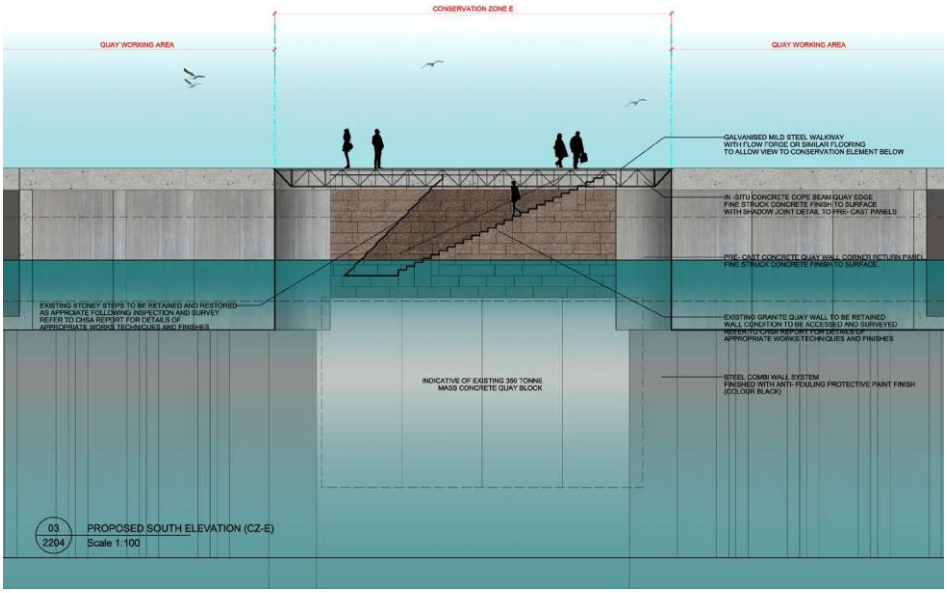
SOUTHGATE

ASSOCIATES

CONSERVATION STRATEGY AND INDUSTRIAL HERITAGE APPRAISAL

OF

ALEXANDRA BASIN



FOR DUBLIN PORT COMPANY

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1 INTRODUCTION & SUMMARY

1.0 Brief

Southgate and Associates were appointed by Dublin Port Company (DPC) to provide a Conservation Strategy and Industrial Heritage Appraisal Report to assess the potential impacts of a proposed redevelopment of Alexandra Basin West in Dublin Port.

This appraisal has been conducted in accordance with the ICOMOS[1]– TICCIH[2] Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes which states as follows (The Dublin Principles – Section I –Article 1):-

> **I - Document and understand industrial heritage structures, sites, areas and landscapes and their values**
>
> *. Researching and documenting industrial structures, sites, landscapes and the related machinery, equipment, records or intangible aspects is essential to their identification, conservation, and the appreciation of their heritage significance and value. Human skills and knowledge involved in old industrial processes are a critically important resource in conservation and must be considered in the heritage evaluation process.*

Dr Colin Rynne of the Department of Archaeology in UCC was engaged by Southgate Associates to assist in the preparation of this Strategy and Report. Dr Rynne is a specialist in industrial archaeology and is the author of *Industrial Ireland 1750-1930 an Archaeology. The Collins Press.*

The aims of the strategy and report are:

- To record all surviving features of archaeological, techno-historical and architectural significance of Alexandra Basin West;
- To appraise and evaluate the heritage significance (in particular industrial archaeological) of Alexandra Basin West;
- To identify immediate conservation priorities (as deemed appropriate) and develop a coherent conservation strategy; and
- To make recommendations to DPC on the implementation of a cultural heritage strategy for Alexandra Basin West with special reference to the interpretation of the cultural heritage of the Port and the creation of additional public realm linked to interpretation and access to surviving features of port infrastructure of cultural heritage significance;

1.1 Introduction

As part of our work, a *level-two* industrial archaeological inventory of the historic docklands landscape in the area of Alexandra Basin West in Dublin Port was conducted by the Historic Building Survey Unit, Department of Archaeology, University College Cork and is included in Chapter 12 of the EIS. The primary aim of this inventory is to enhance the present understanding of the industrial

[1] International Council on Monuments and Sites

[2] The International Committee for the Conservation of the Industrial Heritage

archaeological importance of the Alexandra Basin West, with the results of this survey intended to inform the EIS and overall conservation strategy for an *historic place*, as defined by the Burra Charter[3].

1.2 Legislative and institutional context

The principal Irish legislation, international charters, local development plans and guidelines relating to the protection, recording and enhancement of archaeology and the historic built environment in general may be summarised as follows:

Irish legislation

- National Monuments Act 1930-2004 (amended)
- Heritage Act, 1995
- National Cultural Institutions Act, 1997 (amended)
- Planning and Development Acts 2000-2013
- Architectural Heritage and Historic Properties Act, 1999

International Charters and Conventions

- Granada Convention on the Protection of the Architectural Heritage of Europe, 1985
- Valetta Convention on the Protection of the Archaeological Heritage, 1992
- Joint ICOMOS-TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes (The Dublin Principles), 2011
- The Burra Charter for Places of Cultural Significance, 1999
- The International Council on Monuments and Sites (ICOMOS), advisory body to UNESCO concerning protection of sites and recommendation, 1992

[3] The Burra Charter was adopted by Australia ICOMOS in 1979 and most recently updated in 2013. It defines the basic principles and procedures to be followed in the conservation of Australian heritage places.

Local Authority Development Plans & Other Plans

- Dublin City Heritage Plan 2002-2006 (2002)
- Dublin City Council Development Plan 2011 – 2017
- Dublin Port Company Masterplan, 2012 – 2040
- Dublin Docklands Area Master Plan, 2008

Heritage Plans & Guidelines

- The National Heritage Plan (2002)
- Office of Public Works Statement of Strategy, 2005-2008
- Guidelines on the information to the contained in Environmental Impact Statements, 2002
- Advice notes on Current Practice (in the preparation of Environmental Impact Statements), 2003
- Architectural Heritage Protection: Guidelines for Planning Authorities, 2011
- The Framework and Principles for the Protection of the Archaeological Heritage, 1999

1.3 Assessment methodology

The overview and archaeological evaluation of the site that follows was preceded by a desk-based assessment. Its primary aims are fivefold:

- To record all surviving features of archaeological, techno-historical and architectural significance;
- To appraise and evaluate its industrial archaeological/architectural/techno-historical significance, and to identify immediate conservation priorities (as deemed appropriate).
- To provide an archaeological inventory of the features identified within the assessment area
- To assess the impact of the proposed scheme
- To propose mitigation measures

The principal sources consulted were as follows:

- Record of Monuments and Places (RMP)
- Sites and Monuments Record

- National Museum of Ireland (NMI) Topographical files
- The Irish Railway Record Society Archive, Heuston Station
- The Dublin City Industrial Heritage Record
- The Dublin Docklands Architectural Survey
- Historic map collections
- Historic photographic collections
- Primary written sources such as the Griffith Valuation House books for the survey area in the National Archives, Dublin
- Secondary sources (e.g. archaeological and architectural journals).
- www.excavations.ie

1.4 Previous archaeological research in the study area

Recorded Archaeological Monuments and Places: There are no recorded monuments in the RMP or in the Dublin City Record of Protected Structures within the study area. There are no recorded finds from the study area in the NMI topographical files, nor have any test excavations been conducted within the area under assessment here. In 2013, an extensive *Cultural Heritage Environmental Report, for the proposed Alexandra Basin Redevelopment, North Wall Quay Extension*, was undertaken by Magnus Archaeology for DPC.

1.5 Protection status and significance of the structures

North Wall Quay, which is outside the study area, is identified as a Protected Structure (RPS 5835).

North Wall Quay Extension, which is within the study area, is not a protected structure.

Owing to a general lack of both documentary evidence and thematic archaeological surveys, the manner in which the importance of pre- AD 1700 archaeological sites in a small study area are assessed can often be a subjective process. In the period from about 1800 to the present, however, sites of monument value/importance can be more readily assessed, based on the increasing availability of written sources such as business records, correspondence, newspaper accounts and pre- and ordnance survey cartographic sources.

Other factors such as *rarity*, *group value*, *condition* and *historic, cultural or scientific association*s are also important. Table 1 below shows the designations of significance and types of mitigation considered in this report.

International significance (protected structure)	National significance (protected structure)	Regional significance (unprotected)	Local significance or Not rated
To be avoided	***To be avoided***	***Avoidance recommended***	***Avoidance unnecessary***

Table 1 Assessment of significance and expected type of mitigation

After a full consideration of the available evidence for the structures and features to be directly impacted upon by the proposed development, the assessment of their significance is summarised in Table 2 and the locations of the referenced sites is shown in Figure 1. None of the structures are rated and the following ratings are the opinion of Southgate Associates with advice from Dr Colin Rynne.

SITE NO.	NGR	SITE	DESCRIPTION	CONSTRUCTION PERIOD	SIGNIFICANCE
DP.01	718451 734367	North Wall Quay Extension	Quayside constructed with mass concrete block system developed by Bindon Blood Stoney	1869-1884	Not rated but construction technology considered by Dr Colin Rynne to be international
DP.02	718587 734388	Goods transit shed No. 3 ('Island Shed'), North Wall Quay Extension	No visible remains but foundations likely to survive under present surface	19th century	Not rated
DP.03	718536 734581	Goods transit shed No. 1 ('Island Shed'), North Wall Quay Extension	No visible remains but foundations likely to survive under present surface	19th century	Not rated
DP.04	718691 734362	Goods transit shed No. 2 ('Island Shed'), North Wall Quay Extension	No visible remains but foundations likely to survive under present surface	19th century	Not rated
DP.05	718752 734319	North Wall Light	Light house in steel, riveted sections (replaces earlier light of 1809)	1906, moved to present position c. 1937	Not rated but considered Regional
DP.06	718072 734613	Crossberth Quay	Constructed by Bindon Blood Stoney	1885	Not rated but considered Regional

SITE NO.	NGR	SITE	DESCRIPTION	CONSTRUCTION PERIOD	SIGNIFICANCE
DP.07	718595 743658	Alexandra Wharf	Originally constructed for Anglo-American Oil Co.	1889	Not rated
DP.08	718316 734789	Graving Dock No. 1	Constructed by Bindon Blood Stoney	1860	Not rated but considered National
DP.09	718336 734733	'Pump House' (Graving Dock No. 1)	Single storey, two room brick engine house	1900s	Not rated but considered Regional
DP.10	718370 734789	Graving Dock No. 2		1951-59	Not rated but considered Regional
DP.11	718343 734589	Lead-in jetty		1950s	Not rated
DP.12	718605 734671	Alexandra Quay West	Quay constructed with Joseph Mallagh's concrete caissons	1921-32	Not rated but construction technology considered by Dr Colin Rynne to be international
DP.13	718460 734556	Goulding's (Tara Mines) Jetty		1969-67	Not rated
DP.14	718500 734550	P&O Ramp No. 4		1970s	Not rated
DP.15	718091 734448	P&O Head Offices		1970s	Not rated
DP.16	718139 734423	P&O Terminal Building		1970s	Not rated
DP.17	718080 734553	VMU Building		1970s	Not rated
DP.18	718066 734578	Control building (P&O)		1970s	Not rated
DP.19	718307 734878	Store, Graving Dock 2		1960s	Not rated
DP. 20	n/a	Crane (Stothert & Pitt)		1970s	Not rated
DP. 21	n/a	Crane (Arroll, Glasgow)		1956	Not rated but considered Regional

Table 2 Assessment of significance of structures and features within study area

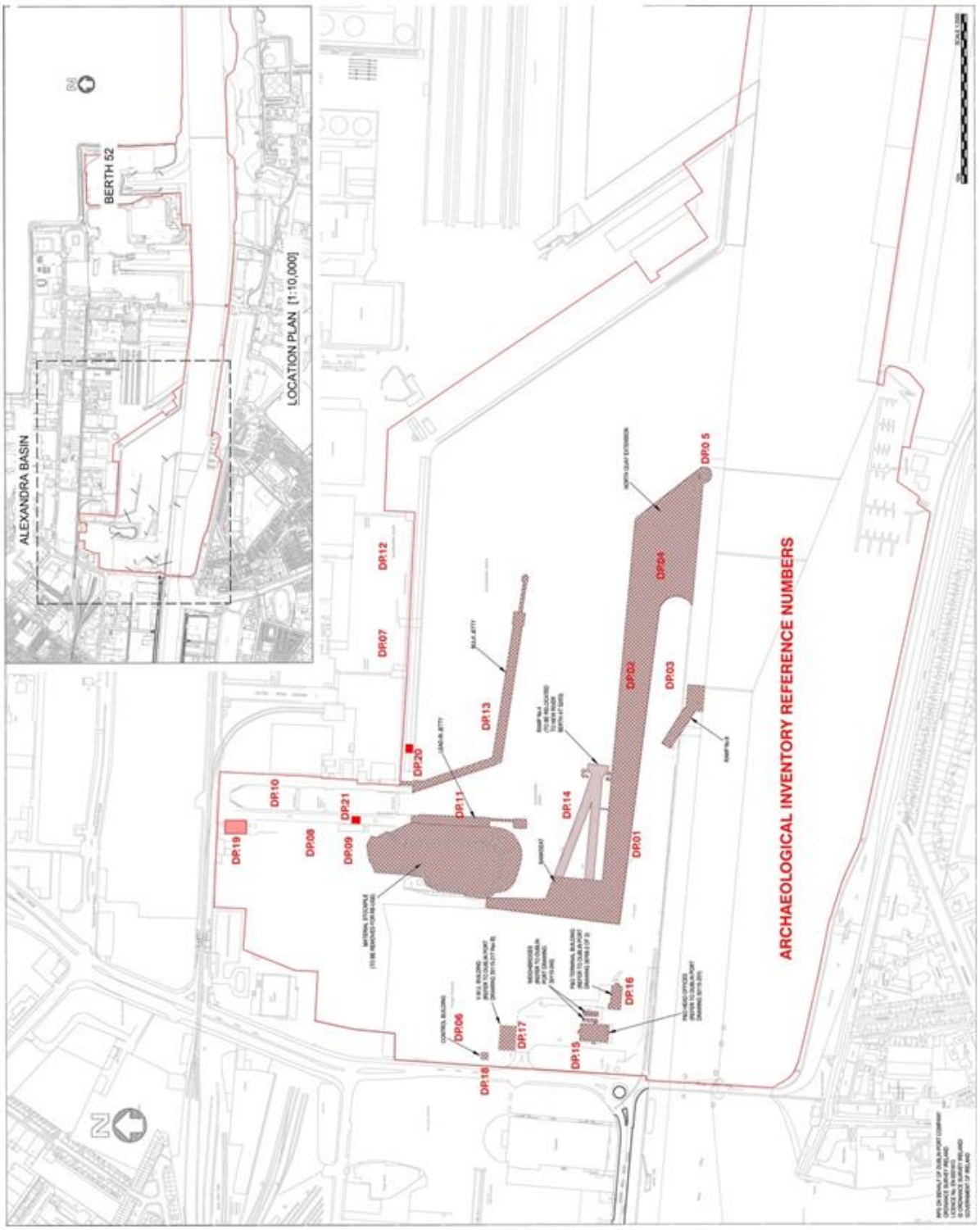


Figure 1 Location of archaeological inventory sites

1.6 Threats to significance

1. Cultural Significance

Dublin Port was systematically developed in the Victorian era to be a deep water port and much of its cultural importance derives from this. However, the increasing size of ships means that this cultural significance could be lost in the future if Dublin Port is unable to adapt to continue to operate as a deep water port. The Port would become less relevant to the needs of the city. The cultural significance of Dublin Port as a deep water port is threatened by the lack of ability to berth deep water vessels.

2. Development

Modern development that is insensitive to the age, character or significance (architectural, cultural, heritage or otherwise) of historic structures or settings, or the removal of features that define the character of an industrial archaeological heritage and development involving intervention which is not mitigated may be a threat to the significance of an industrial archaeological complex.

The following area of development will receive special attention to ensure that intervention is appropriately mitigated both in the design, construction and subsequent operational phases.

SITE NO.	NGR	SITE	DESCRIPTION	CONSTRUCTION PERIOD	SIGNIFICANCE
DP.01	718451, 734367	North Wall Quay Extension	Quayside constructed with mass concrete block system developed by Bindon Blood Stoney	1869-1884	Not rated but construction technology considered by Dr Colin Rynne to be international

3. Decay

Decay issues often involved with historic buildings (including timber dampness and masonry problems, such as cracking etc. caused by damp or inappropriate repairs and modifications).

The action of salt water on masonry in wetting and drying conditions can cause decay.

Iron components need special care and attention to ensure correct corrosion treatment.

Care needs to be taken during construction to ensure consequences of vibration are mitigated.

The following area of development which will receive special attention to ensure that deterioration is appropriately mitigated:-

SITE NO.	NGR	SITE	DESCRIPTION	CONSTRUCTION PERIOD	SIGNIFICANCE
DP.09	718336, 734733	'Pump House' (Graving Dock No. 1)	Single storey, two room brick engine house	1900s	Not rated but considered Regional

Further methodologies for mitigation are discussed in EIS- Chapter 12 -Residual impacts

1.7 Dublin Port Company's requirements for the development of an industrial heritage conservation strategy

In its Masterplan 2012 to 2040, Dublin Port Company set an explicit objective of trying to re-integrate the port with the city.

This objective stems from recognition across Europe that many ports have lost the support of the cities they had grown up with and had spawned. This loss of support and connection left the ports increasingly remote and detached from the urban areas that they helped to create.

DPC is keen to ensure that the requirement to facilitate the future expansion of Dublin Port respects the cultural significance of Dublin Port as a Deep Water Port (see Appendix 3).

The determination of cultural significance is guided by the Burra Charter (Articles 1.2, 1.4, 2.1, 2.2 and 3.1):-

1.2 *Cultural significance* means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.

1.4 *Conservation* means all the processes of looking after a *place* so as to retain its *cultural significance*.

2.1 *Places* of *cultural significance* should be conserved.

2.2 The aim of *conservation* is to retain the *cultural significance* of a *place*.

3.1 *Conservation* is based on a respect for the existing *fabric, use, associations* and *meanings.* It requires a cautious approach of changing as much as necessary but as little as possible.

There is also an appreciation within DPC that the port has a long history which has generated a rich resource of industrial heritage.

Against this background, DPC wishes to ensure that in re-engineering a substantial amount of old infrastructure which is still used for modern day port purposes, particularly from the late Victorian era, the industrial heritage of what is being redeveloped and renewed is respected and preserved appropriately and consistent with the need to expand the capacity of the Port. In Alexandra Basin West part of the existing port infrastructure consists of assets that were developed during the late

Victorian period, and which have been modified and adapted through the installation of more recent interventions to facilitate the safe berthing and loading/discharge of cargo from modern vessels. These assets are at the limit for their operational function and require renewal and reconfiguration as a key part of a busy and dynamic working deep water port. In particular the berths on the quayside directly adjacent to the channel need to be dredged to a depth that can safely accommodate modern vessels. For North Wall Quay Extension, the required berthing depths cannot be achieved in the current structure as they would undermine the structure. Consequently this structure requires re-engineering given its pivotal position at a central part of the deep water port. In addition, the current length of North Wall Quay Extension is suboptimal for the berthing and safe navigation of larger modern day vessels on the quay and within Alexandra Basin West and needs to be reconfigured to take account of these changes.

1.8 Summary

In the context of the operational role played by the deep water facility at Alexandra Basin West, DPC wishes to undertake the sustainable development of the facility to meet current requirements. As indicated above, this was found to require significant interventions to the North Wall Quay Extension. Dublin Port Company has requested that such interventions are carried out in a way that accords with best practice in conservation and preserve the cultural significance of Dublin Port as a functioning deep water Port.

For North Wall Quay Extension, given the berthing depths required and turning circle required by modern vessels, this approach is best secured through the retention of a 560m length of the original quay behind a new quay wall built to support deeper berths and the demolition of a further 690m length on the end and inside of the basin. These constraints are explained further in Section 5 below.

A detailed Historical analysis by Magnus Archaeology (Appendix3) and by ADCO Ltd (Chapter 12 of the EIS) together with an Industrial Assessment by Dr Colin Rynne of UCC Archaeology Department have informed the development a conservation strategy for the project.

A core part of the Conservation Strategy is the development and opening to the public of a number of conservation zones around Alexandra Basin. For instance, as part of the Conservation Strategy it is proposed that the new quay is penetrated by six conservation zones which not only relieve the horizontal proportioning of the new quay but also show the existing quay wall features (including mooring rings and steps) allowing the original wall to be legible. The policy of legibility is continued across the surface finishes of the quay.

As part of DPC's commitment to reintegrating the Port with the City and providing access to aspects of the Port that are part of the Port's cultural heritage , Southgate Associates have also coordinated with MOLA Architects to design two interpretive zones at each end of the quay, which will be open for controlled public access.

The first such zone on North Wall Quay Extension is a public interpretation area for the foundation blocks used by Stoney in the original construction of the Quay (Interpretation Zone 1). This will

involve raising a 350 tone block onto the Western end of the quay augmented by a contemporary design by MOLA Architecture. Details of this design appear in the appended report by MOLA Architecture (*Conservation Strategy for the Alexandra Basin Redevelopment project – The Design Framework*).

The first zone is linked to a second interpretative area (Interpretation Zone 2) around the repositioned lighthouse at the eastern end of the new quay with controlled public access.

There are two other conservation zones:

- Firstly, there is the opening of Graving dock No 1 and the conservation of the Pump House (Conservation Zone G)
- Secondly there is the conservation of an area along the Western wall (Conservation Zone H) preserving the original quay wall and Entrance Gates.

The locations of these zones areas are shown Figure 2.

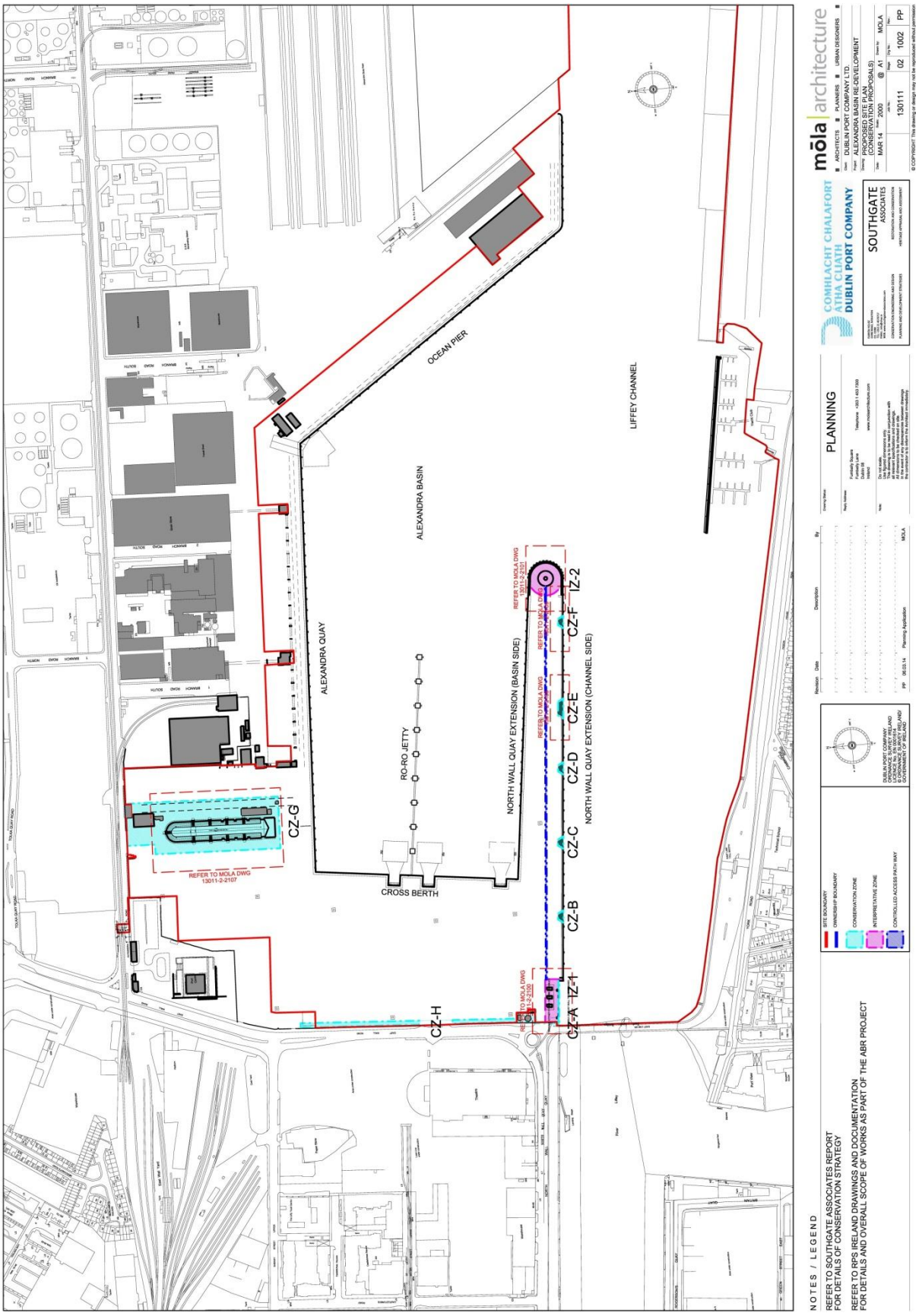


FIGURE 2 LOCATIONS OF CONSERVATION AND INTERPRETATION ZONES

The scheme involves the retention and conservation of structures of regional significance including cranes and capstans associated with Graving Dock No 2 (Figure 1)

The development involves a high quality reconstruction of the end of North Wall Quay Extension to include the relocation of the 1902 lighthouse on original granite plinth with a new curved granite wall protruding above fenders on the eastern quay end (Interpretation Zone 2).

