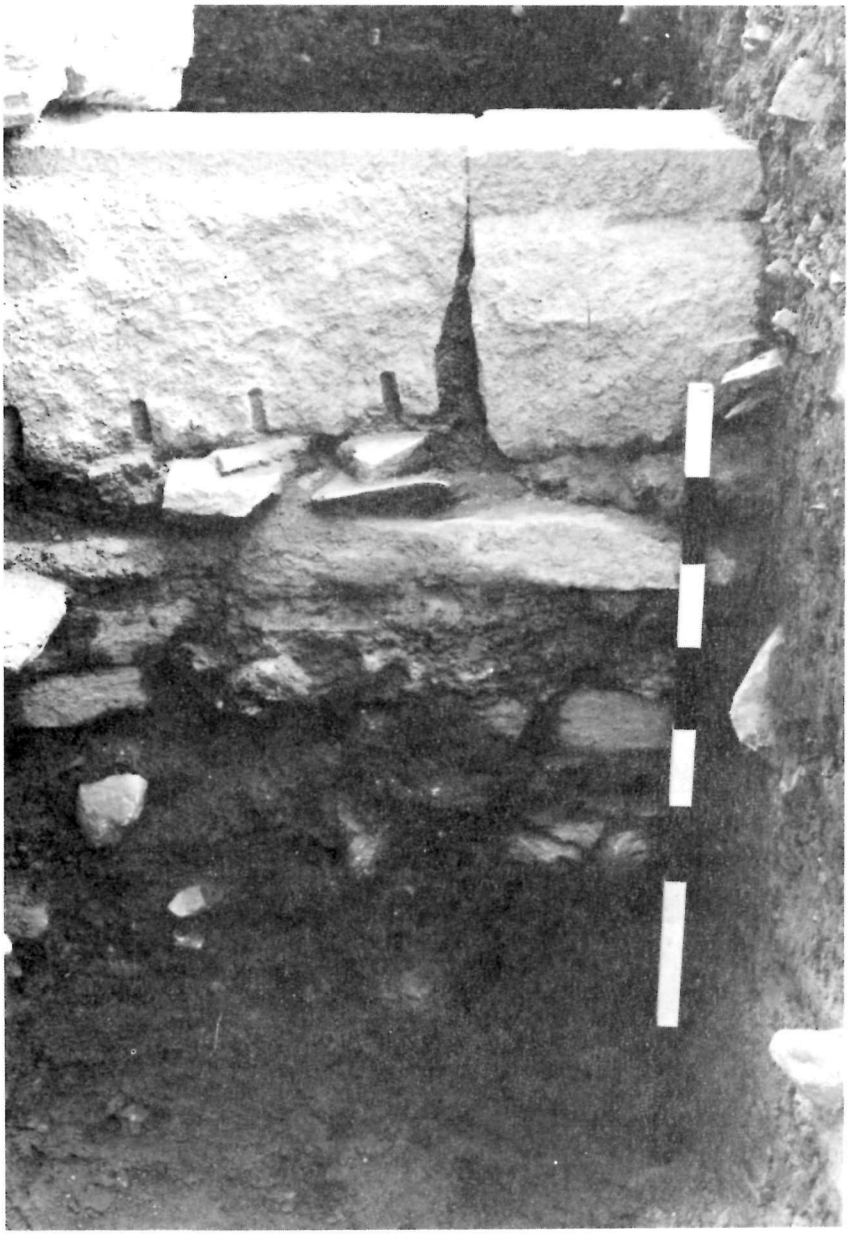


Figure 25

Detail view of lead covering the cramp joining the granite segments of the racer. (scale: 0.50 meter)

Figure 26

Composite cross section with hypothetical genouillère, terreplein and sole ground levels.

a. ironstone and mortar foundation of pivot area
b. ironstone and mortar foundation of racer
c. granite racer
d. unexcavated area
e. cast iron pivot
f. granite - pivot area
g. granite - genouillère area
h. level of sole
i. terreplein ground level

