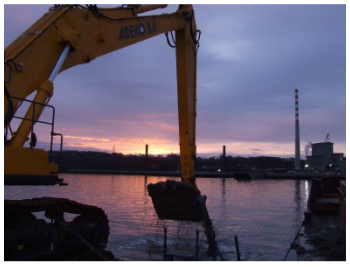
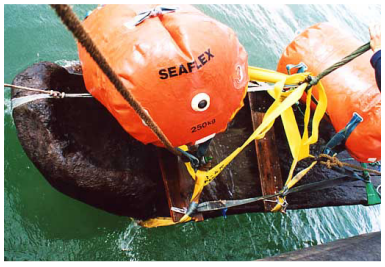
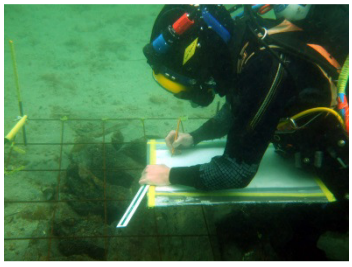
Appendix 10A
Underwater Archaeological Impact Assessment (UAIA) Lower Lee (Cork City) Drainage Scheme

Leading Maritime Archaeology

Underwater Archaeological Impact Assessment (UAIA)
Lower Lee (Cork City) Drainage Scheme

16D0053, 16R0079



Underwater Archaeological Impact Assessment (UAIA)
Lower Lee (Cork City) Drainage Scheme

16D0053, 16R0079

2nd December 2016

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EXECUTIVE SUMMARY

The Archaeological Diving Company Ltd (ADCO) was appointed by Ryan Hanley, Consulting Engineers on behalf of the Office of Public Works (OPW), to carry out an Underwater Archaeological Impact Assessment (UAIA) for the River Lee (Cork City) Drainage Scheme. This work has been carried out as part of the pre-planning requirement and will inform the Cultural Heritage chapter of the project Environmental Impact Statement, which is being prepared in partnership with John Cronin and Associates.

The proposed drainage scheme will be carried out under the Arterial Drainage (Amendment) Act, 1995, and has been designed to provide protection to properties in the study area from the 1-in-100-year fluvial and 1-in-200-year tidal flood events. The scheme was commissioned by the OPW and developed by ARUP in association with JB Consulting, in co-operation with key-stakeholders, including Cork City Council, Cork County Council, and the ESB.

The overall strategy incorporates a series of flood management measures that are designed to mitigate for future flooding events. These measures include: the development of a fluvial flood warning system, the designation of appropriate floodplains, implementation of direct defences, the insertion of a flow-control chamber and demountable flood gates, the re-grading of existing ground levels, and an improved drainage infrastructure. These defence measures are to be enacted at a series of locations along the River Lee, with much of the defence work being carried out on the North and South Channels within Cork City. The westernmost (upstream) river impact location is located at Ballincollig, where the river intersects the townlands of Ballincollig, Lackenshoneen, and Collyduff. The majority of the proposed flood relief measures are located further downstream, within the tidal- influenced sections of the River Lee:

- North Channel, stretching from Thomas Davis Bridge (upstream) to Michael Collins Bridge (downstream).
- South Channel, stretching from Donavan Bridge (upstream) to Eamon de Valera Bridge (downstream).

It is the direct defences that are of particular interest from the cultural heritage aspect of the EIS. These defence measures, in the most part, result in direct impacts to the existing quayside/ river environment and require considered archaeological mitigation. The direct defence methods proposed as part of drainage scheme include the following: the placement of new earthen embankments, the construction of new reinforced concrete walls, the

insertion of sheet piles in-river, the construction of new parapet flood defence walls, the placement of reinforced glass flood defences, the insertion of demountable flood gates, the strengthening of existing bridge parapets, modifications to a number of stepped river-access points, and the reconstruction/ maintenance of existing quay walls.