The major intervention of dismantling over half of the original North Wall Quay Extension is necessitated for Dublin Port Company's operational programme as explained above and is being carried out in line with best conservation principles and is mitigated by the following conservation strategy which has been designed with due regard to the recent ICOMOS "Dublin Principles":-

- Best practice recording using 3D laser technology and supervised by Dr Colin Rynne
- A policy of penetration by conservation zones ensuring legibility of the original construction
- Mitigation measures for interpreting the achievement in the original design and construction through an architecturally innovative interpretation scheme in the Public Realm area
- The retention and management of a considerable quantity of 19th century durable granite blocks which will become available following the engineering works. These blocks will be retained and storage for suitable re-use in accordance with the advice of the relevant statutory conservation authorities.

2 HISTORICAL CHRONOLOGY OF ALEXANDRA BASIN

The following is a list of key dates associated with the construction of Alexandra Basin West taken from section 6.3 of "Cultural Heritage Environmental Report- Magnus Archaeology". The full text is included in Appendix 3.

- North Wall Lighthouse, 1809
- Graving 'Patent Slip' No.1, 1826
- Graving 'Patent Slip' No.2, 1832
- North Wall 'Graving Frame', 1835
- North Wall Basin, 1836-1840
- Timber (Steam Packet) Wharf, 1836
- Eastern Breakwater (Tolka Quay), 1858-1884
- Breakwater Road, 1826-1860
- Stone lined graving dock 1860 Graving dock No 1
- Deep Water Port of Dublin, 1861-1862
- North Wall Quays Rebuilding, 1864-1907
- North Wall Quay Extension, 1869 – 1884
    - Stoney's Shears Float
    - Stoney's Diving Bell & Float
- Crossberth Quay, 1885
- Alexandra Wharf, 1899
- Dublin Deep Water Port Boundary Wall, 1892
- Dockyard Improvements, 1901
- Graving dock NO 2 (1951-1959)
- North Wall Quay Extension 100-Ton Electric Crane, 1904-1986
- Electric 4-ton Cranes & Electric Lighting, 1904
- Crossberth Generating Station, 1905 - 1977

3 THE INDUSTRIAL ARCHAEOLOGICAL ENVIRONMENT

Source Dr Colin Rynne Industrial Archaeologist (See also Chapter 12 of EIS) Department of Archaeology, UCC

Summary

The physical development of the north Dublin city docklands in general mirrors that of other important European ports in the eighteenth and nineteenth centuries. Almost invariably, port facilities were expanded upstream from a medieval core, to accommodate both a growing demand for additional quay space and the need for specialised berths, such as oil terminals, roll on roll off facilities and later, in 1960s, standard size 'inter modal' container terminals. Indeed, as in Dublin's Alexandra Basin, the need for additional berths led to construction of branch docks at right angles to main basin. Similar trends were in evidence in English ports, such as at Huskisson Dock and Langton to Alexandra group of docks at Liverpool in 1860s and 1870s, and also at Tilbury dock on lower Thames in 1884. In Dublin, these were increasingly built downstream as size of ships increases, and its scale of operations and expansion can be paralleled with Liverpool and London docks.

Throughout the eighteenth century the engineering problems presented by the material deposited by the Liffey, Tolka and Dodder rivers (which formed two large sand banks, known as the North and South Bulls), was one of the greatest threats to the long term development of the port of Dublin. In the long term, if not properly dealt with, this would continue to create problems for shipping. Only with the construction the North Bull Wall, between 1820 and 1825, was this problem properly addressed.

Nonetheless, the costs of preparing quay walls below water could be prohibitive. Yet, in 1863, the engineer of Dublin port, Bindon Blood Stoney, undertook a series of tests which established that concrete was actually some 50% cheaper, and he proposed to manufacture monolithic blocks of concrete, up to 350 tons in weight, which would be laid on the river bed as the foundations of quay walls.

Yet for all that, Stoney’s scheme to provide new quay walls on the north side of the estuary of the River Liffey was novel in its execution. The conventional method of laying the foundations of quay walls involved the construction of expensive coffer dams, which were continually pumped dry to facilitate building work. However, in Stoney’s scheme, the foundations for the concrete monoliths were first excavated by a dredger, while the final levelling off work was carried out on the river bed by men working within a massive diving bell, supplied with compressed air. The enormous concrete blocks, which were fabricated nearby, were lifted by a floating crane (or 'shears') and the first block was lowered into position in 1871. Stoney’s method proved to be both expeditious and cheap, and by 1882, over 2,000 ft (609.6 m) of new quay wall, with a depth of 22 ft (6.70 m), had been laid by this means. This was the first of a series of innovations which brought the Port of Dublin to the forefront of dock and harbour design.

4 EVALUATION OF CULTURAL HERITAGE, POTENTIAL IMPACTS AND MITIGATION MEASURES

4.1 Description of construction and impacts

The proposed development at Alexandra Basin West will involve the following works:

- The infilling of Graving Dock No. 2 having an area of 6,055 sq m.
- The excavation and restoration of historic graving dock No. 1 together with the restoration of the associated pump house and lighting *standard* in conservation zone G
- The removal of an area of infill material of c. 9,000 sq m within Alexandra Basin
- The relocation of the ore concentrates loading system within Alexandra Basin
- The relocation of double deck ramp No 4 to the proposed new river berth at existing Berths Nos. 52 and 53

The demolition and removal of

- The bulk jetty and grain conveyor having an area of c. 3,200 sq m.
- 4 no. buildings housing offices, terminal, control and V.M.U. functions having a total area of c. 1,200 sq m. together with a warehouse/workshop at the North end of Graving dock No 1
- A floating ramp on the Liffey side
- A lead-in jetty within the Basin
- Part of North Wall Quay Extension to the north and east having a total area of c. 21,700 sq m.

The proposed demolitions are shown in Figure 3.

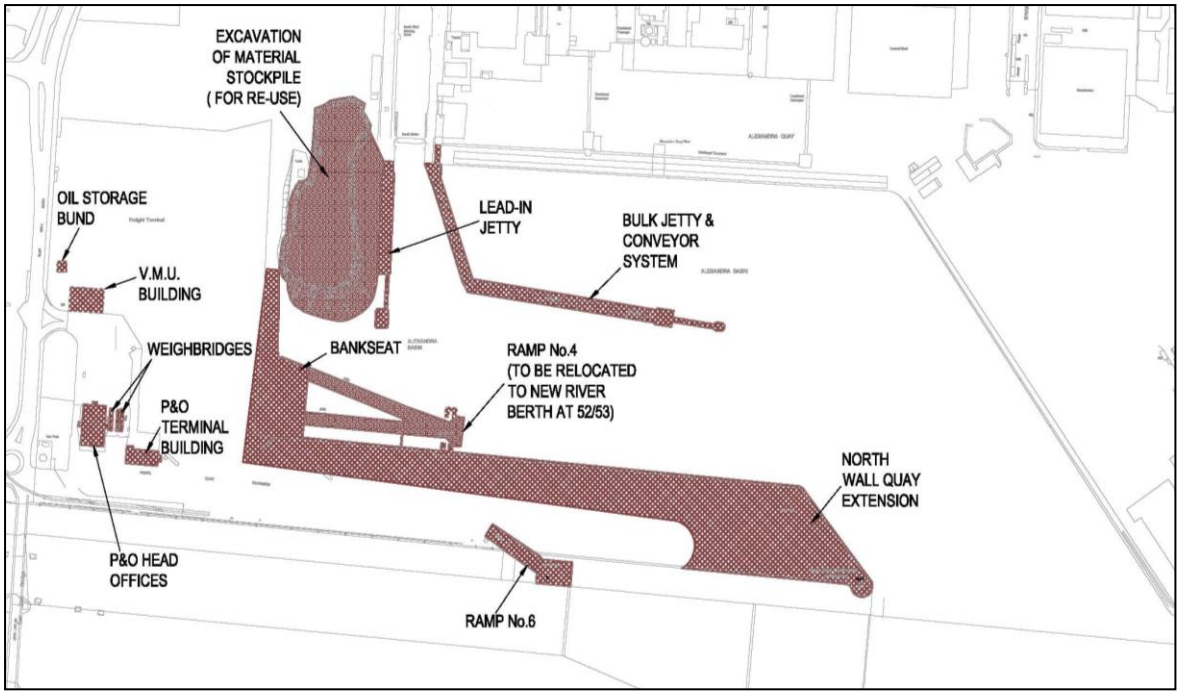


FIGURE 3 DEMOLITIONS AND EXCAVATIONS PROPOSED IN ALEXANDRA BASIN WEST

The construction of:-

- New quay walls at North Wall Quay Extension of circa 910 metres with the conservation of the remainder of the quay behind the new quay walls. The quay walls to the Liffey frontage to be built in sections with the existing quay wall exposed in six zones for conservation purposes in conservation zones A to F as indicated in Figure 2.
- An extension of Alexandra Quay of circa 145m in length.
- A reconfigured rounded quay end in Interpretive Zone 2 using salvaged stone material from the existing quay
- Interpretive glass pavilions in interpretive zone 1having an area of c. 36 sq m. on the west of the reconfigured North Wall Quay Extension and the reconstruction and presentation of a salvaged historic concrete caisson from the existing quay
- 300 m long Ro-Ro jetty and provision of 3 no. Ro-Ro ramps
- The taking down of the existing lighthouse and its reconstruction in interpretive zone 2 at the end of the newly configured North Wall Quay Extension
- Rebuilding of existing quay walls in the remainder of Alexandra Basin West having an aggregate length of c. 1,220 m.

- The provision of Conservation Zone H involving the conservation of the western iron gates, boundary wall, the original quay wall together with the hexagonal entrance building to the tunnel.

4.2 Proposed mitigations of impacts

These are outlined in Chapter 12 of the EIS.

The general conservation principles and methodology proposed is in accordance the ICOMOS – TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes which states as follows:-

> ***III - Conserve and maintain the industrial heritage structures, sites, areas and landscapes***
>
> *12 In case of prospective redundancy, decommissioning, and / or adaptation of industrial heritage sites or structures, the processes should be recorded including, for example, where components have to be demolished and machinery has to be removed. Their material form as well as their functioning and location as part of the industrial processes should be exhaustively documented. Oral and / or written stories of people connected with work processes should also be collected.*

4.3 An integrated conservation strategy for Alexandra Basin

To this end a conservation strategy, utilising policies based on ICOMOS Dublin Principles (2011/12), was formulated. This has led to:

- The introduction of Conservation Zones (Steps, Conserved Quay Walls and Mooring Rings, Conserved Quay Wall Elements)
- The restoration of Graving Dock No. 1 and the Pump House
- Retention of the entrance Gates, western wall and original quay wall

These are discussed in detail in **Section 5.0.**

5 CONSTRAINTS

It was decided by DPC to retain the following historic structures on the site, all of which are of regional significance.

This includes the following:-

- Lighthouse
- Pump house and lighting standard
- Graving Dock No 1 including careful excavation and restoration
- Original quay wall along Western boundary and Western stone wall boundary
- Entrance Gates
- Two cranes dating from 1956 and 1970
- Two steam capstans (powered by electricity) c 1958 to be relocated
- The quay constructed with Joseph Mallagh's concrete caissons is to be conserved in a manner that is reversible behind the new quay wall

The most relevant structure of significance identified in the statement of significance is:-

North Wall Quay Extension

SITE NO.	NGR	SITE	DESCRIPTION	CONSTRUCTION PERIOD	SIGNIFICANCE
DP.01	718451, 734367	North Wall Quay Extension	Quayside constructed with mass concrete block system developed by Bindon Blood Stoney	1869-1884	Not rated but construction technology considered by Dr Colin Rynne to be international

Careful consideration to international best conservation practice has been considered in order to provide a balanced conservation policy for the North Wall Quay Extension in light of the client's operational requirements.

Results of a navigation simulation in the National Maritime College of Ireland on 11th November 2013 resulted in the client having to factor in some significant changes to the existing configuration of North Wall Quay Extension given the operational requirements necessitated by changes in shipping.

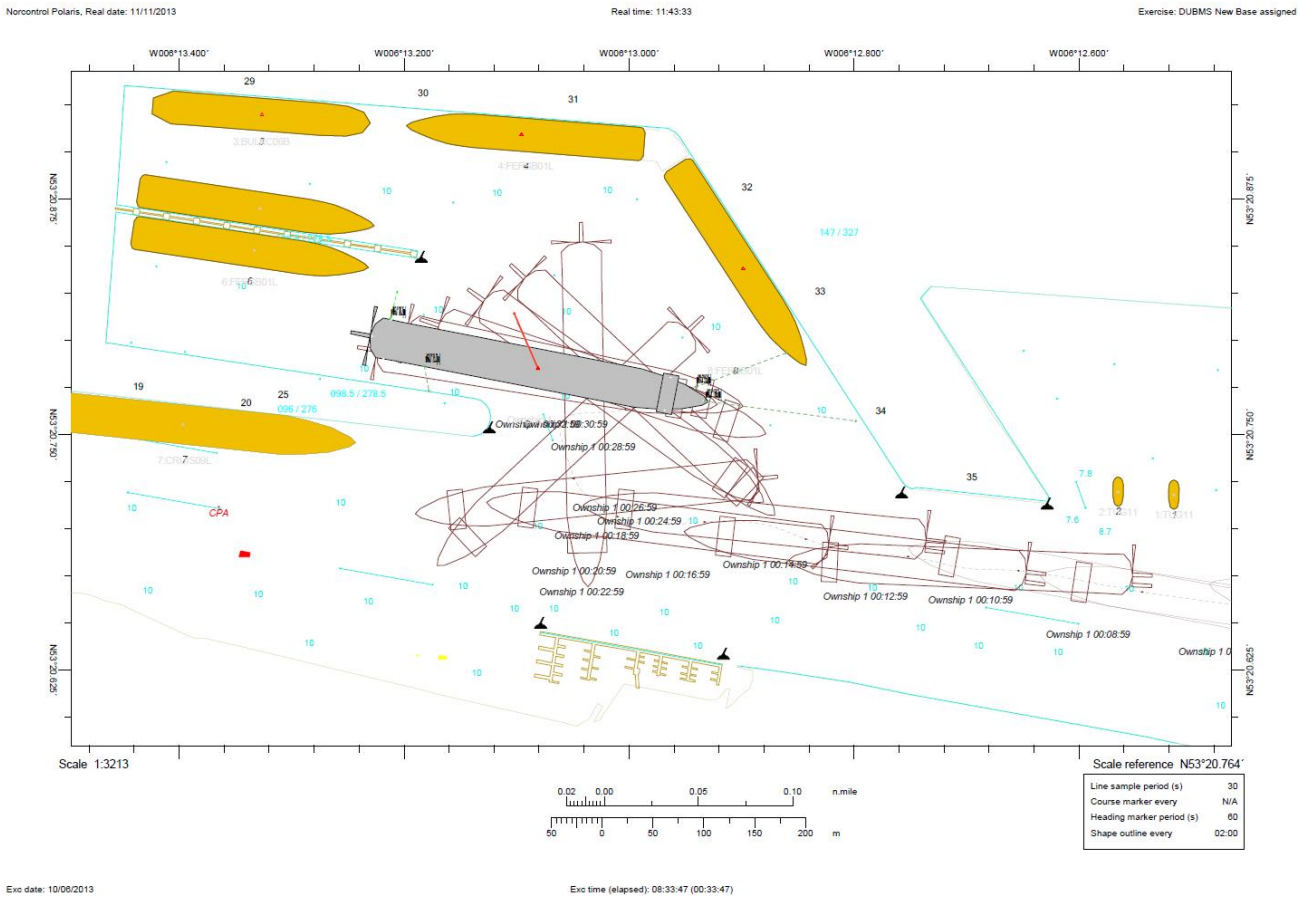


FIGURE 4 SAMPLE OUTPUT FROM THE NAVIGATION SIMULATION STUDY

In order to preserve the cultural significance of Dublin Port as a Deep Water Port and to allow for its sustainable development, a substantial area of the North Wall Quay extension has to be demolished reconfigured as shown in Figure 3.

In particular the simulation exercise confirmed the following:

- The parameters for the Basin entrance width
- The optimal size and shape for North Wall Quay Extension
- The extent of dredging required in the channel to facilitate vessels' berthing and manoeuvring

These changes were reflected in the subsequent design proposals for the ABR project resulting in the layout shown in Figure 5.

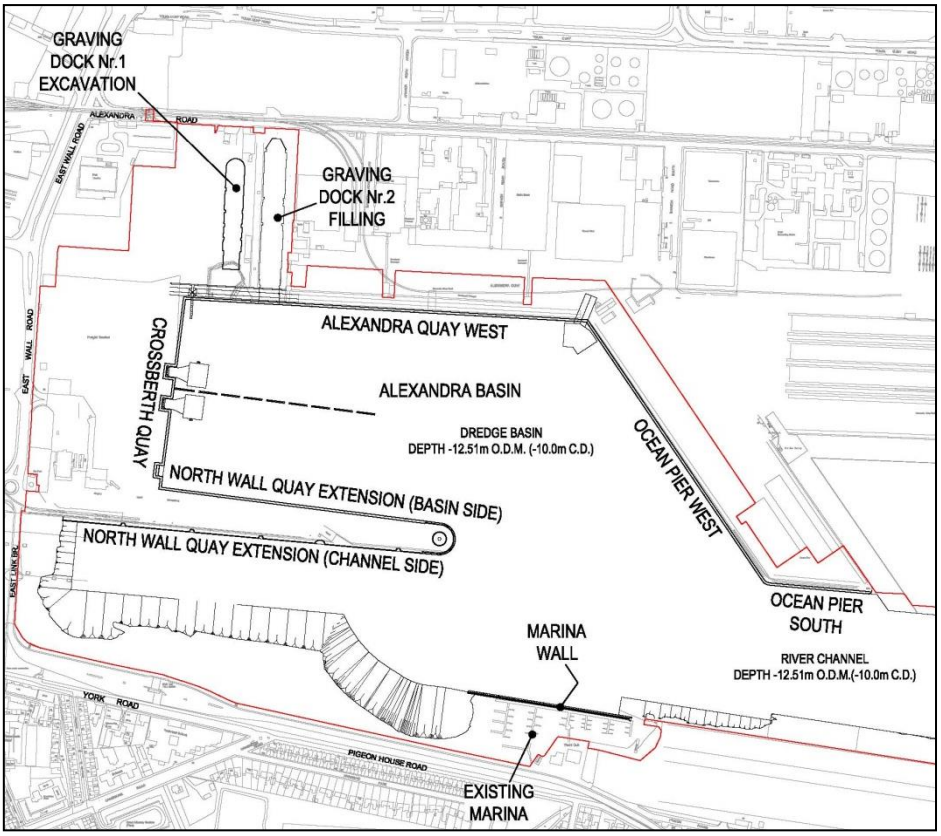


FIGURE 5 RECONFIGURAION OF ALEXANDRA BASIN WEST FOR THE DEEP WATER OPERATIONS BASED ON SHIP TURNING REQUIREMENTS AND SHIP DRAUGHT CONSIDERATIONS

The reconfiguration of North Wall Quay Extension was also driven by the need for deeper berths given the draught of modern vessels. There was a risk that dredging the berths to the required depths would undermine the existing quay wall. The only viable way of supporting the quay for the dredging operation was to construct a new piled wall outside the original quay. Any attempt to model underpinning the original quay wall failed on a practical engineering basis. The design of the new quay wall resulting from this process is shown in Figure 6 below.

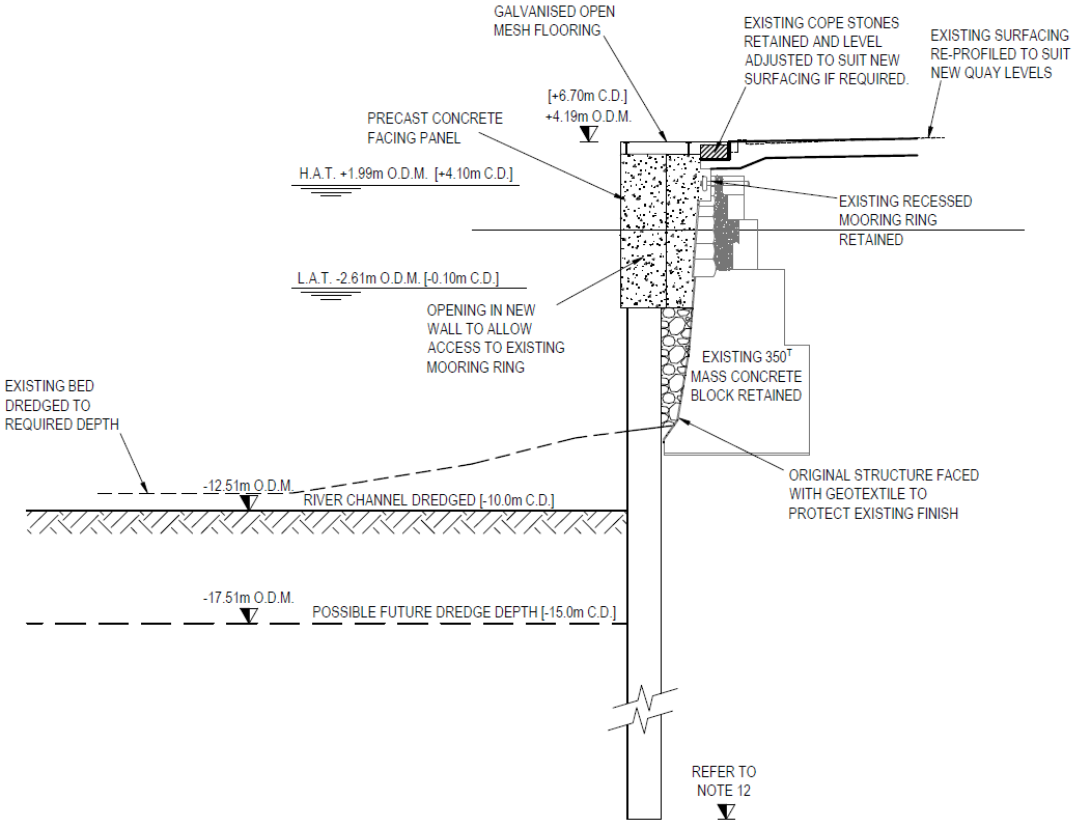


FIGURE 6 DESIGN OF THE NEW PILED WALL OUTSIDE THE ORIGINAL QUAY ON THE RIVER SIDE OF NORTH WALL QUAY EXTENSION

In summary, we developed a conservation strategy to mitigate the impacts arising from engineering works necessary to address the results of the simulation exercise and operational review. These measures included:-

- The conservation of the 560m of existing quay wall behind a New quay wall at North Wall Quay Extension of circa 910m total in length interrupted by six conservation zones (A-F) of 55 metres, 3 metres, 3 metres, 3 metres, 13 metres and 3 metres in length (approximately 10% of the quay length) depicting steps and mooring rings so as to present part of the original quay in a conserved state.
- Reconstruction of light house and granite wall at end of revised North Wall Quay Extension (Interpretation zone 2).
- Rebuilding of existing quay walls in the remainder of Alexandra Basin having an aggregate length of circa 690m after careful recording including a 3D laser scan of the entire area.