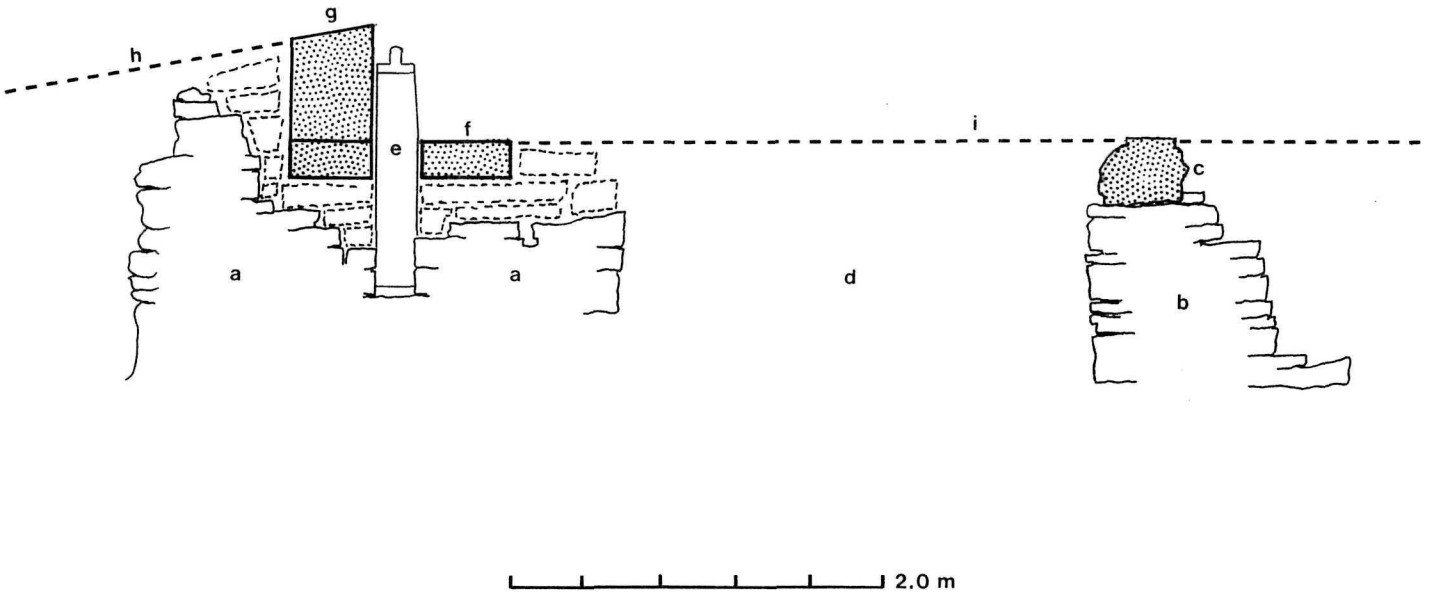

g
h
f
e
i
c
a
a
d
b
2.0 m

Figure 27

1846 plan of racer for an eight inch smooth bore muzzle loading emplacement.

Source: Public Record Office

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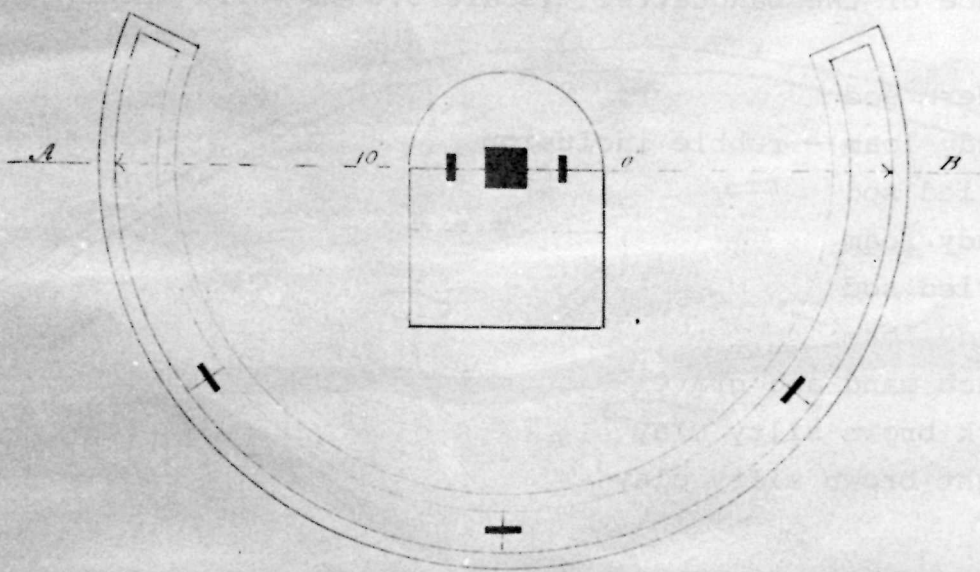
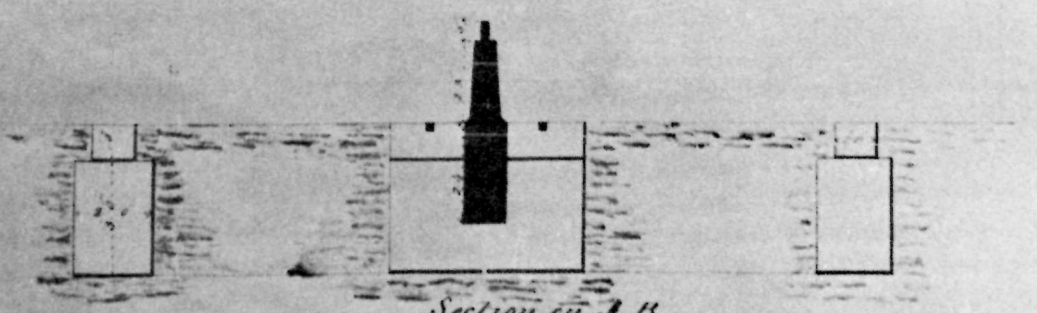
Plan and Section of Proposed
Curbs for Traversing Platform
To accompany the Supplementary
Estimate dated 31st March 1846