Evidence of human activity within the environs of present-day Cork City can be found throughout the prehistoric period, with this early activity principally surrounding the estuarine and harbour areas located to the east of the city. However, the development of a tangible settlement located on the floodplains of the River Lee can be traced to the Hiberno-Vikings, settling on the South Island, and the later Anglo-Norman expansion of that settlement; forming a medieval walled-city that encompassed both South and North Islands. While the city's core has its origins in the medieval period, it is the Industrial period that has exercised the greatest influence on the settlement's development, shaping the conurbation and producing much of what currently defines the city's modern urban space. In particular, the River Lee has witnessed successive alterations/adaptations from the mid-1700s onward, facilitating the development of extractive and manufacturing industries, the enhanced transportation of goods (both to and from the city), and the establishment of public utilities to supply the municipality. As a result, it is Industrial period (1750-1930) sites that are best represented within the context of the UAIA undertaken for the scheme.

The in-water archaeological assessment comprised a *c. 7*km stretch of the River Lee, encompassing a 500m stretch of the waterway at Ballincollig, and both channels of the river as they flow through the centre of Cork. The assessment recorded riverbed topography and provides a detailed account of the existing riverside environment. On-site work comprised systematic non-disturbance underwater and waded inspection of the river channels, their attendant quayside structures, and any associated riverine features, including bridge structures (piers and foundations), weirs, culverts, river-walling, and any natural features encountered. On-site work was carried out between the 7th and 16th of June 2016, under licence from the DAHRRGA; licence numbers 16D0053 and 16R0079.

The UAIA identified fifty-seven known or previously unrecorded features of historic/ industrial archaeological significance within the River Lee study area (Features F01-F057). Identified features include: twenty-one bridge structures (F001-F021); multiple sections of masonry quayside (F023-F045), associated culverts (F33a, F40a, F041a, F045a); and nine weir structures (F046-F054). A set of previously unrecorded features (F055-F057) were also encountered for the intertidal foreshore adjacent to Lee Mills, located on the North Channel. These include a timber structure (F050), forming part of a possible barge landing platform,

timbers from an associated timber walkway/jetty structure (F051), and a number of arched-culverts (F057). The above features are discussed according to site type in Section 5 of this report. In addition, a catalogue of the bridge and quay sites has been included in Appendix 1 and 2. Impact assessment and proposed mitigation is presented in Sections 6.0 and 7.0 respectively.

This report recommends that further archaeological work in advance of construction is required at five locations; to include Alderman Reily's Bridge (F005), Crosses' Green Quay (F36/F036a), an unnamed quay (F039), the downstream side of Albert Quay and its associated timber Wharf (F045/F045a), and a section of riverside wall at Lee Mills (F057). This work is to include detailed survey of each structure, carried out to a level that would constitute preservation by record of these structures. In addition, timber structures F055 and F056 are to be removed under archaeological supervision or subject to an engineering strategy to allow their preservation *in situ*. It is also recommended that archaeological monitoring of ground disturbances during construction be undertaken, with the proviso to resolve fully any archaeological material observed at that point.

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LIST OF ABBREVIATIONS

ADCO	The Archaeological Diving Company Ltd
ACA	Architectural Conservation Area
CFRAM	Catchment Flood Risk Assessment and Management
DAHRRGA	Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs
DAU	Development Applications Unit
EIS	Environmental Impact Statement
E	Easting
N	Northing
NGR	National Grid Reference
NIAH	National Inventory of Architectural Heritage
OPW	Office of Public Works
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
UAU	The Underwater Archaeology Unit
UAIA	Underwater Archaeological Impact Assessment

1.0 INTRODUCTION

The Archaeological Diving Company Ltd. was appointed by Ryan Hanley, consulting engineers on behalf of the Office of Public Works (OPW), to undertake an Underwater Archaeological Impact Assessment (UAIA) along a *c.* 7km section of the River Lee. The assessment area encompasses two substantial sections of both the North and South Channels, as they flow through the centre of Cork, and a 500m stretch of the river near Ballincollig (Figures 1-2). The UAIA was commissioned as part of the EIS for the River Lee (Cork City) Scheme and is designed to provide a thorough baseline of archaeological information for the riverine areas under potential impact from the proposed development.