6 CONSERVATION PHILOSOPHY AND STRATEGY

Conservation philosophy

This conservation proposal is intended to identify the constraints and options pre and post planning stage. Because conservation is an inter-professional discipline, the following professionals have been involved in developing the conservation strategy outlined in this report:-

- Conservation Consultants; Southgate & Associates.
- Architects; MOLA Architects
- Archaeologist: Niall Brady of ADCO Ltd
- Industrial Archaeological Context: Dr Colin Rynne UCC Archaeology Dept
- Engineering Design: RPS Engineers
- Client: Dublin Port Company

In addition there was been extensive consultation with the relevant statutory authorities concerned with conservation of built heritage.

The following general principles of conservation have been adopted in this document, and have resulted in a proposed conservation policy for Alexandra Basin, as follows:-

Explanation and Basis of Approach

The following conservation charters and principles have been considered when formulating a conservation strategy for Alexandra Basin:-

- Burra Charter I.C.O.M.O.S. 1979, revised 2013
- ICOMOS – TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, 2011
- Venice Charter I.C.O.M.O.S. 1964 Venice Charter I.C.O.M.O.S. 1964

In terms of **preserving** the cultural significance of Dublin Port as a deep water Port the following articles from the Burra Charter I.C.O.M.O.S. 1979 Revised 2013 have been considered:

- Article 2.1 Places of cultural significance should be conserved.
- Article 2.2 the aim of conservation is to retain the cultural significance of a place.
- Article 3.1 Conservation is based on a respect for the existing fabric, use, associations and meanings. It requires a cautious approach of changing as much as necessary but as little as possible.
- Article 7.2 a place should have a compatible use. The policy should identify a use or combination of uses or constraints on uses that retain the cultural significance of the place. New use of a place should involve minimal change, to significant fabric and use; should respect associations and meanings; and where appropriate should provide for continuation of practices which contribute to the cultural significance of the place.
- Article 10 Contents, fixtures and objects which contribute to the cultural significance of a place should be retained at that place. Their removal is unacceptable unless it is: the sole means of ensuring their security and preservation; on a temporary basis for treatment or exhibition; for cultural reasons; for health and safety; or to protect the place. Such contents, fixtures and objects should be returned where circumstances permit and it is culturally appropriate.

- Article 15.2 Changes which reduce cultural significance should be reversible, and be reversed when circumstances permit.

In terms of **recording** the site prior to development, the following articles from ICOMOS – TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes have been considered:

> **I - Document and understand industrial heritage structures, sites, areas and landscapes and their values**
>
> (Articles 1 and 2 refer to definitions)
>
> 3. Researching and documenting industrial structures, sites, landscapes and the related machinery, equipment, records or intangible aspects is essential to their identification, conservation, and the appreciation of their heritage significance and value. Human skills and knowledge involved in old industrial processes are a critically important resource in conservation and must be considered in the heritage evaluation process.
>
> 4 Researching and documenting industrial heritage sites and structures must address their historical, technological and socio-economical dimensions to provide an integrated base for conservation and management. It requires an interdisciplinary approach supported by interdisciplinary research and educational programmes to identify the significance of industrial heritage sites or structures. It should benefit from a diversity of sources of expertise and information including site surveys and recording, historical and archaeological investigation, material and landscape analysis, oral history and/or research in public, corporate or private archives. Research and preservation of documentary records, company archives, building plans, and specimens of industrial products should be encouraged. The evaluation and assessment of documents should be undertaken by an appropriate specialist in the industry to which they relate to determine their heritage significance. The participation of communities and other stakeholders is also an integral part of this exercise.
>
> 5 Thorough knowledge of the industrial and socioeconomic history of an area or country or their links to other parts of the world is necessary to understand the significance of industrial heritage sites or structures. Single industry context, typological or regional studies, with a comparative component, aimed at key industrial sectors or technologies are very useful in recognizing the heritage values inherent in individual structures, sites, areas or landscapes. They should be accessible and searchable by the

In terms of ensuring the legibility of the existing North Wall Quay Extension in the context of the new quay wall the following articles from ICOMOS – TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes have been considered:

> 11 Wherever possible, physical interventions should be reversible, and respect the age value and significant traces or marks. Changes should be documented. Reverting to a previous known state may be acceptable under exceptional circumstances for educational purposes, and must be based on thorough research and documentation. Dismantling and relocating are only acceptable in extraordinary cases when the destruction of the site is required by objectively proved overwhelming economic or social needs.

In ensuring that the **scale and setting** of the new quay wall is carefully controlled so as not to dominate the landscape the following Charters and articles have been considered:

> **Venice Charter I.C.O.M.O.S. 1964**
>
> Article 1: The Concept of an historic monument embraces not only the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or an historic event. This applies not only to great works of art but also to more modest works of the past, which have acquired cultural significance with the passing of time.

Article 6: The conservation of a monument implies preserving a setting which is not out of scale. Wherever the traditional setting exists, it must be kept. No new construction, demolition or modification, which would alter the relation of mass and colour, must be allowed.

Washington Charter I.C.O.M.O.S. 1987

1. When it is necessary to construct new building or adapt existing ones, the existing spatial layout should be respected, especially in terms of scale and lot size. The introduction of contemporary elements in harmony with the surrounds should not be discouraged since such features can contribute to the enrichment of an area.

In terms of allowing for interpretation of the Industrial Heritage, particular reference has been made to the following articles from ICOMOS – TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes

13 The industrial heritage is a source of learning which needs to be communicated in its multiple dimensions. It illustrates important aspects of local, national and international history and interactions over times and cultures. It demonstrates the inventive talents related to scientific and technological developments, as well as social and artistic movements. Public and corporate awareness and understanding for the industrial heritage are important means for its successful conservation.

14 Programmes and facilities such as visits of active industrial heritage sites and the presentation of their operations as well as the stories and intangible heritage associated with their history, machinery, and industrial processes, industrial or city museums and interpretation centres, exhibitions, publications, websites, regional or trans-boundary itineraries should be developed and sustained as means to raise awareness and appreciation for the industrial heritage in the full richness of its meaning for contemporary societies. These should ideally be located at the heritage sites itself where the process of industrialisation has taken place and can be best communicated. Wherever possible, national and international institutions in the field of research and conservation of heritage should be empowered to use them as educational facilities for the general public and the professional communities.

6.1 Conservation Strategy for Recording

The site has been recorded to Level 2 Inventory standard by Dr Colin Rynne Industrial Archaeologist (See Chapter 12 of the EIS).

A full measured survey has been carried of Alexandra Basin by RPS and MOLA Architecture. This includes plans and elevations of all buildings to be demolished.

Prior to works commencing a full Laser 3D survey of the site will be undertaken. This recording will require the updating of existing survey drawings so that the adequately represent the detailed layout, structure and materials before works start.

6.2 Conservation Strategy for intervention to North Wall Quay Extension wall incorporating conservation zones for legibility

The development of North Wall Quay Extension requires a substantial intervention which has been well researched and maintains the cultural significance of the quay by continuing its tradition as a key part of the necessary infrastructure for a deep water port. Initial design approaches had attempted to mitigate this by including elements of salvaged granite to replicate the original quay, but this was not deemed to be in accordance with best conversation practice. Instead a policy of best practice contemporary design for the new quay edge was adopted. The engineering design has

been supervised and directed by Southgate Associates to ensure the principles defined above have been complied with. In addition, MOLA Architecture has devised innovative and contemporary interpretative designs for areas of public realm created as part of the conservation strategy.

For practical engineering reasons it is proposed that the new quay wall at North Wall Quay Extension will be built outside the original wall but will be penetrated by six conservation zones showing areas of the original quay wall. This will ensure a policy of "legibility" where the use of materials and the setbacks allow the new intervention to be understood without explanation.

The proposal involves;

- Conservation of a 55 m length of quay in its original state in conservation zone A (Plate 23),
- A visual appreciation of the original mooring rings through specially designed openings in the proposed new concrete quay wall in conservation zones B, C and D (12m total) and conservation zone F (Plate 24).
- A 13m wide central staircase is to be shown in a designed opening in conservation zone E (Plate 25).

The design has been informed by the onus on Dublin Port Company to ensure that port infrastructure meets health and safety and maritime safety requirements.

In order to reduce the potential for adverse visual impacts the proposed design includes fendering at 15m centres along the new quay avoiding the conservation zones with a close fendering configuration on the quay end. It is proposed that the concrete panels on the quay end will be painted black and a granite wall placed above as shown in Figure 7 below.

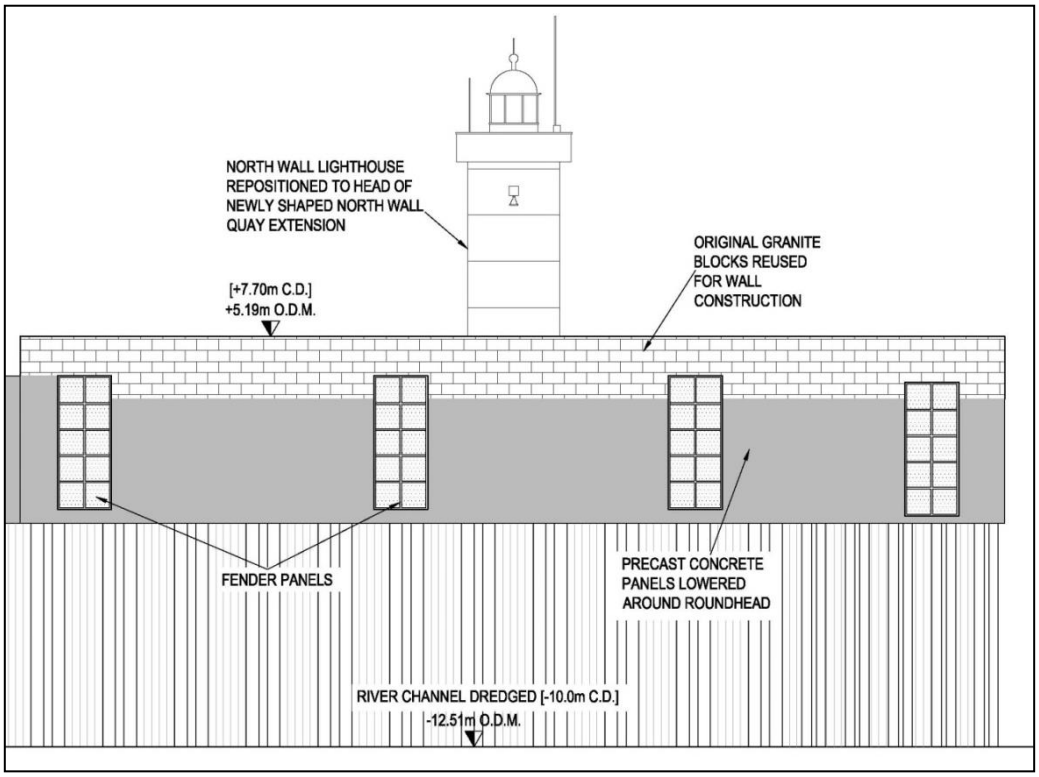


FIGURE 7 DETAILS OF THE DESIGN OF THE END OF NORTH WALL QUAY EXTENSION

6.3 Conservation strategy for scale and setting

Initial constraints imposed a potentially dominating horizontal scale which could have been insensitive to the surroundings. The original quay was interrupted by features serving to break the horizontal emphasis. The incorporation of six conservation zones and the vertical texture of the concrete panels aim to control the scale of the quay edge. This principle is central to the conservation strategy and has been monitored by Southgate Associates and MOLA Architecture during the design development stage.

The surfacing and choice of materials on the surface of the quay have been chosen to ensure that the language of new and old is preserved, the original structure marked by the granite copings, and the new structure in fine finished contemporary concrete. This ensures a principle of legibility where again the use of materials allow the new intervention to be understood without explanation.

6.4 Conservation strategy for the Graving Docks

The stone-lined Graving Dock No. 1 built by Stoney in 1860 (DP. 08), but filled in 2008, will be emptied of fill and restored to be put on public display.

A conservation proposal for the early twentieth-century 'pump house' adjacent to the graving dock will involve the conservation and restoration of the external envelope of the building with due regard to interpretive potential use in the future.

Graving Dock No 2 will be infilled to facilitate the creation of additional berthing facilities in Alexandra Basin. Important features of Graving Dock No. 2 such as the electrically powered capstans will be relocated on the site, whilst the 1950's electric jib crane (DP. 21) will be retained in situ next to the dock. In addition, a second crane, located on Alexandra Quay West (DP. 20), will be dismantled and fully re-erected near the dock basin.

Similar cranes have been successfully preserved at Bristol Industrial Museum. Other 1950s examples survive as exhibits at the India Dock, London, on Manchester's Salford Quays and on the Manchester Ship canal.

6.5 Conservation strategy for Interpretation

When considering the significance of the North Wall Quay Extension the overall layout and scale of the project was seen to be regionally significant. Therefore the interpretation of the original construction methodology as a key part of the Conservation Strategy is considered to be a highly suitable mitigation measure.

When considering the methodology of lifting the granite block as part of the interpretation scheme it was noted that a 1,200 tonne mobile crane (the biggest available in the world) would be needed and the quay would need to be piled to take the load from the outriggers as indicated in Figure 7

below. This will be recorded on film and used for interpretation. The physical scale of the crane is not unlike Stoney's Shear Crane which was 130ft long.

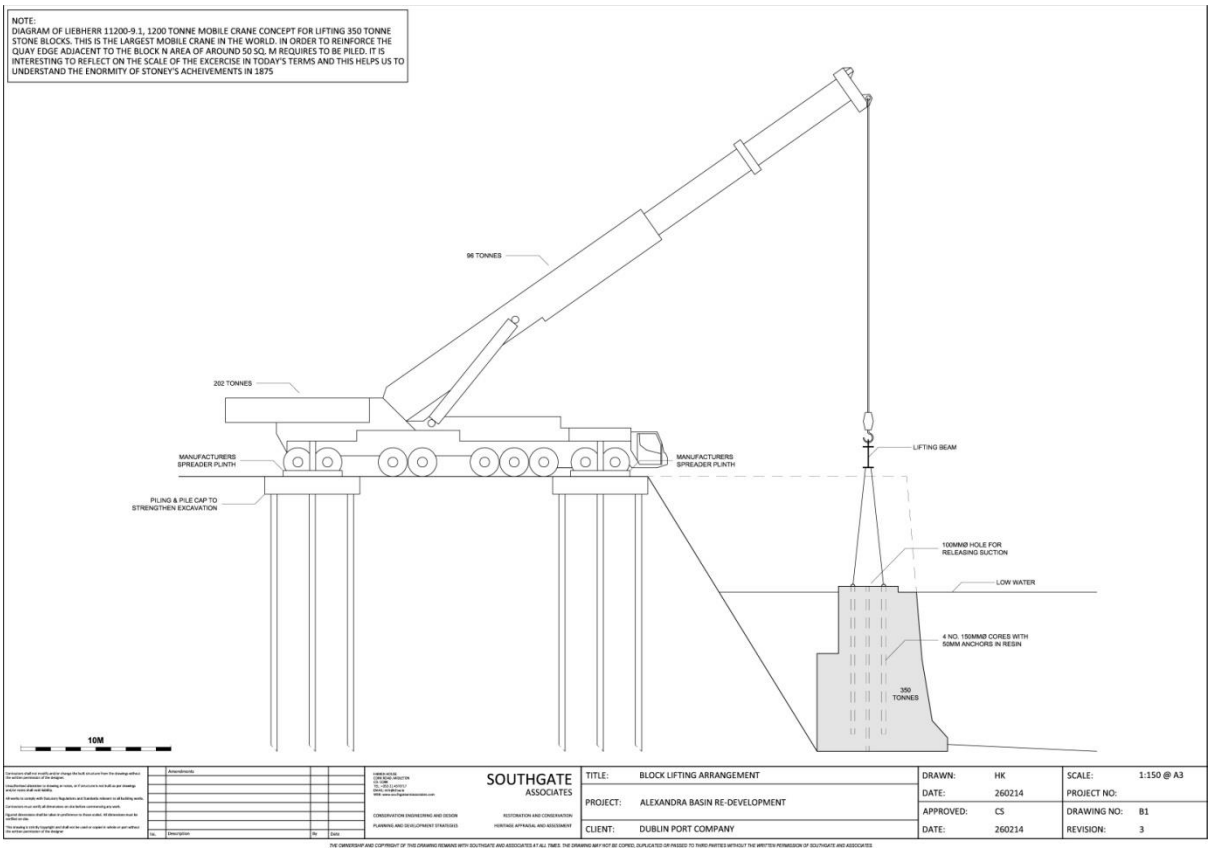


FIGURE 8 CRANEAGE ARRANGEMENT FOR LIFTING A 350 TON STONEY BLOCK

MOLA Architecture has designed an interpretive and public realm scheme (Interpretative zone 1- approximately). This will be 55m x 19m and the design is shown in Plate 21 and Plate 23. The design is intended to promote the built heritage of the Alexandra Basin area, incorporating the research conducted to date on the history and industrial archaeology of the site.

The central feature of this scheme is to house a reclaimed block as a "visual experience "of the scale of the precast concrete blocks. A detailed description of the lifting of the block is attached as Appendix 1.

Public access to the lighthouse will be restricted and controlled for health and safety reasons. The area around the lighthouse will a pedestrian zone constructed in granite blocks reclaimed from the quay wall. This will create an interpretive zone around the reconstructed lighthouse (Plate26.)

The North Wall Light will be dismantled and relocated at the eastern extremity of the new quay in interpretation zone 2. An original ring of granite curved blocks will be set in the paving to demonstrate the lighthouse's original relationship with the existing pier end.

6.6 Public access

The Public Access to the curtilage of the ABR project will demonstrate DPC's commitment to integrate its heritage with the City.

Interpretive zone 1 will be an area of Public Realm open to the public at the west end of the development on a regular basis.

Other areas of the Basin will be publicly accessible, under DPC's supervision, including "controlled" access to the lighthouse (Interpretive Zone 2) the conserved Graving Dock No. 1 (Conservation Zone G) including the Pump House and its immediate curtilage.

6.7 Conservation strategy for salvage

As a result of dismantling a section of the North Wall Quay Extension a considerable quantity of 19th century durable granite blocks will become available. This stock of granite will be preserved and retained for use in this scheme, but also for other conservation projects, subject to the supervision and control of the relevant conservation statutory authorities.

The granite salvaged from the project was presumably specially selected from durable beds and has been subject to excessive wetting and drying cycles. Its durability can therefore be demonstrated. It is felt that the salvaged material would therefore be useful in replacing material in the Port and elsewhere from softer beds which has decayed.

6.8 Lighting Strategy

A functional operational scheme for lighting has been designed by RPS for the ABR Project while in contrast an architectural lighting scheme has been designed by MOLA Architecture to highlight conservation zones at night adding to the texture and breaking the horizontal emphasis as discussed in section 6.3 with particular reference to its legibility from vantage points in the city.

7 CONCLUSION

Following a clear brief from Dublin Port Company (DPC) regarding the operational role played by the deep water facility at Alexandra Basin West, sustainable development of the facility was found to require significant interventions to the North Wall Quay Extension. DPC also instructed a best practice approach to conservation on the site. This approach aims to preserve the cultural significance of Dublin Port as a Deep Water Port.

A detailed historical analysis by Magnus Archaeology (Appendix3) and by ADCO Ltd (Chapter 12 of the EIS) together with an Industrial Assessment by Dr Colin Rynne of UCC Archaeology Department have informed the process of developing a conservation strategy to best practice standards for the development.

In respect of North Wall Quay Extension, the development of a new quay wall outside the existing wall involves the retention of a 560m length behind the new wall and the demolition of a further 690m length on the end and inside of the basin. As a mitigation measure the new quay wall is penetrated by six conservation zones which not only relieve the horizontal proportioning of the new quay but also show the existing quay wall features (including mooring rings and steps) allowing the original wall to be legible. The policy of legibility is continued across the surface finishes of the quay.

As part of DPC's commitment to public interaction through a policy of soft values, Southgate Associates have coordinated with MOLA Architecture to design two interpretive zones at either end of the quay.

The first is a public interpretation area for the Stoney blocks (Interpretation zone 1) and involves lifting an original 350 ton block onto the Western end of the quay and augmenting it with a contemporary design by MOLA Architecture.

This is linked to a second interpretation area (Interpretation zone 2) around the repositioned lighthouse at the eastern end of the new quay with controlled public access due to the access link passing through operational areas.

There are two other conservation zones:

- Firstly there is the opening of Graving dock No 1 and the conservation of the Pump House (Conservation Zone G).
- Secondly there is the conservation of an area along the Western wall (Conservation Zone H) preserving the original quay wall and entrance gates.

Having reviewed the operational requirements of the Port, the extent of the heritage assets in Alexandra Basin West and taking account of the long history of DPC as a deep water port, I believe that the development proposals and the mitigation measures proposed under the Conservation Strategy accord with best conversation practice.

Christopher Southgate, FIEI, MIStructE, C Eng, Conservation Engineer

8 REFERENCES

For the early technical development of steam dredgers see A. W. Skempton 1975 'A history of the steam dredger 1797-1830', *TNS* **47**, pp. 97-116, who omits the Irish evidence.
Gilligan 1988, p. 130.
R. C. Cox 1990 *Bindon Blood Stoney. Biography of a port engineer*. (Dublin), pp. 23-6.
Cox 1990, p. 27.
de Courcy 1996, p. 24.
Cox and Gould 1998, p. 13.
Cox and Gould 1998, pp. 13-14; G. O'Flaherty 1988 'Mature and stately, through the city', in E. Healy, C. Moriarty and G. O'Flaherty (eds) *The book of the Liffey from source to the sea*. (Dublin), pp. 117-62; J. Purser Griffith 1879 'The improvement of the bar of Dublin Harbour by artificial scour', *Min. Proc. Instn Civil Engineers* **58** (1878-9), pp. 104-43.
See Cox 1990, p. 19.
C. O'Mahony 1993 'James Barton, engineer', *JIRRS* **18**, 122, p. 269.
Cox 1990, p. 19.
Gilligan 1988, p. 147-8.