Halifax
Citadel Nova Scotia



Plan



Section on A B

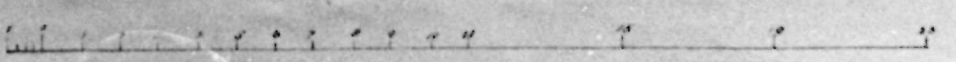
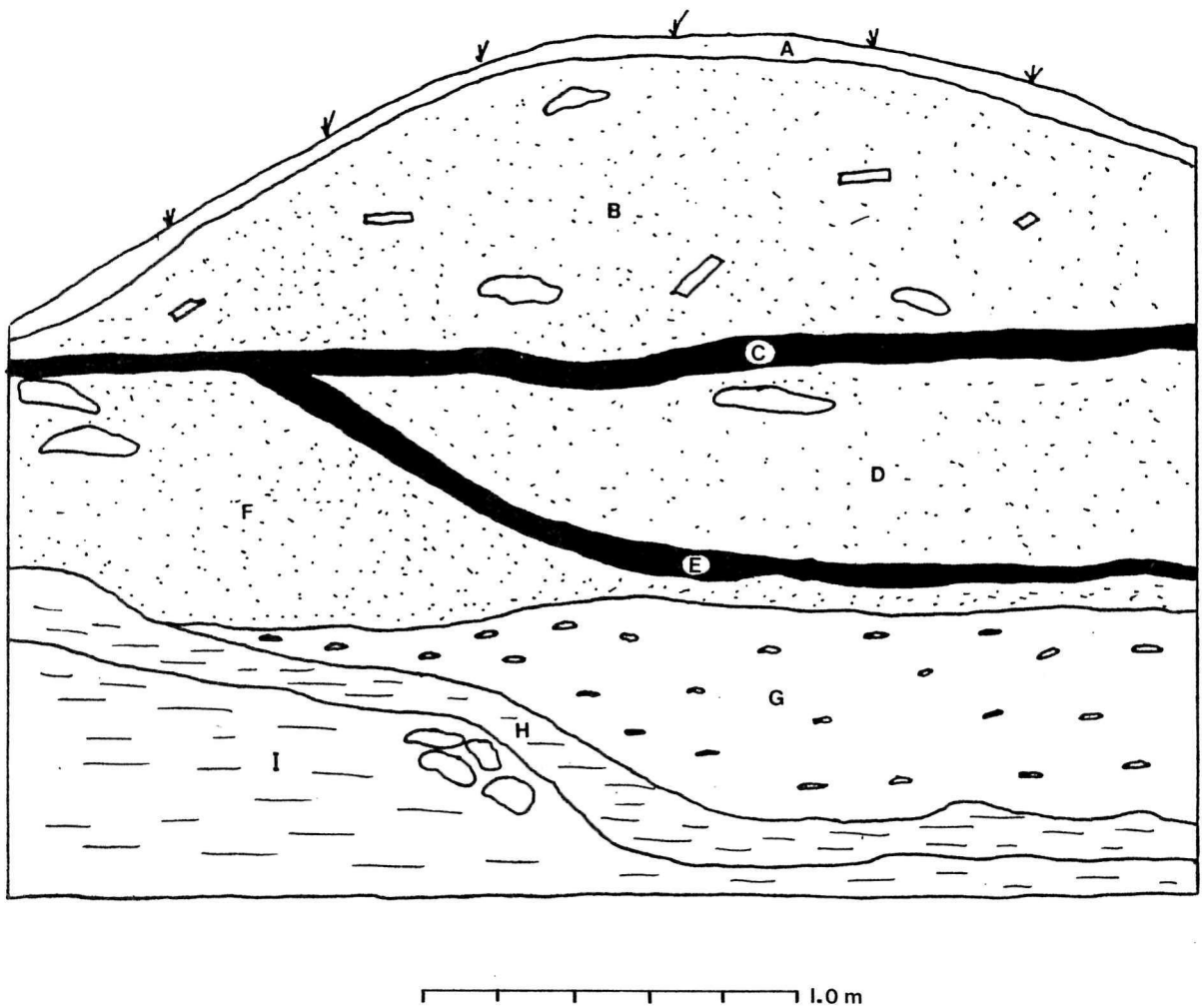


Figure 28

Soil profile illustrating strata of clay indicating the presence of the banquette. (scale 5.0 cm = 1.0 meter)

a. modern sod
b. sandy loam - rubble inclusion
c. buried sod
d. sandy loam
e. buried sod
f. sandy loam
g. beach sand and gravel - ungraded
h. dark brown silty clay
i. light brown silty clay


A
B
C
D
E
F
G
H
I
1.0 m