On-site assessment comprised the systematic visual inspection of the in-water extent of the proposed drainage scheme. The archaeological assessment sought to record riverbed and bankside topography, assess the potential of riverbed deposits to retain archaeological material, and identify any features/structures of archaeological or historic significance that are present. In addition, targeted metal-detection was employed to help assess the riverbed and highlight any metallic concentrations present within those deposits.

The UAIA was carried out in accordance with the terms of Section 5 of the National Monuments Act (2004 Amendment) by a team of underwater archaeologists and a certified surveyor between 7th and 16th of June 2016, under licence from the DAHRRGA; licence numbers 16D0053 and 16R0079.

The following report presents the findings from the UAIA, and includes a catalogue that is a factual record of any known and newly-encountered features of archaeological or historic interest. The report assesses the potential level of impact arising from the development at the location of each of these features, and provides a set of specific mitigation measures relating to each feature. The UAIA was primarily concerned with in-field assessment. A desktop study providing a comprehensive outline of the archaeological and historical background of the assessment area has been completed separately by John Cronin and Associates as part of the project EIS.[1]

2.0 PROPOSED DRAINAGE SCHEME

The Office of Public Works (OPW) in partnership with Cork City and Cork County Councils carried out a Catchment Flood Risk Assessment and Management (CFRAM) Study for the Lee Catchment. The subsequent Catchment Flood Risk Management Plan (CFRMP) recommended the further optimisation of the operation of Carrigadrohid and Inniscarra reservoirs coupled with a flood forecasting system and flood defences downstream of Inniscarra and through Cork City where

[1] Chapter 10, Cultural Heritage Assessment, River Lee (Cork) Drainage Scheme, Environmental Impact Statement, prepared by John Cronin and Associates, November 2016.

necessary as a viable flood risk management option for Cork City and the Lower Section of the River Lee with respect to flooding from both riverine (fluvial) and tidal sources. Arup in association with JBA Consulting were commissioned by the OPW (the lead agency for flood risk management in Ireland) to develop the Lower Lee (Cork City) Scheme. The scheme has been developed in close co-operation with key stakeholders, in particular; Cork City Council, Cork County Council and the ESB.

The proposed scheme incorporates a series of flood management measures that are designed to limit any future flooding events; providing protection to properties from the 1-in-100-year fluvial and 1-in-200-year tidal flood events. These measures include the establishment of a fluvial flood warning system, the designation of appropriate floodplains, employment of direct defences, the insertion of a flow-control chamber, the re-grading of existing ground levels, and an improved drainage infrastructure. These defence measures are to be undertaken at a series of locations along the River Lee, including upstream at Ballincollig, with much of the defence work being carried out on the North and South Channels within Cork City itself. Riverine impacts arising from the drainage scheme are restricted to the aforementioned direct defence measures and flow-control structure; see below, Sections 2.1-2.2.

2.1 Direct Defences

The following direct defences are to be employed as part of the drainage scheme, see Figures 3-6:

- Placement of new earthen embankments, generally between 1m-2m in height, at a series of locations within the development area, but predominantly in rural areas to the west of Cork City at Inniscarra, north of Ballinacollig, Inchaggagin, the Lee Fields, and to a lesser extent in the green areas from Fitzgerald's Park to Presentation College (located on the North Channel). The embankments will typically have 1:3 side-slopes, a 4m crest and will be top-soiled and grassed. The embankment crests will be reinforced to accept vehicular and pedestrian loading, and some will be used as public amenity walks.

- Construction of reinforced concrete walls (suitably clad where relevant) with heights ranging up to *c.* 2m at various locations along the route of the proposed drainage scheme.

- Insertion of sheet-pile walls (suitably clad where relevant) with heights ranging up to *c.* 2m at various locations along the route of the proposed drainage scheme.