9 PLATES

DESIGN CONCEPT

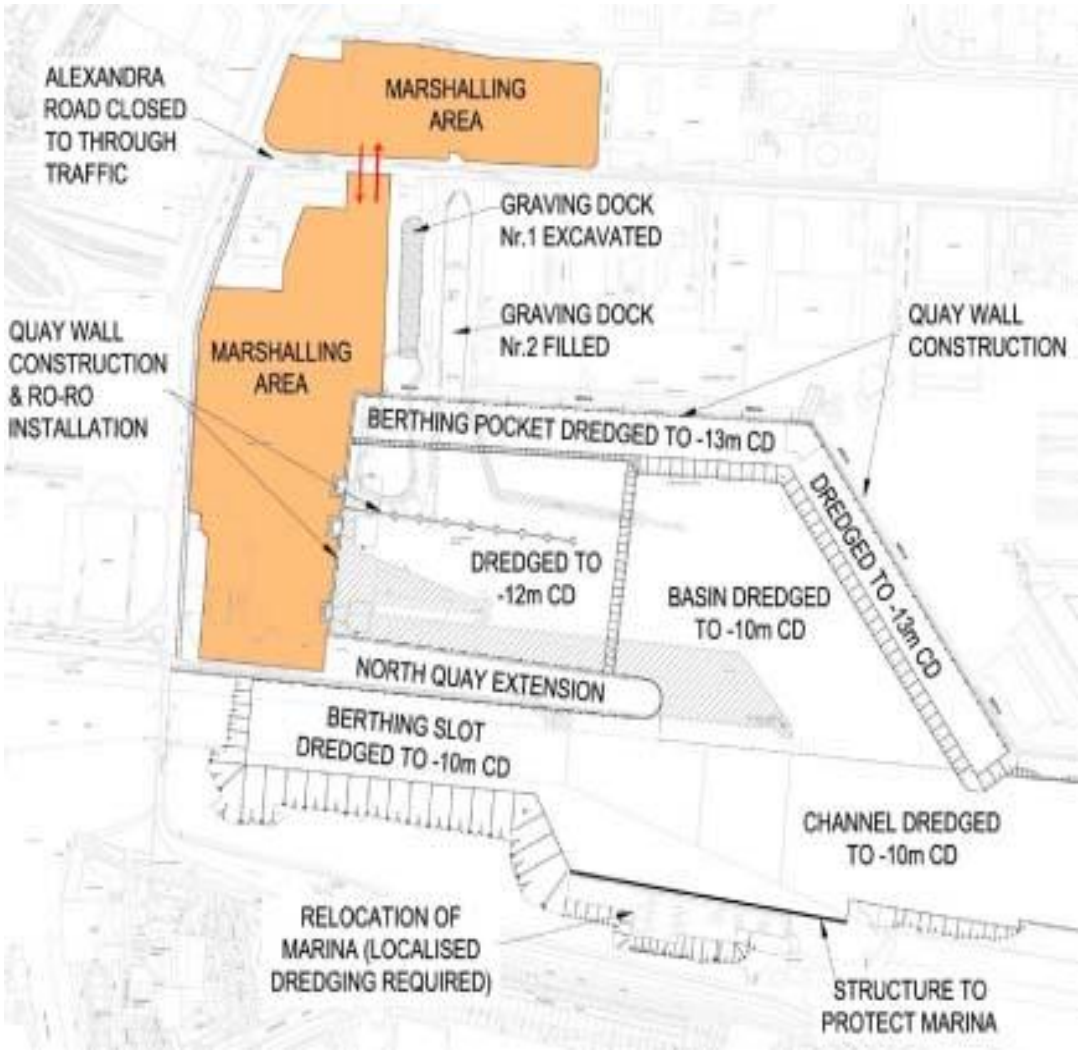
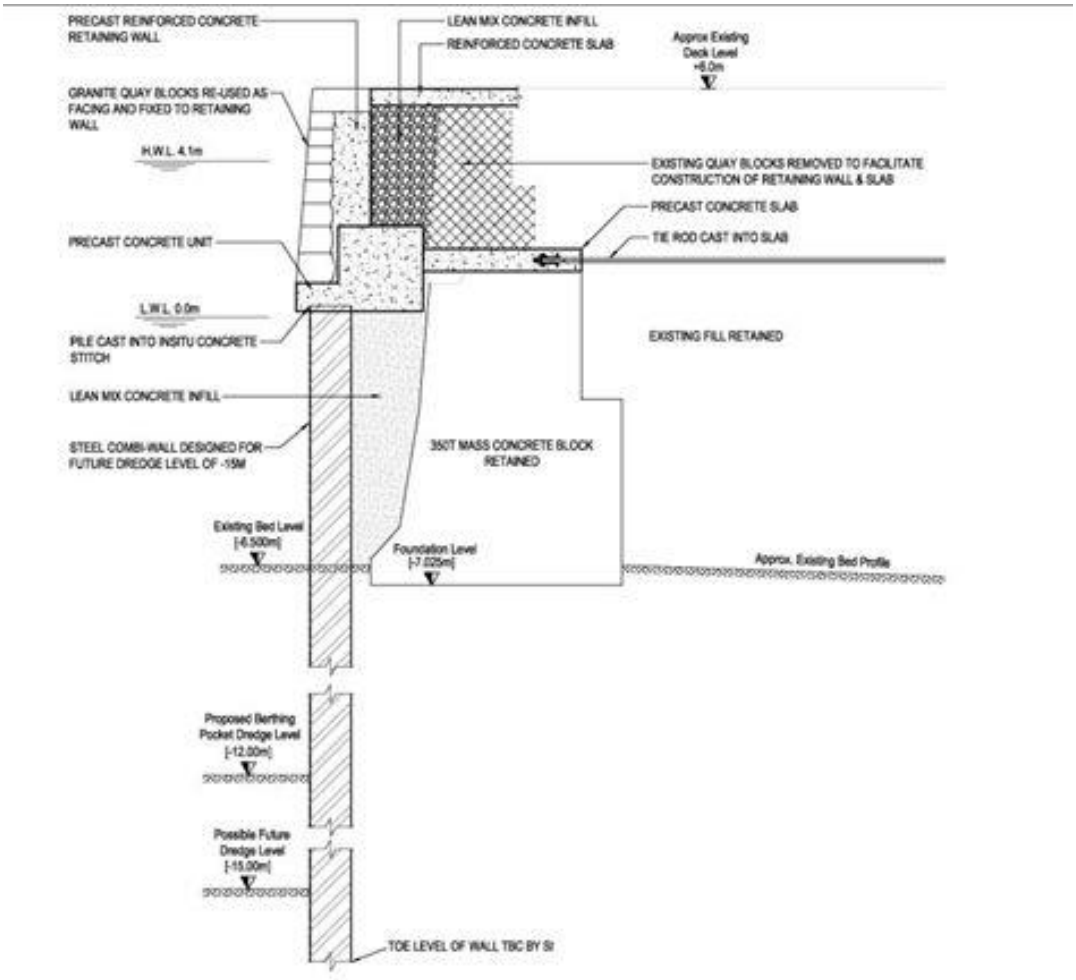


PLATE 1 ORIGINAL DESIGN CONCEPT PRESENTED TO SOUTHGATE ASSOCIATES ON 19TH NOV 2013 (SUBSEQUENTLY AMENDED)



NORTH QUAY EXTENSION - OPTION 2
REMOVAL & RE-USE EXISTING BLOCKS ON
RIVERSIDE QUAY WALL [1:100]

PLATE 2 SHOWS ORIGINAL CONSIDERATION TO REBUILD WALL ON QUAY – NOT VIEWED AS DEMONSTRATING LEGIBILITY

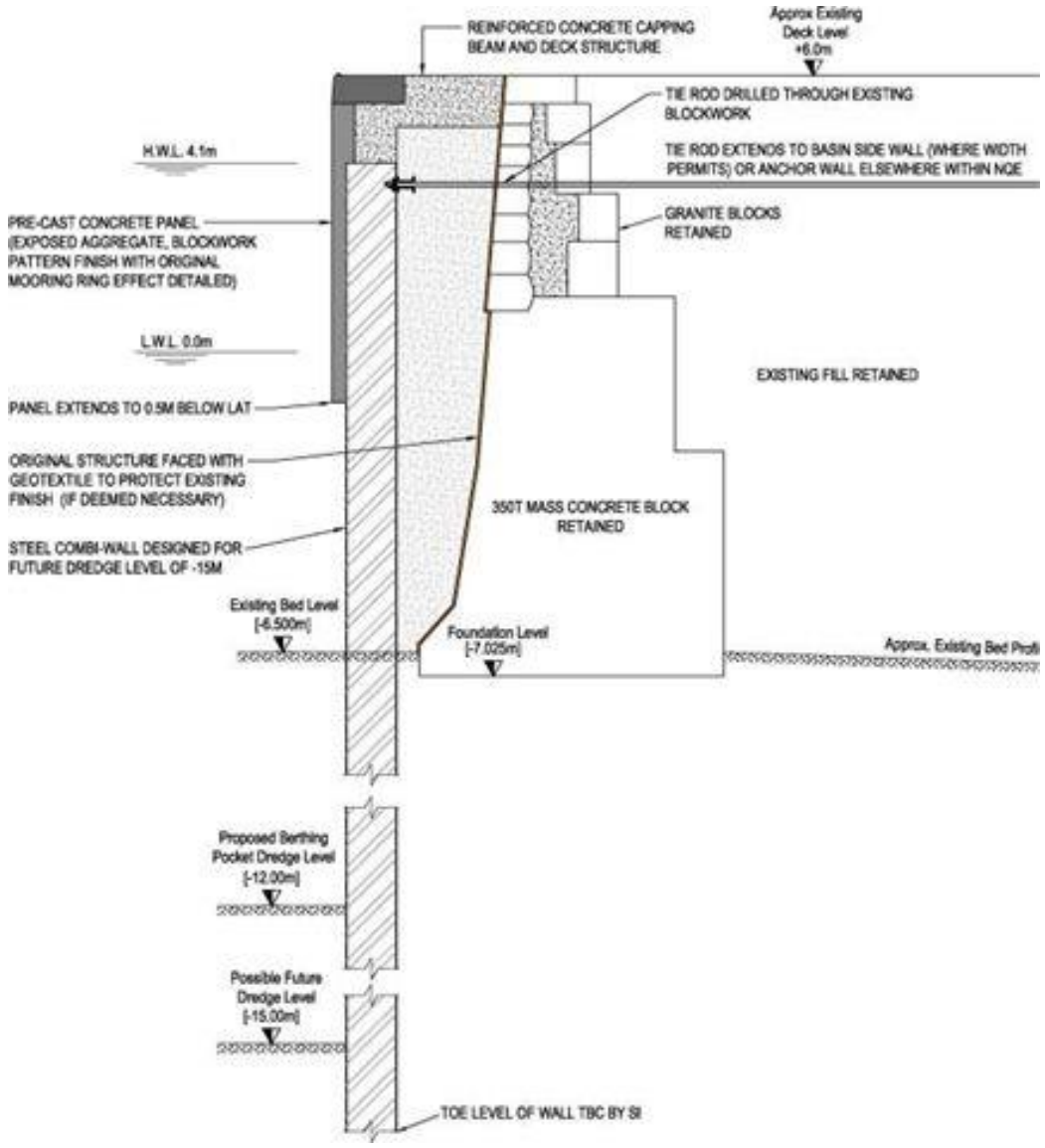


PLATE 3 PREFERRED CONCEPT OF LEGIBILITY WITH CONSERVATION ZONES USING ORIGINAL FABRIC LANGUAGE TO SHOW ORIGINAL POSITION OF QUAY WALL WITH MODERN INTERVENTION

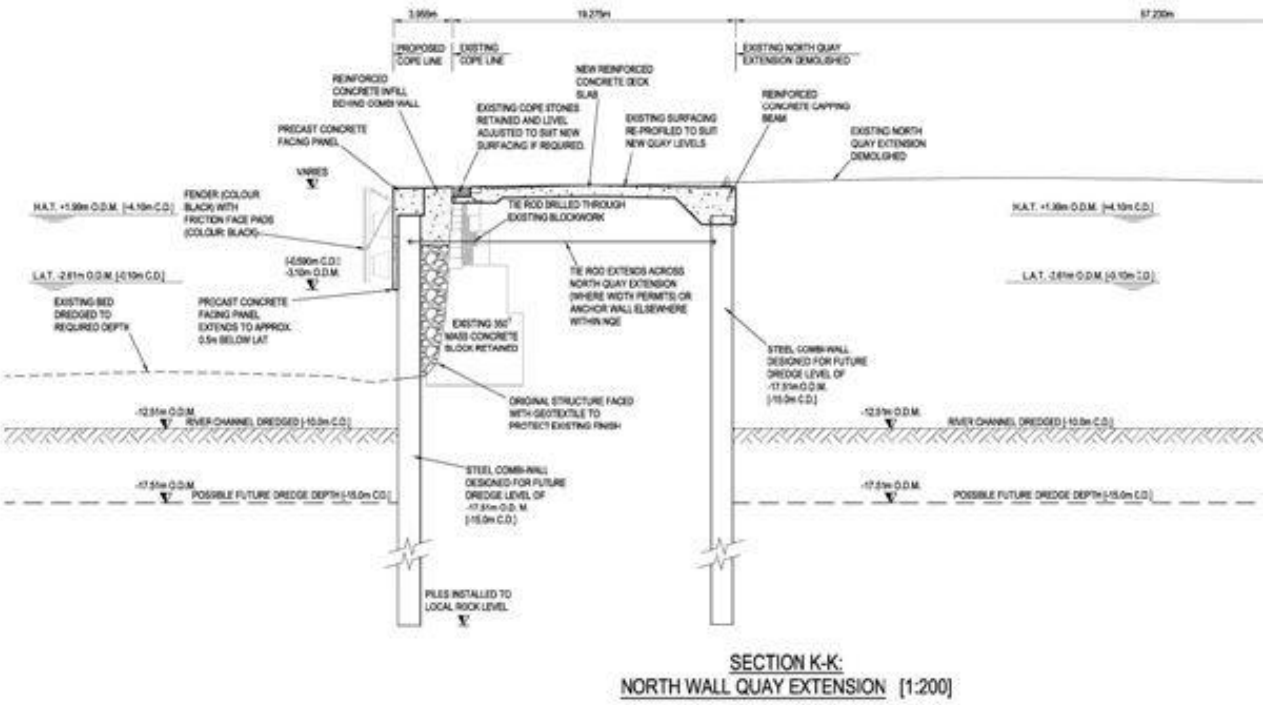


PLATE 4 PROPOSED CROSS SECTION WITH ORIGINAL COPINGS LIFTED SLIGHTLY TO A NEW LEVEL TO SHOW ORIGINAL QUAY POSITION

PLATE 5 CLOSE FENDERING WILL BE REQUIRED AT THE QUAY END WITH A RECONSTRUCTED GRANITE WALL ABOVE AND THE LIGHTHOUSE SET ON ORIGINAL CURVED GRANITE BLOCKS PLINTH

	
Conservation zone A involves a 55m length at Western end of quay preserved in original state	**The new quay wall is designed to indent in zones BCD and F showing original mooring rings**
	
Conservation zone E shows original steps in a 13m long indent	**Some features are to be kept subject to Health and Safety requirements to mark the position of original quay wall on plan along with copings**
	
Original chainage mark is to be relocated at a slightly higher level with other copings but will be in correct longitudinal position	**The quay wall will be cleaned using a conservation micro abrasive vortex system and pointed in Hydraulic lime sand render NHL 5**

PLATE 6 CONSERVATION ZONES A, B, C, D, E AND F - AREAS TO BE CONSERVED

INTERPRETATION ZONE 2

PLATE 6 ORIGINAL 1902 LIGHT HOUSE TO BE RELOCATED ON PIER END WITH 2 COURSES OF CURVED GRANITE BLICKS FORMING A PLINTH THIS WAS MOVED TO THE CURRENT LOCATION IN 1938. THE METHODOLOGY FOR LIFTING IS SHOWN IN APPENDIX 1

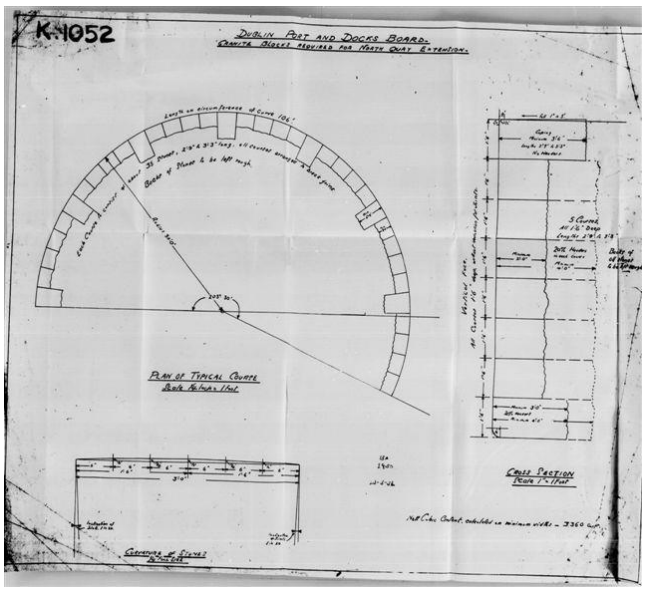


PLATE 7 SHOWING LAYOUT OF CURVED GRANITE BLOCKS (c 1938)

PLATE 8 MAIN ENTRANCE GATES (c. 1875-1900) FROM EAST

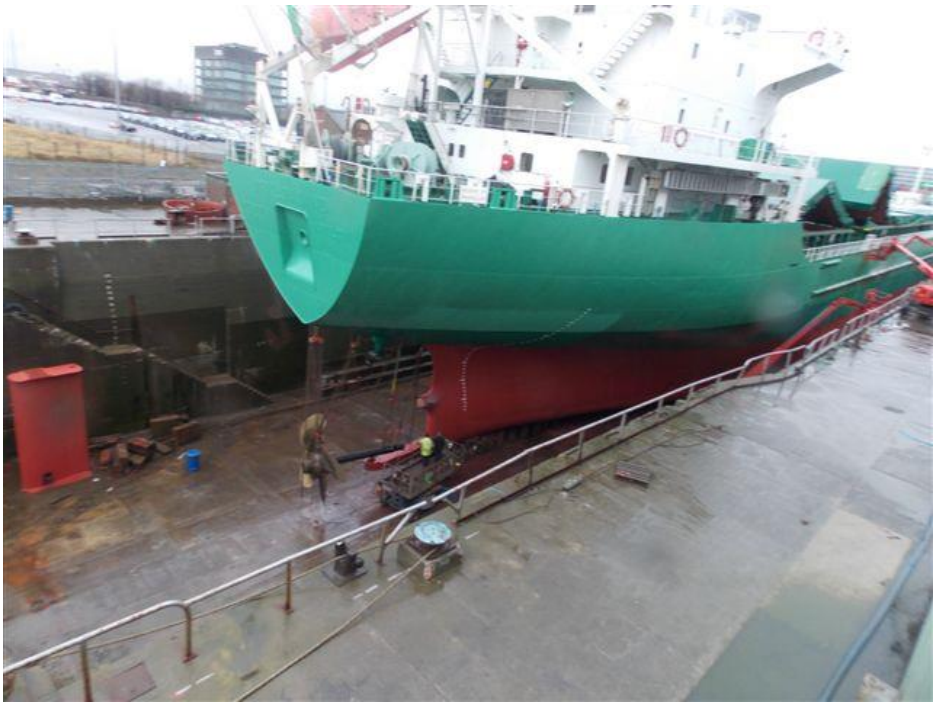
PLATE 9 DETAIL OF RIVETED STEEL GATE POST c 1875

CONSERVATION ZONE H

PLATE 10 WESTERN LIMESTONE WALL AND ORIGINAL QUAY WALL ALONG WESTERN BOUNDARY TO BE CONSERVED VEGITATION TREATMENT AND MAINTENANCE POINTING RECOMMENDED

CONSERVATION ZONE G

GRAVING DOCK NO 2



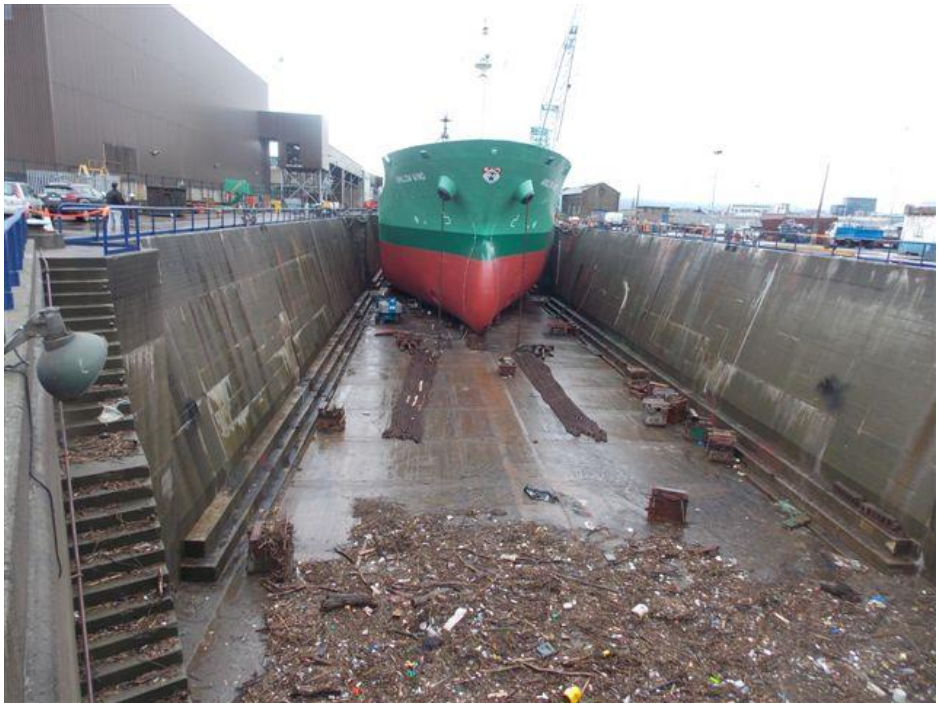


PLATE 11 SHOWING TWO VIEWS OF GRAVING DOCK NO 2 (SOUTH AND NORTH) WHICH IS TO BE CONSERVED IN SITU AND FILLED IN A MANNER WHICH IS REVERSIBLE WITH A POLICY OF MINIMUM INTERVENTION TO PROVIDE ACCESS.