- Construction of new parapet flood defence walls (suitably clad where relevant) built upon refurbished existing quay walls. All such defences are to be built on the lines of existing quay/river walls and heights are to be kept at or less than a guarding height of 1.2m.

- Insertion of glass flood defences in particularly sensitive amenity areas such as north of the Kingsley Hotel, the approach to Daly's Bridge, Fitzgerald's Park, Sundays Well Boating & Tennis Club, Lapp's Quay and shorter discrete sections along Union Quay, Georges Quay, and Wandersford Quay.

- Placement of a series of demountable flood gates at various locations, taking the form of both 'tilt-up' barriers and 'lift-hinge' gates.

- Modification and strengthening of existing bridge parapets at three bridge locations.

- Modification to several of the existing stepped river access points along the city's quayside structures.

2.2 Flow-control Structure

It is proposed to insert a flow-control structure on the south channel of the River Lee, downstream of the existing Salmon Weir. The proposed control structure will be closed during flood water events to prevent (or reduce) the flow entering the south channel, thus diverting a greater proportion of the flow to the North Channel which has a greater flow capacity. In addition, the use of a flow control measure avoids the need for visually intrusive walling along the South Channel and Curaheen River. The proposed structure will consist of two different elements:

- Approximately two thirds of its width will take the form of traditional penstock-type sluice gates. These structures, even in the open position, will not extend above the level of the existing pedestrian bridge.

- The final third will consist of a 'bottom-up' flap gate that will be anchored to a sill in the bed of the channel, hinged along the upstream edge of the gate. It will be stored submerged and flat to the bottom of the channel. To close the gate, the downward edge of the gate is rotated upward; the gate being rotated using a number of methods, including hydraulic cylinders, air-injection, and/or the inflation of rubber bladders. The barrier is stored on the riverbed and is only visible when closed during a flood event.

The flow-control structure, while restricting high flows, will not significantly impact low flows in the channel and will therefore have a negligible impact on the spilt-flow between the north and the south channels at a low-flow rate. The moveable mechanical elements of the structure will be automated, with manual backup, and will be remotely controllable as well as being linked to the flood forecasting system and river gauges. Also, the control structure will be capable of graduated opening, allowing the flexibility of full or partial closure.

3.0 CARTOGRAPHIC INFORMATION

ADCO's scope of work is primarily focused on the presentation of the findings from the on-site survey. However, there is a wealth of historic mapping relating to Cork City, dating from the early seventeenth-century, and their study can provide valuable information regarding the city's developmental past. As such, a number of historic maps have been selected for discussion in the current report. Examination of these cartographic sources provides a direct context for the in-field work, allowing improvements to the city's bridge and waterway infrastructure to be charted over time. The following maps have been included for discussion (Figures 7-19):[2]

- Map of Cork City, *c.* 1600, extracted from the *Pacata Hibernia* 1585-1600.
- Map of Cork City, *c.* 1690 (first map of the city shown to scale).
- *A Survey of the City and Suburbs of Cork* by John Rocque, 1759.

[2] Maps accessed from the OSi Historic Map Archive at www.osi.ie and the Cork City Archives at www.corkpastandpresent.ie.

- *A Survey of the City and Suburbs of Cork* by John Rocque, 1773.
- *Plan of the City and Suburbs of Cork, according to the latest Improvements*, by William Beauford, 1801.
- *Plan of the City and Suburbs of Cork,* surveyed and drawn by Thomas Holt, 1832.
- Ordnance Survey (OS) 6-inch First Edition Map of 1841.
- Ordnance Survey (OS) 25-inch Edition Map of 1889-1900.

Specific cartographic changes/features from these maps have been highlighted and the corresponding item numbers referenced in the report text (Map Items 1-87), allowing for improved cross-referencing with the accompanying figures (Figures 7-19). In addition to the examination of the above maps, the proposed flood defence works have been superimposed on OS 6-inch First Edition (1841) and later 25-inch (1899-1900) edition mapping to allow reliable comparison between the proposed works and the historic landscape depicted on those maps (Figures 12-19).

3.1 **Seventeenth-century mapping**; Figure 7

One of the earliest maps of Cork City is from the *Pacata Hibernia* (*c.* 1600) which provides a stylised view of a walled city, taken from its eastern limits (Figure 7-A). The city is shown occupying two islands, divided by a river-channel that flows through the settlement's centre-point. A two-arched masonry bridge is shown crossing this waterway (Item 1). The city is clearly positioned within the River Lee Estuary; the estuarine environment being depicted by a series of river-channels flowing through marshland that occupies the intertidal areas to the east and west of the settlement. The city is enclosed by a circuit of masonry walling, running between a series of round mural-towers. Two bridge structures, of timber construction, are shown crossing the north and south river channel's, protected by opposing gate towers (Items 2-3). Some development of the suburbs to the north and south of the city are shown, including the presence of a Cathedral to the southwest (at the present day location of St. Finnbar's Cathedral) (Item 4). In addition, a number of sailing vessels are depicted, shown either navigating the estuarine waters to the east or moored within the confines of the walled city itself. These vessels include both lateen-rigged (single-masted) boats and larger (two-masted) barques. While these depictions are to be viewed tentatively, their inclusion points the significance of maritime trade to seventeenth-century Cork and later.

Other seventeenth-century maps of Cork City include The *Towne of Corke in Ireland*, *c.* 1601, by George Carew (Hardiman Atlas) and *John Speeds Map of Crocke*, 1610. Both of these maps comprise similar cartographic details to that shown in the aforementioned *Pacata Hibernia* map.

The earliest scaled map of the Cork City is from *c.* 1690 which provides a plan-view of the settlement and details both the urban centre and the city's expansion to the north, south, and east (Figure 7-B). A clearly defined street pattern is depicted, with a series of minor lanes radiating off a central street that aligns between the north and south entrance points to the city. In addition, the north and south islands are no longer shown as distinct areas; the watercourse that once subdivided the city now

being culverted along its eastern side. However, the west side of the watercourse does appear to remain open, forming a walled watercourse or canal at that location.

The main river channels are well defined as they flow past the walled settlement on both its north and south sides. In addition, a number of braided streams are shown, running through marshland to the west of the city. In contrast, the marshland to the east appears to have undergone considerable reclamation, depicting an area of urban development that includes numerous building plots and a Custom's House (Item 5). In addition, an area of reclamation annotated '*Bonding Green*' is located immediately to the south of this area, separated by a narrow watercourse. Many of the more significant structures located within the city and its outer suburbs are depicted/ labelled, including: the Custom House, St. Francis Abbey, the Red Abbey, a Cathedral (St. Finbarr's), and the North and South Gates. In addition, a fort and associated earthworks (annotated '*The Fort*') are depicted to the south of the southern river channel (Item 6).

Two bridges are shown, as per the earlier mapping, crossing the north and south river channels at the fortified entrance locations to the city (the North Gate Bridge and South Gate Bridge) (Items 7-8). A third bridge, although it is no longer indicated on the mapping, is likely to remain; crossing a watercourse that once sub-divided the centre of the settlement. The North Gate Bridge is shown with four in-water piers, suggesting that the original timber structure at that location has been replaced by a more substantial masonry structure. No bridge piers are shown for the South Gate Bridge.

3.2 **Eighteenth-century mapping**; Figures 8-9

A number of maps depicting Cork City were produced in the eighteenth-century; however, it is those compiled by John Rocque in 1759 and 1773 that provide the greatest detail (Figures 8-9, respectively).

Rocque's 1759-map shows extensive development of the city's suburbs to the north and south, along with wide-scale reclamation of the estuary to the east and west of the original conurbation (Figure 8-B). This includes the reclamation of '*Hammond's Marsh'* on the western side of the city (as far west as '*Reily's Marsh*') and the development of land to the east of the city's original south island; an area annotated '*Bonding Green*' on the late seventeenth-century mapping. It is also the first time that the city's street names have been extensively included.