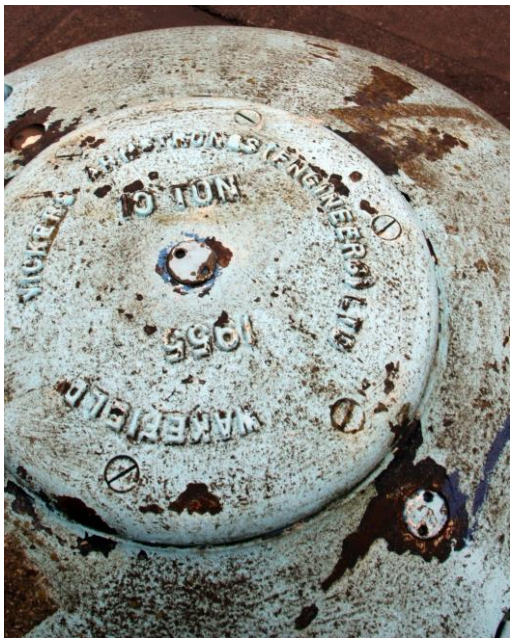


PLATE 12 ELECTRICALLY DRIVEN CAPSTAN WINCH BESIDE GRAVING DOCK NO 2 TO BE CONSERVED AND RELOCATED

(Manufactured by Vickers Armstrong Engineering of Wakefield, 1955; 10 ton capacity)

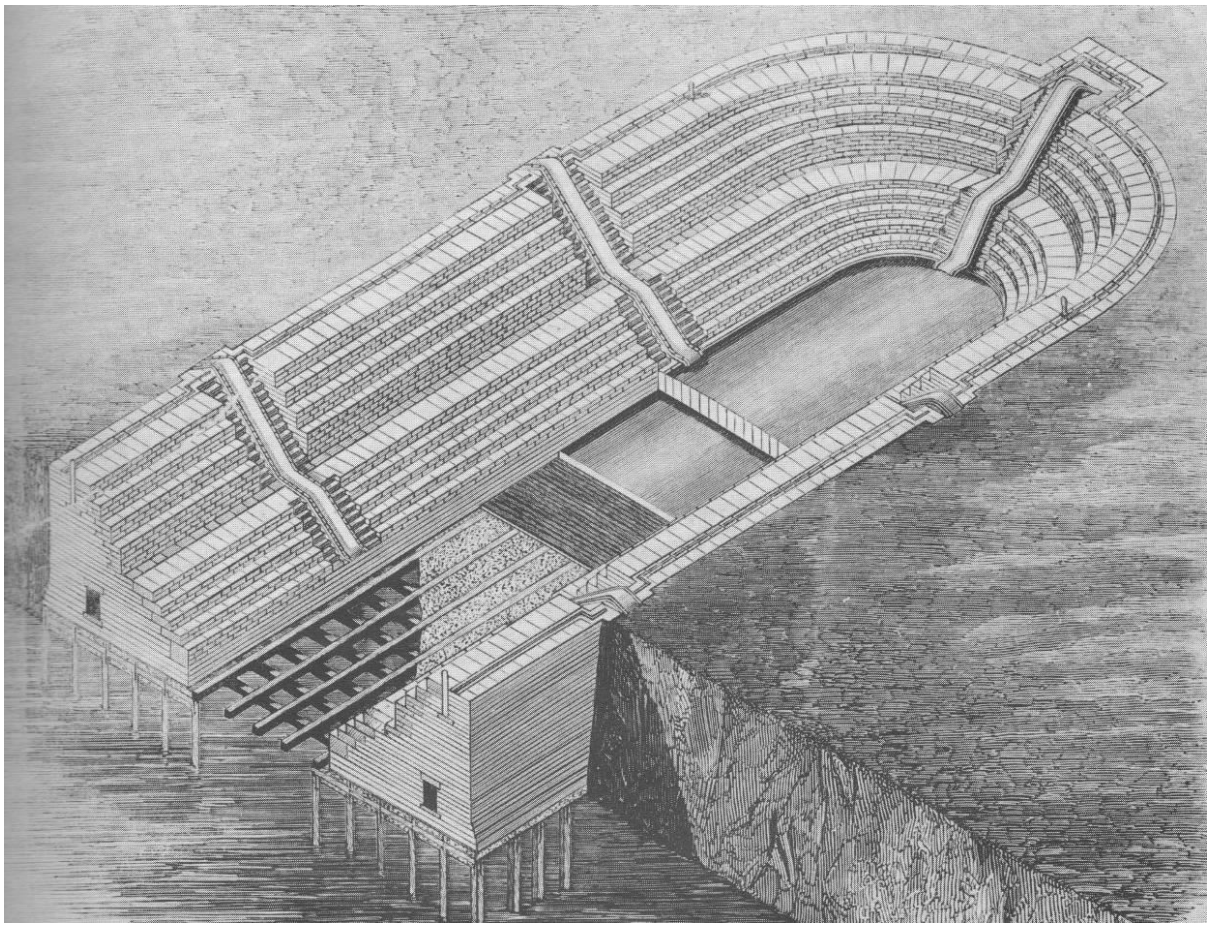


PLATE 13

CUTAWAY DRAWING OF GRAVING SLIP No 1 1860 to be excavated and conserved

PLATE 14

EDGE GRANITE BLOCKS OF GRAVING DOCK NO 1 TO BE CAREFULLY EXCAVATED ADJACENT TO GRAVING DOCK NO1

PLATE 15 PUMP HOUSE TO BE CONSERVED INVOLVING RESLATING, REFURBISHMENT OF GUTTERS, AND REPAIRS TO EXTERNAL BRICKWORK TO REMOVE POOR PREVIOUS REPAIRS.
IN THE BACKGROUND IS THE ARROLL CRANE (1956) TO BE CONSERVED IN SITU(PAINTED BLUE)

PLATE 16 LAMP STANDARD 1904 TO BE CONSERVED AND REUSED

PLATE 17 SHOWING AREAS OF BRICK REPAIR REPAIRS TO IRON WINDOWS AND CONSERVATION AND REDECORATION OF EXTERNAL DOORS

PLATE 18 ORIGINAL GANTRY CRANE INTACT TO BE CONSERVED

PLATE 19 - STOTHERT AND PITT CRANE (1970) PAINTED BLUE TO BE CONSERVED

PLATE 20 CRANE RAILS TO BE REMOVED AND REINSTATED

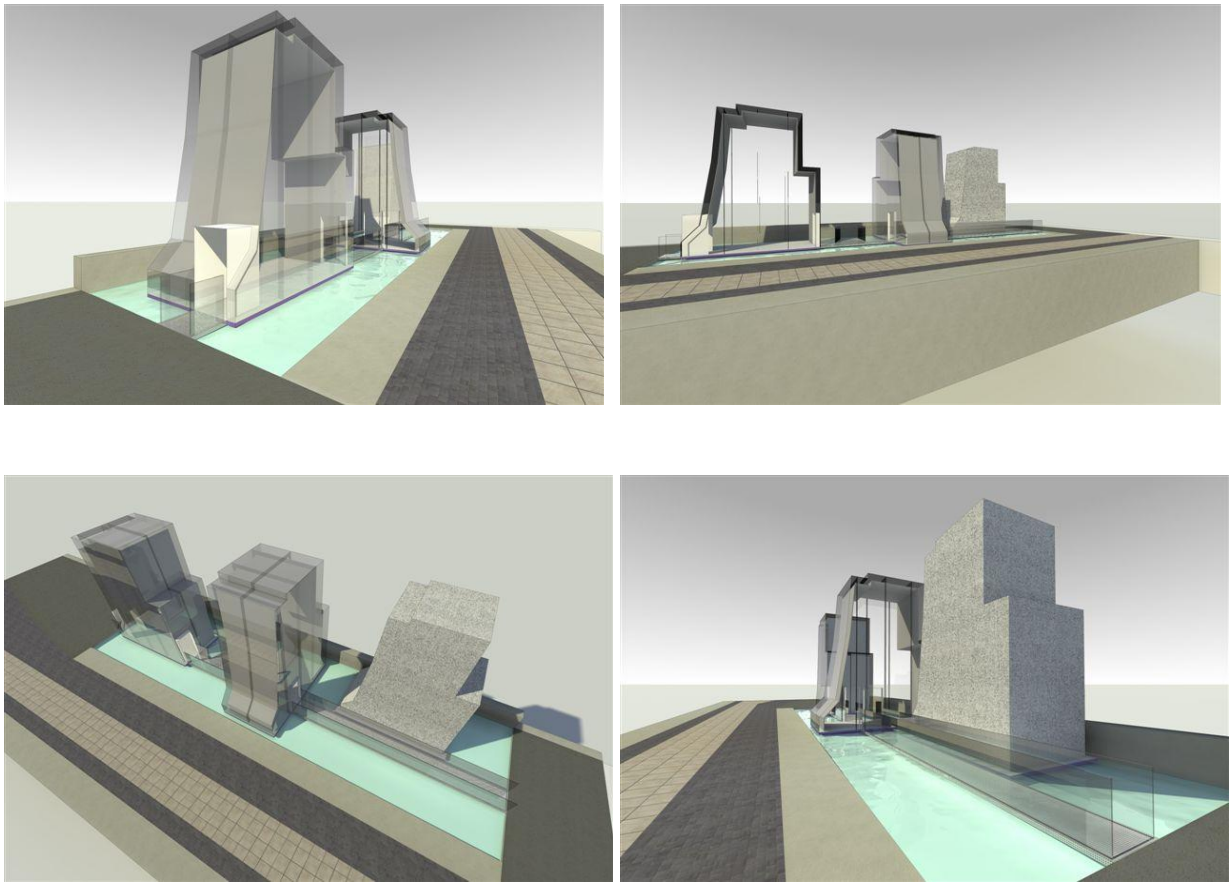
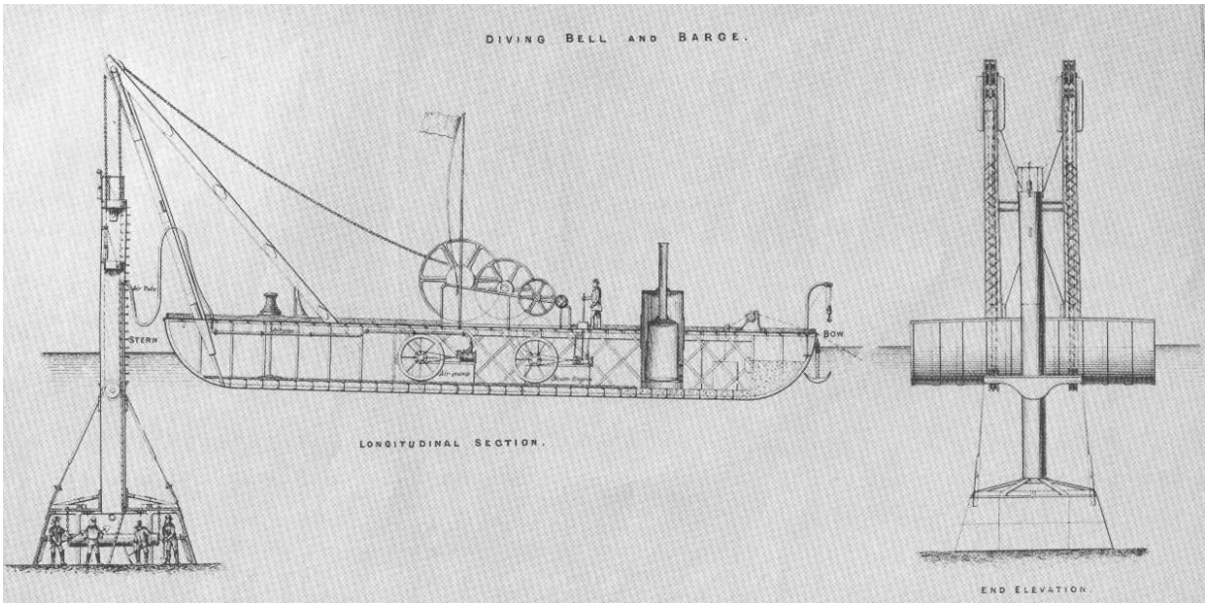


PLATE 21 DESIGN CONSCEPT FOR INTERPRETATION AREA 1 WHICH IS TO BE OPEN TO THE PUBLIC TO INTERPRET THE ACHIEVEMENTS OF BINDON BLOOD STONEY



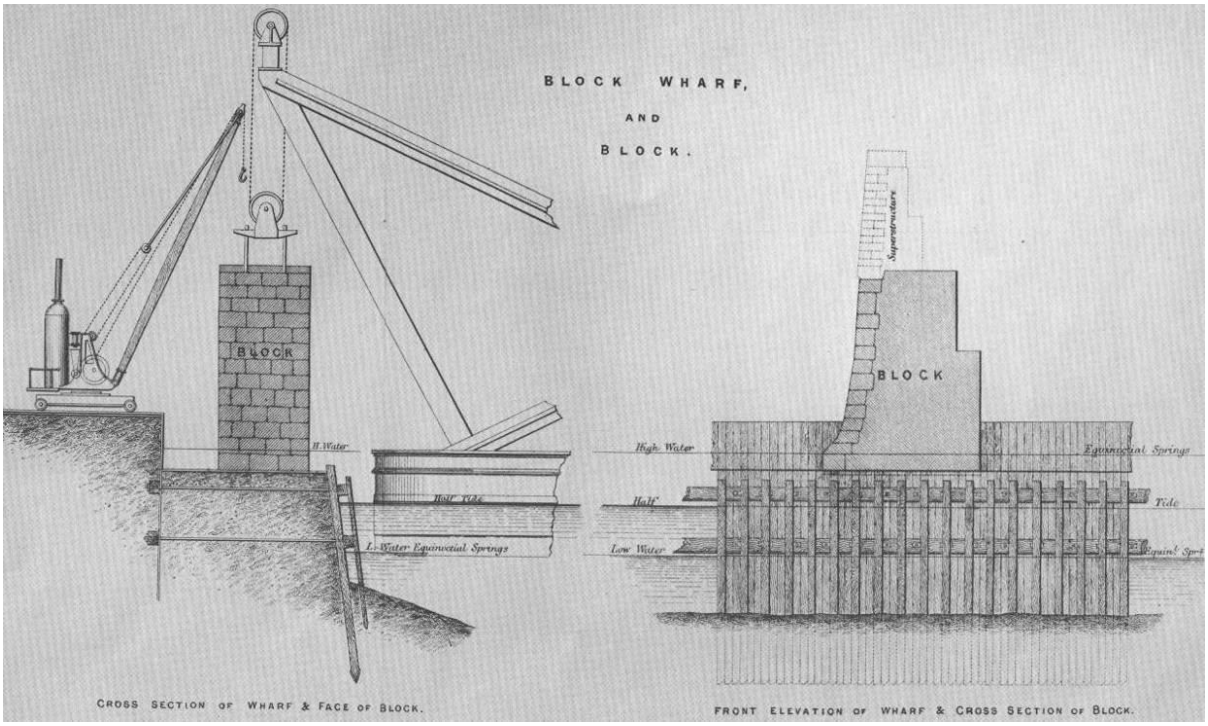


PLATE 22 ORIGINAL PLATES OF STONEY'S SHEARS CRANE AND FLOAT

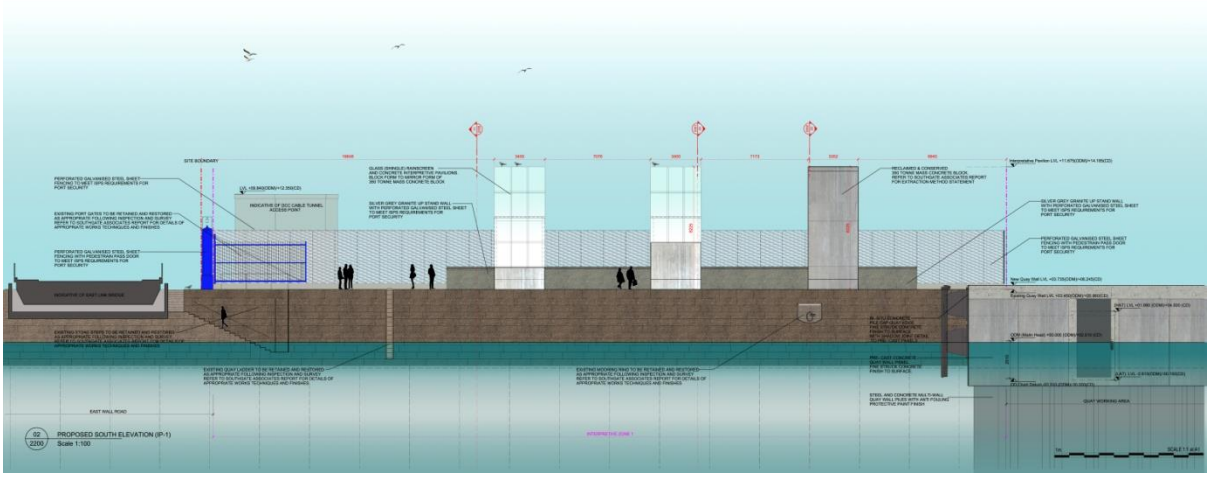


PLATE 23 CONSERVATION ZONE A WITH INTERPRETATION ZONE 1 BEHIND

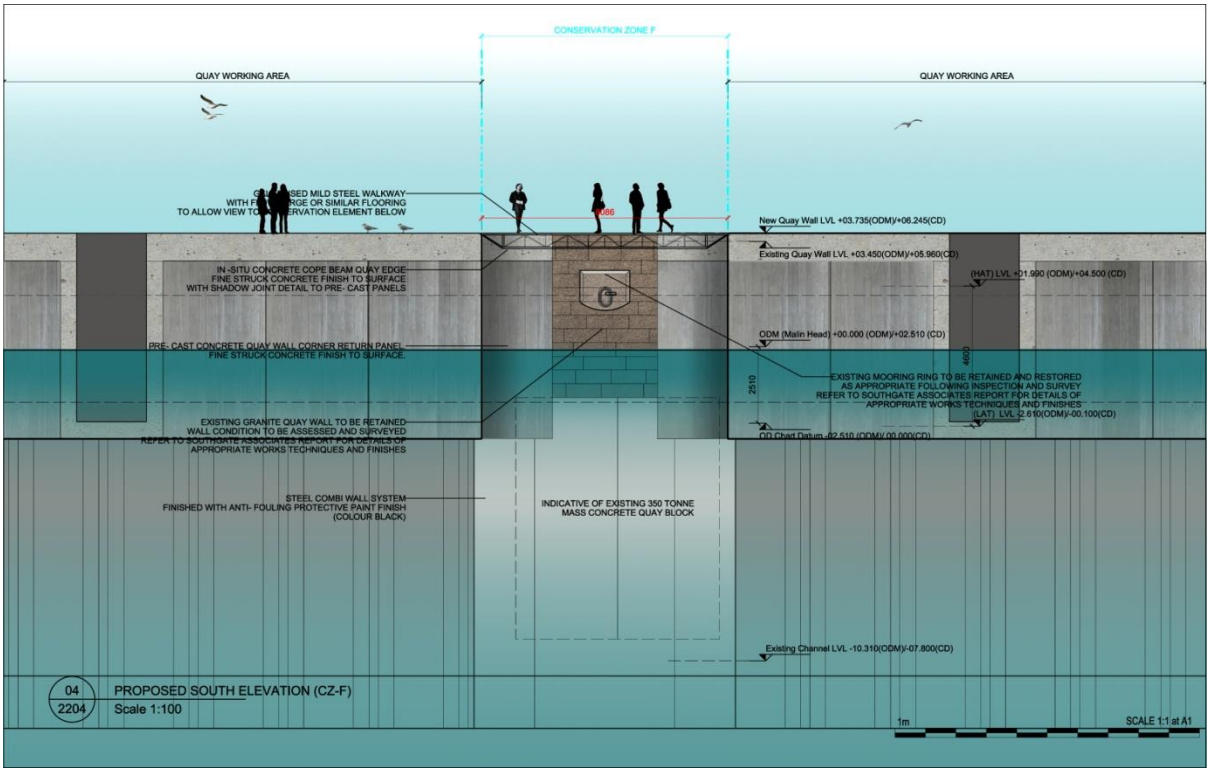


PLATE 24 CONSERVATION ZONE B C D AND F CONSERVED MOORING RINGS

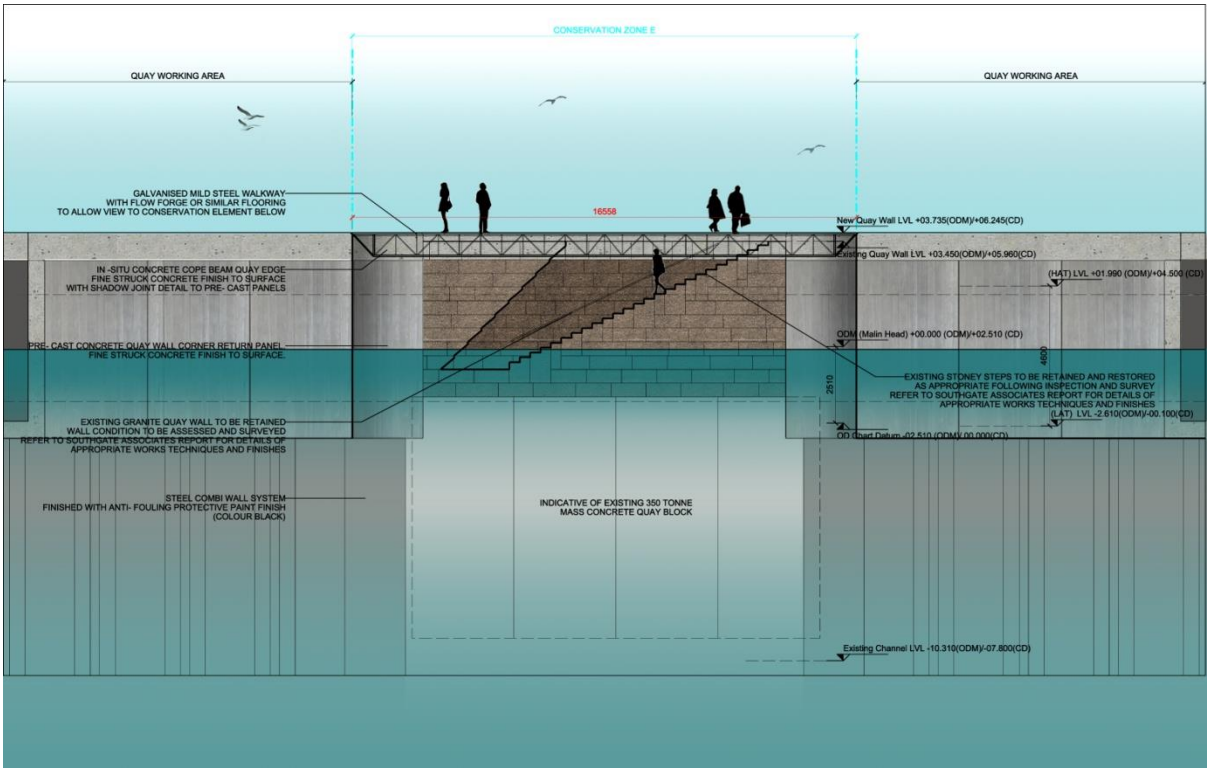
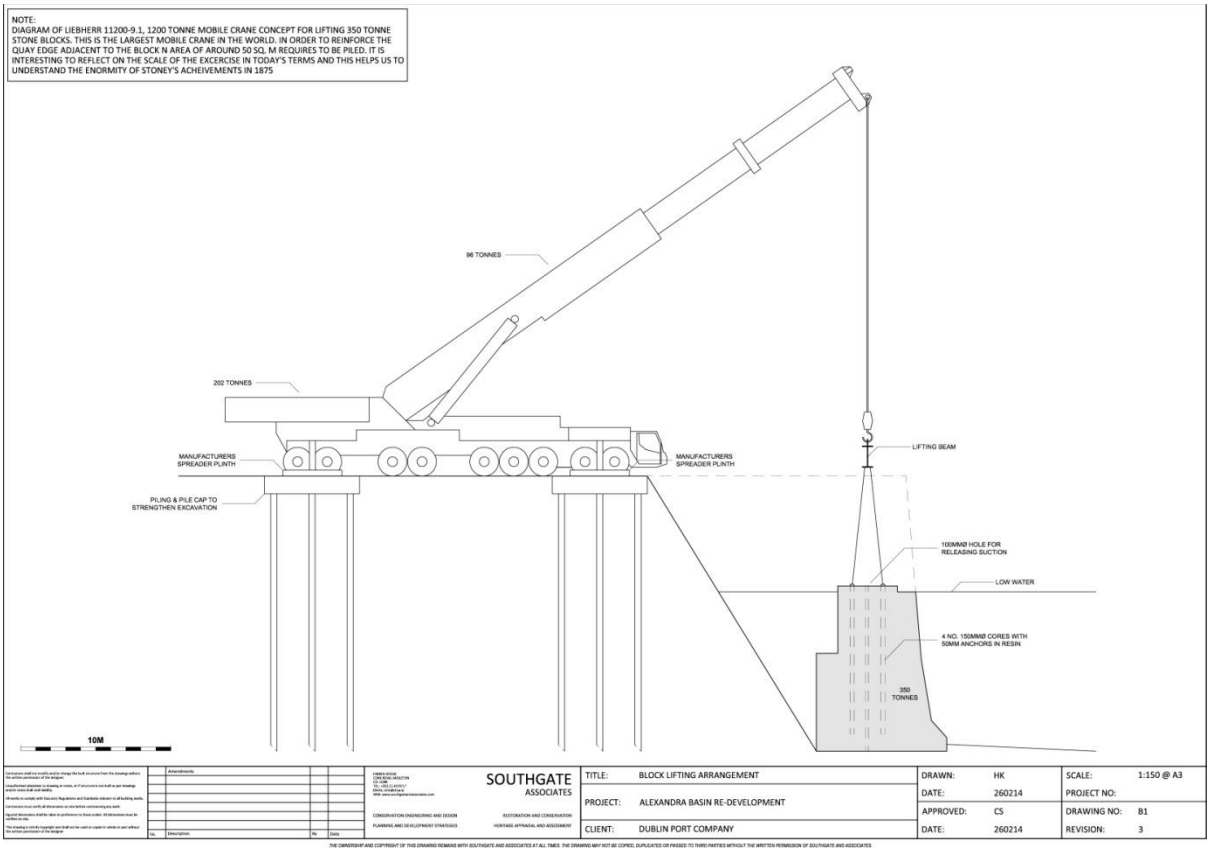