The North Gate and South Gate Bridges remain the only crossing points depicted along the north and south channels remain. A ferry service (annotated '*Custom House Ferry*') is also depicted crossing the North Channel between Frenches Quay and an unnamed quay (present day Kyrl's Quay), located adjacent to the Custom's House. The North Gate Bridge is shown as a substantial structure comprising four in-water piers, with the South Gate Bridge shown as a narrower structure comprising three in-water piers.

These bridges were originally of timber construction, later replaced with masonry bridges in the early eighteenth-century; the timber structures having been swept away on two occasions previously in the flood events of 1630 and 1639.

However, it is the city's mercantile development that should be considered one of the most notable aspects of Roque's map, highlighted by the establishment of a series of quaysides, predominantly along the river's northern channel, to facilitate maritime trade. Three quays are indicated along the northern side of the North Channel; Farrnes Quay, Ferry Quay, and Frenches Quay. In addition, a series of docking areas are represented further downstream, annotated '*Coats Docks'.* A total of ten quays are depicted for the south side of the channel and include: Bachelors Quay, Kierts Quay, Timber Quay, Potatoe Quay, Newham's Quay, Lavitt's Quay, Seven Haven's Quay, Calvills Quay, Marsham Quay, and Cold Harbour Quay. Four of the aforementioned quay structures are located off the main channel, running southward to provide direct access to the inner sections of the city; Newham's Quay, Patatoe Quay, Lavitt's Quay, and Calvills Quay.

This expansion to facilitate shipping and maritime trade is perhaps best represented in an engraving that depicts the North Channel and surrounding cityscape, as visible in 1760 (Figure 8-A); the view being taken from an elevated vantage point located in the city's northern suburbs at Audley Place.[3] The engraving depicts the entrance to the aforementioned Lavitt's Quay (present day Emmett Place) and Calvill's Quay (present day St. Patricks Street), the latter shown with a drawbridge spanning the waterway. Substantial sailing vessels are depicted, moored alongside Cold Harbour Quay, Marsham Quay, Calvill's Quay and Lavitt's Quay, and an unnamed quayside, later called Cole Quay. In addition, mast-heads are also visible at the location of Coats Docks, situated on the north side of the channel. Another noteworthy observation is the presence of Dutch-style gable fronted houses running along Marsham Quay (present day Merchant's Quay), eluding to the well-established trading links between the merchants of Cork and Amsterdam at that time.

In comparison, the South Channel and outlying suburbs appear less advanced, with development focused along the southern approach to the city (Bandon Road leading onto Barrack Street). In addition, the area of marshland that later comprises Morrison's Island remains only partially reclaimed at this time; the northern limit of the island having been built upon, while with the area to the south is depicted as marshy ground, annotated *Dunbar's Marsh*.

A substantial quayside, annotated '*Sullivan's Quay*', has been established on the south of the waterway, downstream of South Gate Bridge. Two further quays, located opposite Sullivan's Quay, are also shown extending northward into the city; running along a waterway that originally defined the eastern limits of city. These structures, named Post Office Quay and Tuckey's Quay, occupied the present day extent of the Grand Parade and were linked to the southern extent of Calvill's Quay. Two

[3] Engraving of Cork City, based on a painting by John Butts, 1760, in Robert Walker's *The City of Cork, How it may be improved*, 1883.

bridge structures (Daunt's Bridge and Tuckey's Bridge) cross the waterway, providing access between The Mall to the east and the aforementioned quaysides to the west; Daunt's Bridge being located at the northern extent of Tuckey's Quay (present day Duant's Square) and the other un-named bridge (Tuckey's Bridge) at the northern limit of Post Office Quay.