PLATE 25 CONSERVATION ZONE E - CONSERVED STEPS

PLATE 26 INTERPRETIVE ZONE 2 - PIER END AND LIGHTHOUSE

APPENDIX 1

METHODOLOGY FOR LIFTING STONEY'S 350 TONNE BLOCKS AND LIGHTHOUSE



The methodology for lifting the 350 tonne block is as follows

- Carefully demolish adjoining blocks. Monitor condition of block to be conserved
- Core drill 4 No 150mm diameter cores to within 300mm of base of block
- Core drill central 100mm diameter hole for high pressure water jetting to base to relieve suction
- Inspect cores for cracking and carry out compression test if sound
- If not sound choose alternative block
- Install 4 No high tensile steel 48mm anchors in resin capacity 120 tonnes each
- Allow to cure
- Assemble 1200 tonne mobile crane using 200 tonne ancillary crane
- Set out area for outriggers using manufacturers setting out and pile adjoining the quay edge 2 areas of about 2.4m x 4.8 m design loading approx 700 tonnes (14 piles at 50 tonnes)
- Set up crane and lifting beam design loading 480 TONNES
- Carry out water jetting while trial lift 100mm to break suction
- Hold load for 20 mins
- Lift block onto Quay and transfer to low loader
- Reassemble crane and lift into proposed position on piled foundations

Discussion

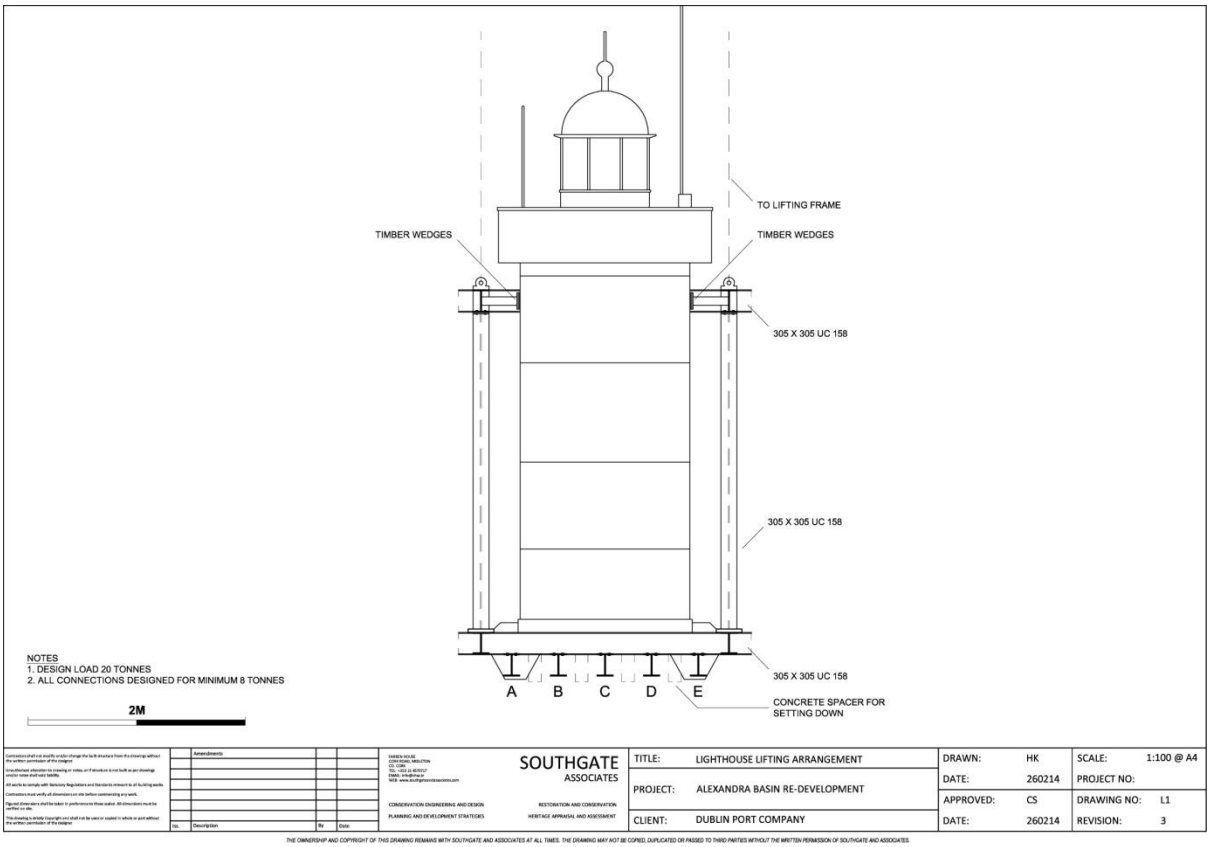
It is interesting to reflect that in 2014 the operation described above uses the largest mobile crane in the world. It is at least 20m long (about ½ the length of Stoney's Shears Crane) and takes about 2 days to assemble using an ancillary low loader and another 200 tonne crane. Once erected the load on the outriggers is so great as to require piling.

It is expected that the block will be in good condition although the original iron lifting rods are not considered to be safe enough to re utilise. The underwater environment protects the concrete from atmospheric corrosion and carbonation.

Nevertheless certain checks should be carried out before attempting the lift as follows:-

- Inspection by divers for cracking

It is recommended that the operation is filmed for record purposes.



LIFTING ARRANGEMENT FOR LIGHT HOUSE

CONSERVATION METHODOLOGIES FOR STRUCTURES RETAINED IN SITU BELOW GROUND

Vibration monitoring for buried North Wall Quay Extension and Graving Dock No 2

The piling operations on the North Wall Quay Extension will be monitored for vibration to ensure that the limits recommended in BS5228-2:2009 are not exceeded, see below. In addition, the piling operations at the North Wall Quay Extension have been programmed for the final phase of the works. This allows the piling contractor to select and refine the optimum method of installation for the piles based on experience gained in the adjoining, less sensitive areas. The initial pile driving will be through soft materials which will offer little resistance; the more difficult installation occurs in the firmer strata below the mass concrete, gravity elements, of the quay wall which provide further protection from the effects of vibration by virtue of their mass.

Extract from BS5228-2:2009 Appendix B

B.4.2 Retaining walls

Unlike conventional buildings, which are tied together by crosswalls, intermediate floors and roofs, retaining walls might have little lateral restraint near their tops. This can result in substantial amplification of vibrations particularly in the horizontal mode normal to the plane of the wall. Amplification factors of between 3 and 5 are typical.

For slender and potentially sensitive masonry walls, it is recommended that threshold limits for PPV of 10 mm・s−1 at the toe and 40 mm・s−1 at the crest should generally be adopted. Propped or tied walls or mass gravity walls can be subject to values 50% to 100% greater than these limits. Similar values could be applied to well-supported steel pile and reinforced concrete retaining walls. Where walls are in poor condition, the allowable values should be diminished and at the same time additional propping or other methods of support should be devised. For continuous vibrations, all the above levels should be reduced by a factor of 1.5 to 2.5 according to individual circumstances.

Infilling of Graving Dock Two

In line with the conservation strategy it is proposed to infill graving dock two with dredge material removed from Alexandra Basin West. The material will be stabilised and then placed in the dock on a suitable separation medium, such as a sand and geotextile layer, to facilitate any future reversal of the infilling process.

The existing pair of lock gates will be positioned at the intermediate gate positions within the dock and the entrance to Alexandra Basin West will be closed by the new quay wall. A structural deck slab, supported on tubular piles, will form the new quay surface and transfer imposed loading from harbour cranes, loading hoppers and conveyors, through piles to the underlying bedrock. The suspended quay slab will also provide stability to the quay wall while protecting the underlying dock from these substantial imposed loads.

The tubular piles will be installed at locations to minimise impact on the existing dock structure through isolation sleeves; these are cored through the dock floor in advance, to minimise the impact of piling operations and future loading on the existing structure. Inclined ground anchors will be installed from the deck slab through the dock floor to provide additional stability to the primary quay wall.

If required in the future, these works can be reversed to return the graving dock to its current condition, with minimal impact on the structural fabric of the dock.

APPENDIX 2

CONSERVATION SPECIFICATIONS

CONSERVATION AND MAINTENANCE OF HISTORIC FABRIC

A2.1 CONSERVATION ZONES IN NORTH WALL QUAY CONSERVING GRANITE

Stone repairs

It is necessary to consider the existing mortar strength, porosity and colour of the stonework when specifying the new mortar. Specialist advice should always be sought and careful consideration needs to be given to the appearance of the repair. The mix should be designed based on hydraulic lime, to be slightly weaker than the surrounding stone and should generally avoid the use of cement. It should be noted that plastic repairs are not recommended for repairing large areas of decayed stonework.

Pointing stonework

Re-pointing should only be carried out when the existing pointing has failed and where water penetration is taking place. Where re-pointing is necessary, flush pointing should be used.

Decayed mortar should be raked out using appropriate hand tools. The use of mechanical equipment such as angle grinders should be avoided at all times as they are difficult to control and can damage the stone arisses and widen joints. Mortar that proves resistant to hand tools should be regarded as sound and should be left in-situ.

Joints should be raked out to the full width of the joint and should be square in profile. The depth will depend on the friability of the pointing but should be at least twice the width of the joint.

Particular care needs to be taken when re-pointing ashlar work where the joints are very fine. Loose mortar should be raked out using a hacksaw blade. New mortar should never be coated over the surrounding stonework and very fine jointing tools are required to maintain a precise finish. It is recommended that masking tape be used to protect the surrounding stonework from mortar staining. In some cases it may be necessary to insert the new mortar with the aid of a syringe

Stone cleaning

Hot water washing after the application of a biocide is recommended

Mortars

Altering the balance of absorption and evaporation through the use of cement mortars has caused long-term damage to stonework and could also have resulted in the decay of mortars. This evaporation process can be hindered with disastrous results when lime mortar is replaced with a harder cement based mortar, which is stronger and less permeable than the brick. When this happens, moisture cannot evaporate through the mortar joint but is forced to evaporate solely from the surface of the brick, resulting in brick decay through frost action and salt crystallisation. For this reason NHL 5 Hydraulic Lime mortars are recommended for re-pointing due to their durability.

Hydraulic lime sets by chemical reaction with very little or no access to air. Hydraulic lime's principal advantage is that it sets faster than non-hydraulic lime and is not as dependent on good weather conditions. It also has an improved durability.

Mortars should not be intended to be permanent but should be sacrificial in nature in that it is intended that it is the mortar joint that decays through moisture movement rather than the substrate itself. Therefore mortars should always be softer and more porous than the substrate to encourage efficient evaporation of moisture through the mortar joint.

It is important that the aggregate is carefully selected in terms texture and of colour, as this will affect the colour of mortars and unpainted renders when carrying out repairs. Aggregates should be well washed to avoid salt attack through mortar contamination, should be well graded and should be sharp in that is it doesn't ball up when rubbed between the fingers.

The proportion of aggregate to binder should be carefully considered, as this will determine the porosity and strength of the mortar once it hardened. Typical mixes often comprise of one part lime to two and a half parts sand but mixes should be specified to suit specific situations.

Lime mortars or renders should not be applied in freezing or very wet conditions as this will hinder carbonation nor should they be applied in very dry or windy conditions as this can cause the mix to dry out too quickly. Protection should be given in the form of fine nets, which allow some circulation of air. It may also be necessary to occasionally spray the mortar with a fine mist to ensure the mortar stays moist in very dry conditions.

Only trained and experience operatives were employed in the preparation, application and immediate aftercare of lime mortars.

A2.2 REPAIRS TO EXTRNAL FABRIC OF PUMP HOUSE ROOF, GUTTERS, AND BRICKWORK

The pump house roof has failed in a recent storm and is to be reslated.

Slate is by nature a very durable material but slate can delaminate in polluted areas and can be damaged by frost action if slates are constantly wet. Slate is also relatively brittle and can easily be damaged by impact. Impact damage caused by traffic across the roof is a particular problem and therefore roof ladders hung from the roof ridge should always be used where access is needed to the roof surface.

The most common defect however is where slates come loose through corrosion of the iron nails securing the slates to the battens. This is commonly known as nail sickness although this is a misleading term as very often a slate comes loose not because the nail has failed but because the timber battens have been softened by wet rot so the nails pull out of the battens. In addition slates can break free where the nail hole becomes enlarged so that the slate slips off the nail head.

Slate replacement

Slipped slates should be secured by either re-nailing or by using hook or clip systems to hold the slate in place while broken slates should be replaced. If there is a need for extensive replacement or re-securing of slates it will be more effective to strip the roof entirely and recover. The critical point for this would be if more than 20% of the slates need some degree of replacement or re-securing. Such practise is preferable as numerous patch repairs can be unstable particularly where the battens and fixings are reaching the end of their workable life.

When stripping a roof it is important that all reusable slate is salvaged and carefully stored for reuse. It should be noted that sound slates would ring when struck with a hammer while defective slates will emit a dull thud. Natural slates should always be used and replacement slates should where possible match the original in terms of colour, texture and thickness. Salvaged slates can be used but care needs to be taken to ensure that they are of good quality. If salvaged slates are too large they can be cut to the required size.

Individual damaged slates can be replaced relatively easily where slates have been single head nailed, by pivoting the surrounding slates aside to give access to the damaged slate so it can be replaced. Where the slates are double nailed it will not be possible to do this so it will be necessary to use a slater's ripper to cut the nails to allow the slate to be removed.

Non-ferrous nails such as copper, aluminium or stainless steel with large heads should be used when re-slating or carrying out repairs. Galvanised nails should not be used, as the zinc coating will eventually break down allowing the nail to corrode.

Slates can also be fixed in place using an S-shaped hook or clip made of copper, zinc or stainless steel, which clips over the battens and holds the slate in place. The visual appearance of these clips can however be obtrusive on an exposed roof and they should really only be used for temporary repairs as they are not very durable. If extensive numbers of these clips are required it is likely that the timber battens are in poor condition and therefore it would be more effective to strip the roof and relay the slates.

Period ridge tiles should be carefully handled and stored for reuse in all roof renewal works.

Ventilation

It is very important to ensure that there is a free passage of air through the roof space so as to ensure that moisture within the roof space can evaporate thus preventing the decay of roof timbers. There are a number of proprietary vents available

and these should be assessed to ensure that there is the minimum visual intrusion. All vent systems should be carefully installed following manufacturer's instructions and recommendations.

Gutters and Ironwork

It is essential that painting be carried out carefully to ensure that a satisfactory seal is provided to the metal. Ordinarily there is no need to strip the existing layers of sound paint but where rust occurs or where paint is loose or flaking, it is recommended that the paint and rust be stripped back to the sound underlying metal.

Paint layers and rust can be removed in a number of ways. Mechanised wire brushes can be used to clean both wrought iron and cast iron. Abrasive cleaning can also be used to clean cast iron. Only skilled operatives should be employed where abrasive cleaning is being considered and precautions such as protective hoarding or nets should be erected to reduce dust levels should be put in place.

The gutter joints should be sealed with Sikaflex 11FC

Brickwork

Any repairs to brickwork should be the minimum necessary to prevent further decay and ensure the survival of the brickwork and the building fabric In the case of the pump house the red brick repair should be replaced. Specialist advice should be sought to ensure that repairs

Brick Replacement.

Great care should be taken when cutting out bricks to avoid damaging surrounding bricks. The cutting out operation should be done by hand as it is very difficult to adequately control mechanised equipment such as angle grinders. Mortar drills can be used with caution to loosen hard mortar.

Replacement bricks should match the originals in size, colour and texture and to achieve this it may be necessary to have new bricks specially made.

If existing brick cannot be used salvaged brick is to be used, it is essential that the brick is facing brick with good weathering capabilities and is free of cracks, fissures and mortar staining. Salvaged brick should be of appropriate size and colour and should be similar in age as well as hardness. It is recommended to reuse discarded brick from the demolition for replacement work.

Plastic Repairs are not advised

Repointing

Repointing should only occur where necessary i.e. where pointing is too hard or deteriorated. All sound pointing should be retained. The use of mechanical saws and grinders should be avoided for raking out – this should be carried out manually using appropriately sized chisels. Masonry drills using small bits may be used sparingly.

Repointing should involve the use of an appropriate lime-based mortar and should be softer than the brick and thereby sacrificial in nature so as to avoid future damage and spalling of the brick.

Summary

- Carry out repairs on a like for like basis.
- Seek specialist advice when considering large-scale repairs and cleaning.
- Only re-point those areas where pointing is too hard or deteriorated and retain all sound pointing.
- Always use lime mortars that are weaker than surrounding brick
- Don't use hard cement mortars or use inappropriate pointing style. It is recommended that samples of pointing be carried out before wholesale re-pointing to determine the appropriate pointing style and mortar colour.

A 2.3 CONSERVATION OF GRAVING DOCK NO 1

A test trench at each level should determine the profile so that mechanical excavation can continue to within 0.5 m of the historic wall. The remaining excavation should be completed by hand. Once the bulk excavation is complete. The remaining areas will have to be carefully excavated by hand

This will be followed by an inspection and cleaning and evaluating masonry will follow the principles in section 8.1. Works should be supervised by a conservation engineer/ architect.

A 2.4 CONSERVATION OF HISTORIC GRANITE PAVING

This may be cleaned and pointed as section 8.1 preceded by vegetation treatment as set out below.

A 2.5 CONSERVATON OF WROUGHT IRON GATE PIERS

Cleaning

Ironwork is generally covered in paint and frequently a build-up of rust in water traps etc. Commonly, paint and some of the rust are removed by grit blasting. Grit blasting will remove the outer surface of the iron, known as mill scale which keeps corrosion at bay. It is a protective surface in its own right, and hence of value.

Rust deposits are normally dealt with by the application of heat. Rust scale does not expand when heated to the same extent as does the iron. (**SAFETY NOTE:** Wrought iron is frequently coated with lead based paints, often with a 75% lead content. Care must therefore be taken, see

www.coatings.org.uk look under *FAQS* for lead paint and then in text click on "Old Lead

Painted Surfaces")

Dismantling

Ironwork is often fastened together with riveted, or tenoned joints. It is not possible to part such joints without at least some damage, or weakening becoming evident on re-assembly.

It is worth avoiding the parting of frame joints etc, merely to gain access to corroded components, as the frame will never be as strong again. Where tenoned joints must be parted, it is nearly always necessary to replace the tenon with a screw or screwed tenon, in order to gain adequate strength.

Protection.

Owing to the natural ability of wrought irons to resist corrosion, by reason of their in-built barriers of slags, it is sufficient to protect ironwork by a good coating of paint. Wrought ironwork needs regular maintenance.

APPPENDIX 3

MARCUS ARCHAEOLOGY SECTION 6.3

6.3 Deep Water Port of Dublin (1800 – present)

The development of a deep water port for Dublin started in the second half of the 19th century, but its need was recognised many years previously. With the formation of the Ballast Office in1707 and the subsequent development of quay walls both north and south, Dublin Port began to transform itself and gradually move away from its medieval origins. These new stone walls provided nice quays and also enabled new land to be reclaimed behind them, thus providing the space and berthage necessary for the rapidly expanding trade that the city was experiencing. By 1728 Charles Brooking shows the North Wall, South Wall (Sir John Rogerson's Quay) and East Wall complete, with a structure at the 'Point'.

North Wall Lighthouse, 1809

In 1809 a lighthouse was constructed at the 'Point', to guide the ships into the channel. This became known as the North Wall Light. It remained until it was replaced by a new cast iron structure at the end of North Wall Quay Extension in 1908.

Graving 'Patent Slip' No.1, 1826

The Ballast Board, in recognition of the need for proper facilities to build and repair some of the larger vessels being built at the time, decided to develop a graving slip for the port. A Scottish shipbuilder Thomas Morton was engaged to provide a slip capable of holding vessels of up 300 tons. He had recently patented a design which consisted of a slipway inclined at a slope of 1:16 which had metal rails imbedded in the structure. Using a winch and cable, a carriage could be hauled up the slip with a boat on board, thus lifting the vessel from the water to a secure dry working area. The slip was built in 1826 and then extended the following year by a further 19m (De Courcy 1996). Located parallel alongside the East Wall, the slip was only recently buried as part of the infill in the 1990s.

Graving 'Patent Slip' No.2, 1832

The success of the first Patent Slip say increased demand for its use, and even after its extension in 1829, it was clear that a second structure would be required. A second slip was ordered from Morton, and this was to accommodate vessels of up to 800 tons. The slip opened in 1832 and included blocks, shores, screws, a stove boilers and a forge (De Courcy 1996). A small pier was constructed running east from the East Wall, and the slip constructed at the end, in a north south direction. This gave the effect of creating a small harbour, and can be seen as the first manifest sign of the development of the modern port. The slip was only recently buried as part of the infill in the 1990s.

North Wall 'Graving Frame', 1835

Located to the south of the 1st Graving Patent Slip and running to the 'Point', the frame or 'Grid' was a heavy timber grillage fixed to the bottom of a flat area of strand, which would allow a vessel to be floated over and secured while then being exposed once the tide receded to allow small repairs to take place. The construction of this 30m long structure in 1835 was a response to the demand placed on the two recently built graving slips, allowing their use to be restricted to more larger works. The grid was increased in size to 60m in 1847 before being filled in and built on as part of the development of North Wall Quay Extension.

North Wall Basin, 1836-1840

The construction of the 2nd Graving 'Patent Slip' had required a causeway or road to be constructed stretching eastwards out into the bay from the East Wall. The additional land required to provide space for the ship works led to infilling on the northern side. Finally it was decided in 1836 to provide deep water facilities with the creation of what was known as North

Wall Basin. A retaining wall was constructed running from the angle of East Wall road east into the bay, on what was to become known as Tolka Quay. The land to the south, between the graving slip and the new wall was filled in. The Breakwater, as it was now known, continued eastwards and was 700m long. It principally consisted of an earthen raised area, constructed using dredged materials from the port area. A second breakwater, this time running north south, was also to be constructed in the same method. The result was an area of water was enclosed to the north, east and west. This area was dredged to 12ft in low water, later deepened to 16ft in 1840. It was dredged deep to allow large steam vessels to moor close to the city and not have to worry about the tides. North Wall Basin was known locally as 'Halpin's Pond'. Bindon Blood Stoney would later take over this project, remove the north-south breakwater and enlarge Halpin's pond as part of his deep water port proposals (see below).

Timber (Steam Packet) Wharf, 1836

As part of the works for the creation of North Wall Basin, a new timber wharf was built out from East Wall. The wharf, which ran in a north south direction parallel to East Wall became known as Steam Packet Wharf, in recognition of the types of vessels it now served. It was only a temporary solution to the problem of providing permanent adequate deep water protection to the new generation of vessels now using the port. This was later to become Crossberth (see below).

Eastern Breakwater (Tolka Quay), 1858-1884

Prior to Stoney's proposals for the Deep Water Port (see below), the Dublin Port and Docks board had asked him for proposals for an eastern breakwater, to run eastwards from a point where the East Wall turned northwest and to provide storm protection for the area known as Halpin's pond. This would later become known as Tolka Quay. He reported back on 12th March 1858 and construction of an embankment commenced shortly after the opening of Graving Dock in 1860. The breakwater project was soon to be subsumed into the more ambitious Deep Water Port proposals. Stoney used the project to conduct comparative tests for his new construction techniques, with which he was locked in a battle with George Halpin Jnr over proposals for a new deep water basin (see below). In 1863 he built two 100ft sections of the Breakwater, one in traditional rubble masonry with lime mortar and the other in Portland cement concrete. The Portland cement concrete worked out 50% cheaper than the more traditional methods, and vindicated Stoney's arguments on efficiency and modern technology. By 1868 the breakwater had reached its furthest point east, and turned south for 450ft (137m). The Breakwater was completed in 1884 with the construction of the pier head, using the same large concrete blocks that Stoney developed for the North Wall Quay Extension.

Breakwater Road, 1826-1860

Originally a causeway built for the construction of Graving 'Patent Slip' No. 2, this small stretch of land was utilised for the construction of the Graving Dock, and allowed access to the northern areas under reclamation. It was superseded with the construction of Alexandra Road in 1881 and became subsumed into the Shipbuilding Yards.

No. 1 Graving Dock, 1860

The Graving Slips built at North Wall in 1826 & 1832 were not sufficient to meet the needs of Dublin almost from the time they were opened. As such, the addition of the 'Graving Frame' in 1835 was only a temporary solution. The Ballast Board took advice from George Halpin and Sir William Cubitt and in 1853 commissioned eminent engineer William Dargan to construct a new dry-dock structure capable of holding some of the largest ships of the time (De Courcy 1996). His tender of £64,154 18s & 8d was accepted on 18th May 1853 (Gilligan 1988) but the final cost ran to £116,704, which also included an

adjoining repair shed (Cox 1990). George Halpin Snr. initially produced some plans for the structure in 1850 which was to be situated beside the 1832 Patent Slip No.2. It was to be 350ft (106m) long and 70ft (21m) wide but this was extended to 400ft (122m) and 80ft (24m) respectively, although the final length was 410ft (124.5m) (Cox 1990, Gilligan 1988). The dock was faced in granite ashlar blocks, which formed descending steps or 'alters'. The gates were designed by Wyld & Mallet, and were built in Dublin by J & R Mallet at the Victoria Foundry. Steam pumps de-watered the dock, and the engine was housed in a structure to the north. It was possible to de-water the dock in a little over 4 hours on a 13ft tide (Cox 1990). The steam pumps were replaced by two electric pumps and pump wells built by Drysdale & Co. of Glasgow in 1908, and the result was the dock could be de-watered in 1 hour. A new structure was built to the east of the Dock housing the new equipment (Known as the 'Pump House') and it survives to this day (Purser Griffith 1915). The gates were replaced in 1881 and again in 1931. The Dock opened on 9th of February 1860 and was closed in 1989. It was filled in 2008 (O'Connor 2008). It should be noted that the Graving Dock represents one of the first involvements of Bindon Blood Stoney on a project in Dublin Port. Having been appointed in 1856 as an assistant engineer to George Halpin Jnr (who succeeded his father in 1854), Stoney found himself working closely with Dargan. The excellent workmanship displayed in the project, particularly with the Masonry finish, is perhaps a direct result of the close relationship the two men had, and acted as a standard for Stoney's subsequent engineering works for the Port (Cox 1990).

LNWR Steam Packet at North Wall Quay, 1861-1908

The London & North Western Railway Company (LNWR) provided a train and boat service between London and Dublin from North Wall Quay. What began life originally as a postal service soon expanded to provide significant passenger services, aided principally with the development of the railways in the middle of the 19th Century. The mail route was contracted out by the Royal Mail and various companies benefitted from it over the years. In 1848 the LNWR, in conjunction with a new railway company (the Chester & Holyhead), were providing the mail service from Dun Laoghaire to Holyhead. However in 1850 the City of Dublin Steam Packet Company won the contract and the LNWR moved their passenger services to the North Wall in 1861. The LNWR concentrated operations along the North Quays and branch lines were built from the main Dublin Terminals. Between 1890 and 1907 they built North Wall Railway Station, servicing both passengers and goods, as well as the animal trade. In 1890 the London and North Western Hotel was opened close by and 1908 passenger services were suspended from North Wall and moved back to Dun Laoghaire. During World War I the four LNWR boats were requisitioned by the British Navy for use as troop ships, one of which (HMS Tara) was sunk off the coast of Egypt in 1915. Following the collapse of the City of Dublin Steam Packet Company in 1919 the LNWR took over the mail contract. In 1921 the company became the London, Midland & Scottish Railway before being nationalised into British Rail in 1948. The ferry service became known as Sealink, before being taken over by Stena Line.

Dublin Shipyards, 1862-1890

In 1862 Thomas Walpole and William Webb set up the first shipyard beside the new graving dock in an area that was to become known as the Dublin Shipyards. The partners leased newly reclaimed land and delivered their first order, an iron float, that year. Three further floats were built in 1883, and a new partner Thomas Bewley was brought in to the business to replace Walpole. The first steamship built in the yards was the Lady Wodehouse, and was launched in 1865. The yard increased in size in 1868 with the leasing of more land but fortunes began to wane, and by 1890 the yard was almost derelict (Gilligan 1988, De Courcy 1996). 45

Planning the Deep Water Port of Dublin, 1861-1862

Stoney had been tasked with finding proposals to provide additional space for ships using Dublin port which would allow for additional trade, and allow Dublin to compete with other ports in the United Kingdom. The Port and Docks Board wanted to develop a long term plan for the future of the port. In January 1861 Stoney presented a preliminary report to the Harbour Improvement Committee of the Dublin Port and Docks Board for the creation of a wet dock, along with a complete reorganisation of Dredging operations. These proposals principally consisted of the construction of a tidal basin or Deep Water port on the northern side of the life, east of East wall road, enclosing an area known as Halpin's Pond. Stoney saw that the constant underpinning of the Liffey Quay walls and timber wharfs only highlighted the need for proper long term facilities. He also recognised that the cost of constructing his ambitious plan in the traditional way would be very high. He therefore sought to find new more cost effective methods of construction for his project. Up until then, the accepted method of constructing quay walls involved the erection of wooden coffer-dams, sealed with clay and pumped dry of water. The walls could then be built in the conventional manner, often using a lime concrete bond and rubble stone body. For the deep water port, Stoney proposed a new methodology still in its infancy, and also new material. Stoney proposed to construct the foundations and main underwater body of the piers using large pre-cast concrete blocks. The blocks would be cast on shore using Portland cement, a material infinitely stronger than the more common and traditional lime-based concrete. His idea was to then lift them into position, sitting on a previously levelled sea bed. Each block would then be tied into each other for stability, and a superstructure above the waterline constructed in the traditional manner. Stoney calculated that the new methodology would be much quicker and more cost effective, but it was a gamble.

On 10th August 1862, Stoney submitted his Draft Plan No.4. He had developed his proposal since its first airing a year and a half previously, and he was much clearer on the details. His proposal principally consisted of the construction of a wide quay, running as an extension to the North Wally Quay, and contained within a new basin. Berthage for ships would be provided on both the basin and river sides, with the pier providing almost 1 mile (1,610m) of deep water quay side. The sequence of events would begin with the construction of the eastern breakwater running east from the Graving Dock (modern day Alexandra Road), which would then turn south, enclosing Halpin's Pond and creating the new Basin. Stoney also proposed an angled entrance to the new port area, to make it easier for ships to enter. The blocks for the new pier would be cast on a new timber wharf beside the Graving Dock, and then transported to create North Wall Quay Extension. He had initially proposed a Low Water Ordinary Spring Tides (LWOST) water depth of 20ft (6.1m) on the basin side and 16ft (4.9m) on the river side, but this was increased to 24ft (7.3m) and 22ft (6.7m) respectively, perhaps a growing recognition of the rapid development in ship building technology. The new basin was to be 47 acres in area, and the project was estimated to cost £350,000. The proposals were met with resistance by the then Inspector of Works George Halpin Junior, who made counter proposals for the development, arguing that traditional methods of construction were tried and trusted, and that Stoney's proposals would not work. This led to Stoney replying on 24th August, not only defending his plan, but arguing that Halpin's proposals would cost more than double to implement and take twice as long. Stoney argued that although his proposed construction method had not been done before on the scale envisaged, it had been successfully done on a smaller scale, and the principal was the same. In the end Stoney won the day and the Board approved his plans, directing him to prepare for the project. In 1863 he conducted comparative tests on two 100ft sections of the Eastern Breakwater. He built one section in rubble masonry with lime mortar, and another in Portland cement concrete. The results showed that the Portland cement concrete worked out 50% cheaper than the more traditional methods, and showed his arguments the previous year to be correct. The Block Wharf was built to the east of the Graving Dock. The Wharf was a timber faced earthen embankment, stepped down so that the final section was under high water. It was specially designed so that the concrete blocks could be cast and delivered. The wharf was 461ft (140.5m) long. Stoney designed the engineering

equipment he deemed necessary for the massive development project. These included the 'Float Shears', diving 'Bell float', Hopper floats (for the associated dredging works) and a steam tug. The 'Float Shears' was essentially a floating crane, designed to lift and deposit the massive concrete blocks from Block Wharf to North Wall Quay Extension. Stoney had designed the specifications for this machine in the early 1860s. It worked as a giant counterbalance rather than a conventional crane, using the pressure of the water to keep the barge afloat. Large water tanks at the back of the vessel were filled to create a counterweight to the 350-ton blocks, and the rising tide lifted the entire vessel, thus allowing the block to be floated into position. Harland & Wolff of Belfast built the hull of the vessel, and the machinery was supplier by Courtney & Stephens of Dublin. The vessel was delivered in 1866, costing £17,058. In order to make sure the blocks were laid correctly, Stoney also needed the sea bed to be properly levelled, something the dredgers could not achieve to his satisfaction. He designed a diving bell which would allow men to manually level-out the seabed in preparation for the concrete blocks. This bell, which can still be seen today on Sir John Rogerson's Quay, was attached to a special floating pontoon with a crane apparatus, and held up to seven men. Both the bell and the pontoon were built by Grendon & Co. of Drogheda, with the horizontal air pump and air tube designed specially by George Strype. Despite all this preparation it was not until 1869 that the Dock Board allowed Stoney to press ahead with the project.

North Wall Quays Rebuilding, 1864-1907

While the Ballast Board had accepted Stoney's proposals for the development of a deep water port, attention was diverted to the state of the North Wall Quays (see above). Halpin had constructed timber wharves all along the quays in an attempt to satisfy the ship owners, who were struggling with the shallow water in the Liffey and the increasing size of modern vessels. However in order to provide greater depth, the quays would have to be rebuilt. Between 1864 and 1907 the northern quays were rebuilt from Commons Street up to the Point, allowing modern steamships and timber merchants to use them (Cox 1990).

North Wall Quay Extension, 1869 – 1884

Stoney's plans that had been accepted by the Harbour Improvements Committee in 1862 were revived in 1869 and he was instructed to proceed with the extension to the North Wall Quay. The Quay was to be double sided, and to be not less than twice the width of the existing quay. The plan was to construct up to 300ft of new quay wall in the first year, and then utilise the new space to allow for double the length for further subsequent years. As soon as each section was finished, it was to be opened to shipping immediately. A loan of £150,000 was provided to the Dublin Port and Docks Board by the Bank of Ireland, and it was decided to carry out the works using the Ports own workforce, rather than going out to contract. Work commenced on the block laying in May 1871, and by the end of the year 10 blocks had been successfully laid down, giving 100ft of new quayside. The design of the new quay was quite simple, but revolutionary for the time and a world first in scale. First the area of the proposed new quay was dredged to the desired depth. Then the diving bell would be lowered over the dredged area, and a team of men would manually level out the sea bed in preparation for the foundations. Once the bed was prepared, the massive concrete blocks would be lifted from Block Wharf and floated into position before being dropped down onto the prepared bed. The dredged material was then pumped into the space between the two rows of blocks to act as fill. The blocks only rose up to about 3ft above the Low Watermark Ordinary Spring Tide (LWOST), with the remaining part of the quay wall built in the conventional way and finished in cut granite ashlar blocks. Previously the use of concrete blocks on the scale of that proposed by Stoney had never been undertaken before. Blocks of up to 50 tons had been used in harbour works, but Stoney proposed using blocks up to seven times larger. The blocks themselves were constructed in a complex manner. They were 27ft (8.3m) tall, 21ft 4" (6.5m) wide and 12ft (3.66m) long and weighed 350 tons. The Blocks

were built using stones oblong shaped stones of up to 2 tons set upright on their ends with the voids filled with a concrete mix of 7:1 Ballast to Cement Concrete, while small stones were also rammed in to compact the block. Four wrought iron girders were incorporated through the block, with two 11cwt foot-plate bars tying them together at the base. The girders protruded the top of the block and were attached to a winch pulley. This spread the load from the iron girders and held the block together. The outer or quay face of the concrete block was faced in Dublin calp limestone, set in a 4:1 sand to cement mortar mix. The blocks took between 3-4 weeks to make, and then needed to cure for a further 10 weeks. They were then ready to be transported into position. The transportation of the blocks involved the 'Shears'. Once the blocks were cured and ready to be placed, the shears float approached during flood tide where the lifting chains were attached to the iron girders cast through the block. The chains were then hauled in by the steam winches, while at the same time water was used to flood the counter balance tanks. The shears float was specially designed by Stoney to withstand the pressures of the weight, and avoid the shears piercing through the hull of the ship when it had a block attached. Once the block was successfully lifted and secured, the vessel was moved over into position and the block lowered at low tide, thus allowing the top part to protrude above the water and aid in the positioning relative to the other blocks. The accuracy required to seal the joints meant the blocks had to be suspended in a horizontal plane before being set. As each block was essentially unique, the task fell to Stoney's assistant, Purser Griffiths, to determine the centre of gravity and vertical axis of each block. Once the blocks were laid in the correct position, they were the sealed and bonded together. The concrete foundation walls were 27ft (8.3m) tall, but only protruded above the waterline at low tide. The remainder of the quay wall was built in the traditional method, with large granite ashlar blocks and the edges coped with blocks ranging from 2-4 tons. This gave the North Wall Quay Extension a height of just over 13m (8.3m concrete block faced with calp limestone and 4.7m granite ashlar masonry). Work progressed up until 1884, when the Port and Docks Board decided to suspend works on the extension once the pier head of the eastern breakwater had been completed. The reason for the suspension was purely financial, but it left the end of the quay unfinished and attention turned to projects on the south quays. At the time of the suspension, the works had provided over 1.5km of deep water berthage and cost £750,000. Transit Shed No. 1 was built in 1882 and was on the river side of the pier. It was soon accompanied by a twin on the northern Basin side. In 1917 the British military build Transit Shed No. 3 (Island Shed) and added a rail line to the Basin side of the pier. The pier itself would remain unfinished until 1931, when works recommenced under Joseph Mallagh to cap the end of North Wall Quay Extension in anticipation of the Eucharistic Congress being held in Dublin in 1932. The Lighthouse at the end of the quay was moved in 1937 and the quay has remained the same since. About 170m of the Basin side of the pier was filled in 1984 to provide more space for vehicle storage. The engineering feat achieved by Stoney was recognised widely, and led to a number of high profile visitors eager to witness the process for themselves. In October 1877 William Gladstone, Prime Minister of Britain on four different occasions was given a demonstration of the whole process, as was the Lord Lieutenant of Ireland, Earl Spencer, who visited in February 1884 in a private capacity. On Sunday April 12th 1885, the Prince and Princess of Wales (future Edward VII and Queen Alexandra) paid a visit to officially open the North Wall Extension. The area was renamed Alexandra Basin, in honour of the princess (see Figures 48 & 49).

Stoney's Shears Float

While the use of concrete blocks in maritime engineering works was not a new occurrence, Bindon Blood Stoney's innovation was the scale and methodology. Previously blocks of up to 50 tons had been the limit, owing to the difficulty in transporting the load. Stoney wanted to use blocks seven times bigger. What was of critical importance to Stoney's plan was a methodology of moving and setting the blocks into place. Many of the engineers at the time did not believe it possible to successfully undertake this. However Stoney achieved his goal by devising and designing his 'Float Shears', essentially a floating barge with a fixed counterweight frame that would use the pressure of the water to maintain the weight of the 360 ton blocks. The hull of the Float Shears was rectangular,

130ft long, 48ft wide and 14ft deep (see Figure 51). It was built by Harland & Wolff in Belfast and powered by a steam engine located in the middle. What was interesting to this 'lifting pontoon' was one end contained a series of tanks, which could be flooded with water to create a counter balance to the concrete block when lifting and transporting. The superstructure of the Float Shears was built by Courtney & Stephens of Dublin, and consisted of a rigid frame, one end anchored to the vessel, the other protruding from the bow with lifting chains. Stoney had to design the structure of the barge so as to distribute the weight of the shears and therefore prevent it puncturing the vessel when it was loading a block (Cox 1990). The Float Shears was delivered to the Dublin Port & Docks Board in 1866 and cost £17,058 (Cox 1990). It was instrumental in the construction of much of the engineering works in the Port up until it was scrapped in 1919. A model of the Float Shears is on display in the foyer of the Dublin Port Company offices at Port Centre.

Stoney's Diving Bell & Float

Central to Stoney's plan for construction the new North Wall Quay Extension with large pre-fabricated concrete blocks was a level sea bed. Due to the size of the block, and that they would be standing vertically, they needed a dead level base upon which to sit. The dredgers of the time were unable to provide this, so Stoney needed to come up with a solution. The concept of a diving bell was nothing new, but Stoney developed it much further. He designed a chamber where seven men could work, manually finishing and preparing the sea bed in preparation for the large blocks. The bell chamber was 20ft square at roof level tapering out wider at the base. It was 6.5ft high so as to allow a man to stand easily within. A large tube projected 37.5ft from the roof and allowed the men to climb in and out. The whole structure was constructed using 25 massive castings, with special joints bolted together. The bell could be lifted and set in place using a special barge, the 'Bell Float'. Similar in form to the Shears Float, it was built by Grendon & Co of Drogheda, who also manufactured the bell and associated equipment. The horizontal air pump and feed tube was designed specially by George Strype of Grendon & Co. The Bell still survives as an exhibit along Sir John Rogerson's Quay.

Goulding's Jetty, 1869

In 1868 the firm of Goulding's signed a lease for 3 acres of newly reclaimed land north of the Graving Dock. They wanted to produce chemical manure (fertilizer) and needed good access to the Port. As part of the agreement, the Dublin Port & Docks Board agreed to build a jetty into Alexandra Basin. The jetty was to be 150ft (46m) but it was then extended to 180ft (55m). A tramway then connected the jetty to the manufacturing plant. The jetty was later replaced by Alexandra Quay.

Alexandra Road, 1881

To facilitate access to the rapid reclamation being undertaken to the north of Alexandra Basin, a new road was constructed and called Alexandra Road. In 1887 rail lines were added to facilitate the chemical manure plant and later the oil facilities. The road eventually stretched out to the Eastern Breakwater, and in more modern times has been extended further eastwards along with the reclamation.

Crossberth Quay, 1885

Originally known as Steam Packet Wharf since it was constructed by George Halpin in 1836, Crossberth was built as a new quay parallel to East Wall Road, but within the new Alexandra Basin. Steam Packet Wharf had already seen the construction of the Harbour Masters Office and residence, along with other ancillary buildings, and the need to incorporate a quayside at the location became apparent with the North Wall Quay Extension project. The edge of the new quay was 200ft

(61m) east of East Wall Road, and was 450ft (137m) in length, running north south. It was constructed in the same manner as North Wall Quay Extension, using Bindon Blood Stoney's Block Shears to drop large 360-ton concrete foundation blocks and a superstructure of granite ashlar. The 1826 No.1 Graving Slip was retained as part of the development. In 1917 the British military built a railway line to the quayside and extended it down the northern side of North Wall Quay Extension, giving the docks direct access to the railway network. An electricity generating station opened in 1907 at the northern end of the quay, before being demolished in 1977. The area of the quay has since been filled in (1984) but survives below ground.

SS Great Eastern at North Wall Quay Extension, 1886-1887

The Great Eastern was designed by Isambard Kingdom Brunell and when launched in 1858 it was the largest ship in the world by some considerable distance. At 18,915 tons, 692ft (211m) long and a beam of 82ft (25m), it had a draft of between 20-30ft (6-9m). It remained the largest in the world for over 40 years. It was built at Milwall, London and because of it's size, no dry dock was large enough for it. As such it had to be built alongside the river and launched sideways. The ship was designed to carry 4,000 passengers and crew around the world without the need to refuel. It was powered by five engines giving a total of 8,000 horsepower to two large paddle wheels and a screw propeller. Six masts also allowed it to harness sail power. Unfortunately the ship never fulfilled its promise, was massively over budget and seemed to be plagued with bad luck and tragedy. In 1866 it was refitted as a cable laying ship and laid the first successful telegraph cable across the Atlantic from Valentia in Kerry to the United States. From 1866 to 1878 it laid over 48,000km of telegraph cable throughout the world, much of it under the command of Irishman Captain Robert Halpin. First appointed Chief Officer in June 1865, he acted as navigator to a second attempt to lay a cable across the Atlantic (the first had ended in failure in 1858). Unfortunately after 1,660 miles the cable was lost in 2,000ft of water. Unable to recover the cable, the project was suspended. The following year between 30th June and 26th July Halpin successfully navigated the ship to the exact place where the cable had been lost, successfully recovered it, spliced it and completed the connection. Two lines of communication between America and Europe (via Ireland) was now operational. Halpin was given a civic reception in Dublin in October 1866 in recognition for his achievements. He was appointed master of the Great Eastern and continued to lay telegraph cables from France to America, and Bombay (India) to Suez (Egypt) in 1870. In 1874 he laid a cable to Brazil before the ship was replaced by a purpose built vessel and retired. Despite the failure of the ship as a passenger liner, its fame was worldwide and in 1888 it caused a stir when its owners decided to come to Dublin as an attraction and allow the public to visit. The ship arrived on 15th October 1886 and stayed until 3 April 1887. Initially the Dublin Port & Docks Board did not want the ship as they feared any accident could both block the port and damage the newly built facilities at Alexandra Basin. It was finally agreed that the ship could moor in the Basin, but on approach the captain felt he could not safely manoeuvre in and promptly docked at North Wall Quay Extension. The Ship stayed there for over 6 months, and huge crowds came to visit. This posed a problem for the port authorities, as the pier was open to the public and the crowds could not be controlled. Finally the ship was sold buy its owners and on 3rd April it left Dublin for Liverpool and was scrapped shortly afterwards. One of the masts is now the flagpole at Anfield Stadium in Liverpool.

Alexandra Wharf, 1899

Bindon Blood Stoney's Block Wharf, which was constructed especially for the construction of the North Wall Quay Extension works, was the subject of redevelopment following the agreement between the port and the Anglo-American Oil Company for the lease of 8.5 acres of land to the east of the Graving Dock. Construction commenced on a series of storage tanks and buildings, including a barrel factory for making oil drums for the British and Irish markets. To allow the new tankers access this facility, a new deep water timber quay or wharf was constructed, set out from the edge of the Block Wharf. This became known as Alexandra Wharf, and was visited for the first time on February 1899 by the steam tanker Potomac, which

discharged its cargo of 2,468 tons of Petroleum. Alexander Wharf was later replaced by Alexandra Quay in the 1920's (see below).

Dublin Deep Water Port Boundary Wall, 1892

With the rapid development of the deep-water port centred off East Wall Road, the necessity to enclose the lands became apparent, and in 1892, a boundary wall was constructed from the River along East Wall Road up to Tolka Quay. The wall, constructed of Dublin calp limestone, contained entrances and gates, and gave a uniformity to the area. Elements of the wall still survive today, along with the original gate and gate piers (minus the capstones) at North Wall Quay Extension.

Dublin Dockyard Company, 1901-1922

The original Walpole & Webb shipyard was reopened in 1901 by a new venture called the Dublin Dockyard Company, headed by two Scottish businessmen, Walter Scott and John Smellie. Invited to Dublin by the Lord Mayor, they were at first not impressed by the state of the facilities. The buildings and machinery were in a very bad state and the yard was overgrown with grass and underwood. The fitting out wharf was a total wreck and there was an obstruction at the mouth of the Graving Dock. However, having come to an agreement with all concerned, including the unions. The new yard was to mirror the Clyde dockyards in both working conditions and rates of pay. A lease was signed on 8th November with the Dublin Port and Docks Board. The first order, a coasting steamship called SS Gertie, was launched on 4th October 1902, from Building berth No.3. The vessel was a 380 ton raised quarterdeck type coaster, with a long single hatchway serving a songle hold and measured 150ft by 24ft powered by a compound steam engine. Between 250-270 men were employed on the project and it was quickly followed by further ships for places as far away as Canada, New Zealand, India, France and Chile. In 1908 the fisheries protection vessel Helga II was built at the yards, as were vessels for the Commissioners of Irish Lights. The largest ship built at the time, the Glenstal, weighed in at 5,150 tons. Between 1902-1914 60 ships were built and launched from the yard. The yard saw a boom during World War I primarily resulting from the necessity to repair and fit out ships for the war effort. Over 3,000 people were employed in the yards between 1914-1918. Finally the yard went into liquidation in 1922. The SS Gertie was sunk by a stray British mine off the Tuskar Rock on 23rd November 1941 en-route from Port Talbot to Waterford with a cargo of Coal.

Dockyard Improvements, 1901

Reconstruction of the fitting-out wharf at the graving dock, dredging of the berth to accommodate vessels safely, renewal of the carriage and winding gear at No.2 Patent Slip beside the yard. Also carried out alterations to the floor of the dry-dock to suit modern vessels and to provide a heavy lift crane at North Wall Extension so ship boilers and other ship equipment could be discharged. Clearance of old yard began in December 1901 and new building to house a plate and angle-bending furnace was completed. New plate rollers, punching and shearing machines, counter sinking and planning machines bought and erected along with hydraulic power and wiring for electricity to operate equipment. With the influx of skilled workers to the yard the company reconstructed an existing building and turned it into a dining room, social hall and sleeping cubicles for those who found difficulty finding suitable accommodation. In 1905 the company built '20 small houses' for the Dockers on a plot at Church road and East Wall, called Fairfield Avenue. The building, called 'Scotch Building' locally, was overseen by Alexander Maclean from Govan, Glasgow and consisted of a 2-storey apartment block with 20 units. When the yard opened, three building berths were laid out, capable of vessels of up to 300ft. These were numbered 1 to 3 from east to west. The berths were on the land between Patent Slip No. 2 and the Graving Dock No.1. During World War I land to the

west of the Patent Slip was also leased and more berths (Called No.4 & 5) were laid out capable of accommodating ships 420ft long. Over 90 classes of tradesmen were employed at the yard.

North Wall Quay Extension 100-Ton Electric Crane, 1904-1986

For many years the North Wall Quay Extension was the site of a large electric crane which was a landmark for generations. Built in Hamburg, Germany, it was erected in 1904 and entered service in July 1905. The Crane was electric-powered, ran on embedded rails and could lift up to 100-Tons. It was the first electric crane in Ireland, and came about following a visit of Sir John Purser Griffith, 'Engineer in Chief' of the Dublin Port and Docks to Hamburg Port in Germany, where he observed this new technology at first hand (Cox 1990). The crane was commissioned from Maschinenfabrik Augsburg Nürnberg AG of Munich and was powered by motors from Siemens Brother's of London. Foundations were laid at the end of North Wall Quay Extension and consisted of 3,400 tons of concrete sitting on 110 piles, which stretched down 40ft (12.2m) into the quay (Gilligan 1988). The crane stood to a height of 80ft (24.4m) and worked for 81 years before being decommissioned and removed in 1986. It could lift 100 tons at 5ft per minute at a radius of 75ft or 20 tons at 20ft per minutes at a radius of 80ft. One of its last jobs was the unloading of the Dart railway carriages in 1984.

Electric 4-ton Cranes & Electric Lighting, 1904

As part of the transformation from steam to electricity within the port, new equipment was ordered. Ten 4-ton electric cranes were ordered for North Wall Quay Extension and Crossberth, and the port area was fitted with electric lighting for the first time.

Crossberth Generating Station, 1905 - 1977

As part of the modernisation programme being undertaken at the port at the turn of the century, plans were drawn up (initially in 1902 then approved in 1904) for the conversion to electric power throughput. New electric cranes could lift cargos at a much more efficient rate and thus speed up the loading and unloading process. As part of this conversion, the port decided to generate its over power needs. A site was chosen at Crossberth and in 1905 a contract was signed with C. A. Parsons of Newcastle-upon-Tyne to supply 3 steam turbines which would couple directly to continuous current dynamos, each giving a normal output of 200Kv at 500v. The station was finally commissioned in 1907. By 1932 it was no longer being used to generate electricity and was called Transit Shed No. 5, and for the Eucharistic congress it was converted into a temporary chapel for the pilgrims aboard the cruise ships docked at the port. In 1940, with the outbreak of World War II it was converted into a peat Briquette making factory, with turf coming into the port from the midlands and stored at Alexandra Quay. It remained a briquette factory until 1948, when it was again returned to service as a Transit Shed. In 1962 it was converted into a 'Read Room', where Dockers would assemble at the start of the day to be assigned their tasks. It was finally demolished in 1977.

The Guinness Ships and Dublin Port, 1913-1993

The Guinness Brewery at St. James's Gate was founded by Arthur Guinness in 1759 and has been synonymous with the city ever since. Within 10 years of opening the brewery, stout was being exported from Dublin, initially to Britain but soon all over the world. Guinness barges plied the river full of barrels from the brewery up to ocean going ships east of O'Connell Bridge. The 1913 general strike at Dublin Port prompted the company to set up its own fleet. The first Guinness ship was bought from John Kelly & Sons of Belfast, who would go on to supply further vessels. The SS W. M. Barkley was a 569-ton coaster, built in 1898 in Ailsa Shipping yard in Troon, Scotland. It sailed from Dublin to Liverpool and Manchester delivering

stout. During WWI it was briefly requisitioned by the British Admiralty but returned in 1917. The ship resumed Guinness duties until the 12th October 1917, when it was sunk by a German submarine off the Kish bank with the loss of 5 lives. The SS W.M. Barkley was the first of four vessels in the early years of the fleet. The SS Carrowdore (1914 - 1953), SS Clareisland (1915 - 1931) and SS Clarecastle (1915 - 1953) all entered service for the Brewery. In February 1914 the SS Carrowdore, a 598-ton self-trimming 'collier' built by Scotts of Glasgow, was also purchased from John Kelly & Sons of Belfast. The ship carried stout in wooden casks from Dublin to London. In July 1941 it was dive-bombed by the German Luftwaffe (air force) about fifteen miles from Dublin, but the bomb ricocheted off the boat and exploded in the water, causing minor damage. The 663-ton SS Clareisland and 627-ton SS Clarecastle were both built in 1915, again purchased from John Kelly & Sons and sailed the Liverpool and Manchester routes. In 1930 a new ship was ordered for the fleet, specifically designed for the export of stout to London. The 1,151-ton SS Guinness (1931-1963) was built at Aisla shipyard in Troon, Scotland and was launched in May 1931. Following delivery, the SS Clareisland was sold to the Antrim Iron Ore Co. In late 1938 it sank off the Isle of Man ferrying a cargo of iron ore. The fleet of three steamships were a fixture of Dublin Port up until the early 1950s, when new motorised vessels were brought in to replace them. These new motor ships became known as the Guinness Ladies. The MV Lady Grania (1952 - 1976) was built at Ailsa Yard, Troon, Scotland and arrived in Dublin in December 1952. The MV The Lady Gwendolen (1953 - 1976) was built by the Ardrossan Dockyard Company and arrived in Dublin in early 1953. They were built to the specifications of Guinness Chief Engineer, W.D. Robertson, designed to hold new special stainless steel 500-gallon transportable beer tanks in air-conditioned temperature controlled holds. Following the arrival of the new ships, the SS Clarecastle and SS Carrowdore were sold off to Davidson's of Belfast, before being broken up in 1958. Two further ships were added to the fleet, the MV Lady Patricia (1962 – 1993) and MV Lady Miranda Guinness (1977 – 1993). The 1187-ton Lady Patricia was built in 1962 by Charles Hill and Sons of Bristol for £280,000 and was capable of transporting 148,000 gallons of stout. It replaced the last steamship of the fleet, the SS Guinness, which left Dublin in 1963 and was broken up on the Clyde subsequently. In May 1973 the Lady Patricia was converted into a tanker, becoming what is believed to be the first beer tanker ship in the world. The Lady Patricia was complemented by the MV Miranda Guinness (1977 – 1993). The Miranda Guinness left Dublin Port for the first time on 26th January 1977 and was the world's first specially commissioned bulk liquid (beer) carrier. Built in Bristol, it had twin diesel engines capable of 16 knots and could hold almost 2 million pints of stout in fifteen stainless steel tanks. The Beer was pumped directly aboard the ship at City Quay from road tankers. Irish Marine Services Ltd took over the management of the fleet in 1987 and in 1993 Guinness stopped using the bulk liquid carriers, preferring to use roll-on roll-off road tankers instead. The ships were moored at North Wall Quay Extension for a number of months before being sold off. The Lady Miranda Guinness and Lady Patricia left North Wall Quay in April 1993 and were broken up shortly afterwards.

Dublin Lockout, 1913 - 1914

The Lockout of 1913 was a major industrial dispute between employers and workers in Dublin. The dispute lasted from 26th August 1913 to 18th January 1914 and witnessed both brutal violence and repression from the authorities and hardship for the people involved. The backdrop to the dispute was the appalling conditions that thousands of workers lived in at the time in Dublin. Trade Unions had begun to rise and assert themselves, looking for better wages and conditions for their members. The sudden rise and militancy of trade Unions within Ireland had been seen with some alarm by employers, who viewed the organisations with suspicion. The spark that ignited the dispute was a decision by an Irish Businessman, William Martian Murphy, chairman of the Dublin United Tramway Company and owner of both Cleary's department store and the Imperial Hotel. Having chaired a meeting with about 300 employers in July 1913 to counter the rise in trade unionism, Murphy set about making sure the Irish Transport and General Workers Union (ITGWU) did not get a presence into his companies. On 21st August he fired 100 workers from the Dublin United Tramway Company. The response came at 10:00 on 26th August 1913 which happened to be the first day of the Dublin

Horse Show. Tram drivers and conductors stopped abandoned their trams and about 700 of the 1,700 employees went on strike. The resulting dispute saw the employees 'locked out' by employers, and a mass strike ensued. Blackleg labour was sourced from elsewhere in Ireland and Britain, with violent pickets and intimidation used against 'strike breakers'. On 31st August James Larkin addressed a banned meeting from a balcony of the Imperial Hotel. He was quickly arrested and the police responded infamously to the angry crowd by baton charging. Two people were killed and hundreds injured and this along with other incidents resulted in the formation of the Irish Citizens Army. On 28th September a relief ship sent from British Unions, The Hare, arrived in Dublin with 60,000 'family boxes', each box holding enough food for five people. The aid was distributed to thousands of people from Liberty Hall, in exchange for vouchers which had been distributed previously by the union. On 12th November over 1,000 labourers in Dublin Port stopped work in solidarity with the strikers, principally affecting the Dublin Steam Packet Company, the Burns Line and the Haysham Line (Intelligence Notes 1913). With the strike dragging on for months, severe hardship led to many families starving, and relief ships from Britain arrived with food parcels. However the employers held out, and by the end of January most workers had returned to work.

Seizure of 'The Worker', 1914

Following on from the industrial disturbances of 1913 and early 1914, and the subsequent outbreak of war, the British Government introduced a Defence of the Realm Act on 28th November 1914 which allowed for the censorship and banning of publications it deemed inflammatory. In reality this was used in Ireland as a way of suppressing the ITGWU and other social movements. The Union had its own paper, The Irish Worker, which was beginning to have a wide circulation. First published by Jim Larkin in May 1911 it savaged capitalism, imperialism, employers and the Irish Parliamentary Party. It also had a distinct anti-war opinion which did not sit well with London. Widely blamed for stoking up industrial disputes and radicalising workers, The Irish Worker was subsequently banned under the act and its printing presses seized. However arrangements were made for a sister paper, The Worker, published in Glasgow, to be imported and distributed. The 1st issue was dispatched but British forces seized the shipment at North Wall Quay Extension on 26th December and the publication ceased.

Dublin Deep Water Port & World War I, 1914-1918

The outbreak of World War I led to the British military commandeering Alexandra Basin on 4th August 1914. Two Naval officers were installed at the Harbour Office, guards were posted and naval ratings and soldiers were billeted in the Dockers 'cookhouse'. Immediately the military banned North Wall Quay Extension and Alexandra Quay from commercial use, later allowing some traffic to Alexandra Quay as long as the military got preference. North Wall Quay Extension was retained exclusively for the military. A dramatic logistical operation was beginning to take shape. All military regiments based in Ireland had to be transported to France, including horses, carriages guns, cars trucks and tanks. Civilian ships were requisitioned as transports and had to be fitted out and made suitable for their new uses. Much of this work was undertaken at the Dublin Dockyards. The pressure on the Dockyard during the war increased due to the lack of sufficient space. Erosion at the launching ways had meant large timbers had been used to prop up the wharf. In 1917 the Dublin Dockyard Company agreed to lease land to the east of the Graving Dock while the Dublin Port & Docks Board agreed to extend Alexandra Wharf further eastwards to allow for an expansion in the operations of the shipbuilders (see above). Berths No.4 & 5 were laid out and the yard could now accommodate vessels up to 420ft long. Among some of the changes undertaken by the British military during this occupation was the refitting of the sheds on North Wall Quay Extension so that they could billet troops and crews waiting for troop transports. Facilities were also made to temporarily house wounded soldiers returning from the war in France and elsewhere. Both the existing sheds were enlarged and a third island shed (No. 3) the East Wall Road end. In 1917 a direct rail connection to Crossberth and the Alexandra Basin side of North Wall Quay Extension was made which resulted in the removal of a stretch of the 1892 boundary wall (now the entrance to the P&O Terminal).

Dublin SPCA Cats at North Wall Quay Extension, 1914

In October 1914 the British military had a significant rat infestation in the transit sheds along North Wall Quay Extension. They turned to the Dublin branch of the Society for the Prevention of Cruelty to Animals (SPCA) for help. Following discussions, it was agreed that the SPCA would rent the military 10 cats for two months to deal with the rats. They were paid 1 shilling per cat, and the military also had to employ a part-time attendant to take care of the animals and to provide them with milk and food. The contract was not renewed so it is assumed the cats performed their tasks with great efficiency.

Test Run of New Motor Bus, 1914

On 28th July 1914 an experiment was undertaken along the north quays. A new fleet of motor busses, the first ever seen in Ireland, ran from O'Connell Bridge up to North Wall Quay Extension and back. Up to this point public transport was dominated by the electric or horse-drawn tram. The promotion of the new motor bus was a direct result of the events of the Dublin Lockout (see above). The new mode of transport was seen as requiring less labour then its equivalent, the tram. This event can be seen as the start of the decline of the Tram system in Dublin.

Arrival of War Wounded from France, 1914

On 7th September 1914 the first reality of the war was seen at North Wall Quay Extension when the hospital ship HMS Oxfordshire arrived with 611 wounded British soldiers. They had been among the first casualties of the British Expeditionary Force (BEF) which was engaging the Germans, and had been shipped out from Le Havre. They were treated at Leopardstown Hospital, many suffering from shell shock (Yeates 2012).

Dublin Dockyard World War I Military Production, 1914-1918

Following the outbreak of war, the Dockyard Company signed a number of agreements with the War Office for the supply of military items other than ships. The yard was thus engaged in the production of bridging stores, mining cases, trunks, telegraph poles, ladders and pontoons (Sweeney 2010). About 100 pontoons were supplied, built of yellow pine, covered in canvas and made watertight. They were able to be interlocked together and compatible with those made elsewhere (Smellie 1915). Most of these items were made for the Royal Engineers.

Artillery Shell Factory, 1915-1919

In 1915 part of the shipyard factory was converted to allow for the production of artillery shells for use by the British Army in World War I. The Dublin Dockyard War Munitions Company Limited was established in December 1915 by Walter Scott and John Smellie, with John Purser Griffith as chairman. The new company immediately received an order from the Ministry of Munitions for 50,000 18-pound artillery shells. The appropriate machinery was ordered from Manchester and would be capable of producing 2,000 shells a week. The factory was to be operated by women only, with a maximum of 5% men or boys allowed. At the beginning 12 women were sent on a six-week training course to the Vickers plant in Barrow-in-Furness and they returned to train the rest of the workforce. The workforce comprised 200 girls or women and was said to have operated very efficiently (Smellie 1923, Sweeney 2010).

Merchants Warehousing Company Grain Silo, Alexandra Quay, 1915-20

The Merchants Warehousing Company was incorporated in 1889 and was principally involved in supplying storage and transportation for importers and exporters. Many of its early premises were located along the East Wall, and in 1895 it bought the 'East Wall Ice House', a venture into cold

storage. In 1910 the company leased two acres at the port, beside what would later become ship building slips No. 4 & 5. Planning for a reinforced concrete 14,000-ton grain silo commenced and by 1915 a significant programme of piling had commenced. The building was completed in 1922, designed by Hicks and built by J. & W. Stewart. It was extended by 9,000 tons in 1927 and by a further 16,000 in 1936. The building was connected to the Dublin Port Milling Company's new Mill complex, which was being developed at an adjacent site at the same time (DPH 1967).

Steam Tug Slieve Foy & Gallipoli Landings, 1915

The Slieve Foy was a small vessel built at the Dublin Dockyards for the Carlingford Lough Improvement Commission, Newry, in 1910. It was a small tug 102ft long with a beam of 22ft and was designed to act as both a tug and a buoy tender for maintaining navigation marks at Carlingford Lough. Powered by 82 horsepower twin steam compound engines with twin screw propellers, it was capable of 11.5 knots and had a crane derrick able to lift 5 tons (Sweeney 2010). In 1915 it was taken over by the Admiralty and sent to the Dardanelles to act as a salvage vessel following the infamous allied invasion landings where many Irish soldiers were killed.

North Wall Quay Extension, Sir John Maxwell & Dublin Easter Rising, 1916

Following the occupation of buildings on 24th April 1916 by the Irish Republican Brotherhood under Pádraig Pearce, the British Military rushed troops into Dublin and attempted to secure important sites. One such site was the Port, and North Wall Quay Extension in particular. On hearing of the outbreak of fighting, an order was made directing all personnel at the Port to stay on the premises and to keep the port operational. The Docks were defended by Major H F Somerville with a detachment of troops from the Dollymount School of Musketry. They were reinforced by 330 officers and troops of the 9th Reserve Cavalry Regiment, who had arrived by train from the Curragh. At 02:00 on 28th April, Sir John Maxwell arrived at North Wall Quay Extension to take charge of the city which had been placed under Martial Law. He had been dispatched by British Prime Minister Henry Asquith, and Maxwell's decision to execute the leadership of the rising is widely seen as a critical event which turned public opinion and ultimately led to the War of Independence and the creation of the Irish Free State.

HMY Helga II & Dublin Easter Rising, 1916

Famous for its role in the shelling of Liberty Hall and O'Connell Street during the 1916 Easter Rising, the Helga II was originally built in the Liffey Dockyard in 1908, and was commissioned as a fishery protection cruiser under control of the Department of Agriculture & Technical Instruction. The keel was laid down on 20th December 1907 and was designed by naval architect James Maxton of Belfast. The ship was launched on 16th May 1908 and named by Mrs TW Russell, wife of the deputy head of the fisheries department. The ship underwent speed trials on the Cylde and in July was handed over and started work as a protection vessel. A searchlight was mounted on the bridge and a 3-pound non-explosive solid shell gun on the forecastle. In March 1915 it was taken over by the Admiralty and converted into an armed steam yacht serving as an anti-submarine patrol vessel and escort for the Irish Sea during World War I. Based in Dun Laoghaire it was renamed HMY Helga and given two 12-pounder guns, one fore and aft, at the Dublin Dockyards. In April 1918 it successfully sank a German submarine off the Isle of Man and carried a star on the funnel as a result of the sinking. When the Leinster was struck by a torpedo in October 1918 the Helga managed to save 90 passengers, although a further 600 were lost in the tragedy. The Helga was later used to transport Black and Tans around the coast of Ireland during the War of Independence. The Helga was given to the Irish Free State in August 1923 and renamed Muirchu, one of the first ships in the Irish Navy. In the inter-war years the Muirchu again served as a fisheries protection vessel until the outbreak of World War II, where it became part of the coast guard. At the end of the war the vessel was sold to Hammond Lane Foundry, but sank off the Saltee Islands while en route Dublin on the 8th May, 1947. The Helga is famous for its role in the 1916 Easter Rising in Dublin. On Monday 24th April, at the outbreak of the rising, it was ordered from Dun Laoghaire into the Liffey where it immediately ferried British troops

who had arrived via train from the Curragh to the Pigeon House generating station and moored at North Wall Quay Extension overnight under military guard. On Tuesday 25th April it steamed out and 'made fast in the River Berth. Guns, crew and rifle party standing by' (Sweeney. At 05:20 it proceeded up River and fired two rounds into the mill near Grand Canal Dock held by the rebels. At 14:15 it commandeered 34 short deals from the quay for defence for gun platform and bridge and built up a barricade and coaling irons on the front part of the gun platforms and front of the navigation bridge. At 15:00 sandbags were placed around the forecastle. At 22:45 it steamed to the Pigeon House Fort where the power station was allegedly under attack from the rebels, and anchored off the fort at 23:24 (there is no record of an attack at Pigeon House, so the entry into the ships log may be the result of miscommunication – Sweeney 2010). At 08:00 on 26th April 1916 the Helga was ordered up-river, along with another vessel the armed trawler HMS Sealark II, where they both anchored off Georges Quay on the southern side of the Liffey (McNally). At 08:30 Liberty Hall was bombarded by the Helga for an hour using the ships two 12-pounder guns. Twenty-four rounds were fired in total. It is believed that the ship focused on the building beside Liberty Hall, completely destroying it with the high explosive shells, while field artillery located at Tara Street focused on Liberty Hall itself. The Helga then sailed down the Liffey to the Pigeon House Fort and stayed there until mid-day on the 27th where it returned to begin shelling the rear of Boland's Mills, occupied and commanded by Eamon de Valera. The ships log records 14 rounds fired at 12:15. These were the last shots fired by the Helga, as it retreated to the Pigeon House again, bordered the steamship Campbeltown looking for hidden fugitives and stayed there until leaving on the 1st May. It is believed that the ship was not involved in the shelling of O'Connell Street as the navel guns would not have been able to elevate high enough to clear the intermediate buildings. Indeed it is also thought that the Loop-line Bridge posed a significant barrier to the gunners to such an extent that they had to fire under it while attacking Liberty Hall.

Deportation of Easter Rising Rebels, 1916

Following the surrender of the rebels British forces arrested 3,226 people and they were detained for various periods at various places. The majority (2,262) were transported to prisons across the channel and their transportation became known as the 'deportation' of 1916. On 30th April 1916 the first batch of 200 prisoners were marched down the North Quays to North Wall Quay Extension and loaded into open cattle-pens aboard a cattle ship. The conditions were described as terrifying, with many violently sick, wet from crashing waves and also worried about possible German submarine attacks. They ended up at Knutsford Detention Barracks in England. On 1st May 239 prisoners were sent to Stafford Detention Barracks via North Wall Quay Extension. The 2nd May saw 303 prisoners sent to Knutsford, 376 to Wakefield Detention Barracks on 5th May, 203 to Stafford and 197 to Wandsworth on 8th May on while 54 went to Wandsworth, 273 to Wakefield and 53 to Stafford on 12th May. The 19th May saw 40 sent to Woking, 59 to Lewes, 100 to Wakefield, 49 to Wandsworth and 50 to Knutsford on 1st June, 41 were sent to Knutsford on 6th June while 25 were also sent to Knutsford on 15th June. Many of the prisoners were released after a short time and allowed to return to Dublin via Dun Laoghaire, while the majority were home by the end of the year (Sinn Fein Rebellion Handbook 1917).

Steam Tug Slieve Foy & Lawrence of Arabia, 1916-1917

The Slieve Foy was a small vessel built at the Dublin Dockyards in 1910 (see above). In 1915 it was taken over by the Admiralty and sent into action in the Mediterranean. Between 1916 and 1917 the Slieve Foy was involved with Laurence of Arabia in supporting the Arab rebellion against the Turks by taking part in the Red Sea blockage as well as transporting arms, munitions, provisions money and secret agents from Suez and Port Sudan to the Arabian Coast. In April 1916 it steamed into the port of Ismalia (Egypt) and, under long range rifle fire, destroyed 12 mines that had been secretly laid by the controlling Turkish garrison (Navel Review No.4 1925). The vessel was scrapped at Ringsend in 1960.

Dublin Shipbuilders Limited, 1919-1926

Dublin Shipbuilders Limited started life at a very difficult time, just after the end of World War I and the depression that followed. Although in existence since 1919, it was a full 2 years before the first ship was launched, the SS Craigavon, for clients in Belfast. Up to 300 men were employed in the shipyard, which was described at the time as being fitted with the most modern appliances for the construction of ships (Sweeney 2012). The second ship launched was the 681-ton SS Moygannon in 1921, which was recorded by Pathé News (see link below). The third ship launched was the SS Kyleberg, also in 1921, and was a mirror image of the SS Moygannon. The last ship built was the 498-ton SS Lady Anstruther. In September 1922 the shipbuilders went on strike, and the yard was paralised. Put up for sale, no buyers were found and the company was wound up in 1926 (Sweeney 2010).