Roque's 1773-map depicts only minor changes to settlement extent, showing a cityscape and street pattern that remains largely unchanged to that presented on his earlier map of 1759 (Figure 9). However, a number of changes are shown, most notably the reclamation of Dunbar's Marsh (Morrison's Island) and the insertion of a new bridge (Parliament Bridge), crossing the south channel between Sullivan's Quay and the western limit of Morrison's Island (present day Father Matthew Quay) (Items 9-10). Parliament Bridge was built in 1760s and is on shown on Roque's map to a similar scale as South Gate Bridge, with three in-water piers indicated. The structure was later replaced by the current bridge in 1804.

Continued development on the southern side of the channel is also evident, along the present day extent of George's Quay, as far as Thomas Street (now White Street) (Item 11). In addition, Tuckey's Quay has now been culverted and marks the first of the city's inner quays to be reclaimed (Item 12).

Reclamation is also evident to the north of the city with an area of marshland (annotated *'Green Marsh'),* located on the North Channel between Knapp's Square and Coats Docks, having undergone development (Item 13). Minor reclamation of the north tip of Reily's Marsh, situated on city's western limit is also shown; presumably providing access to the '*Flood Gate'* and '*Old Salmon Weir*' located at a river meander a short distance to the south. The north side of this marshland is defined by a waterway that provides power to adjacent mill complex, annotated '*Abbey Mill'.* The mill is not shown on the earlier 1759 map and is likely to represent one of a series of new constructions located toward the western end of The North Mall. A new bridge has been inserted at this location, crossing the aforementioned waterway between the mill site and northwest tip of Riely's Marsh (Item 14). This bridge was built *c.* 1770 and is depicted a long, narrow, structure with two in-water piers, annotated '*Alderman Reily's Bridge*'.

3.3 **Nineteenth-century mapping**; Figures 10-19

Examination of the nineteenth-century maps shows continued mercantile growth and the successive expansion of the city, particularly along the eastern and western extremities of the settlement (Plate 1). These changes are linked to the industrial development of the city, a process that was begun in the latter part of the seventeen-century. Maps by William Beauford (1801) and Thomas Holt (1832) provide insight into the early part of that process (Figures 10-11), the later OS Frist Edition (1841) and Second Edition (1889-1900) maps providing a closer account of the settlement's transition to the modern-day (Figure 12-19). The main developmental changes depicted on these maps, viewed in relation to the city's emergent waterway and bridge infrastructure, are discussed below.

Beauford's Map of 1801 sees the insertion of two new bridge structures at locations on the north and south channels (Items 15-16). The more prominent of the two being St. Patrick Bridge, which is shown crossing the North Channel between Merchant's Quay (formerly Marsham Quay) to the south and the newly constructed Camden Place (formerly Coats Docks) to the north. St. Patrick's Bridge was built in 1789, later being replaced due to flood damage in 1853; the latter structure, designed by Sir John Benson, still standing today. The second structure, built in 1776, is located upstream of South Gate Bridge at '*Clarkes Marsh'*, and is annotated '*Wandersford Bridge*' (later being renamed Clarke's Bridge). Other noticeable developments include the culverting and/or in-filling of the waterway at Calvill's Quay and Post Office Quay, forming St. Patrick's Street and the Grand Parade respectively (Items 17-18). In addition, Morrison's Island is shown to have undergone further improvements and is now delineated by three clearly defined quay structures, namely; Charlotte's Quay (present Day Father Mathew Quay) to the south, Morrison's Quay to the east, and Lawton's Quay to the north (running parallel to the South Mall) (Item 19).

The former site of Dunscomb's Marsh, an area of marshland located at the downstream (eastern) confluence of the two river channels, is now depicted as developed land and annotated '*Lapp's Island'* (Item 20). The island is separated from the main conurbation by a narrow waterway, running between Cold Harbour Quay (to the west) and Nelson's Quay (to the east); an un-named bridge/culvert provides access between the island and Georges Street, the present day site of Oliver Plunkett Street.

The continued development of scrublands behind Georges Quay is also evident, along with marshy-ground further to the southeast, near the western limit of Allen's Marsh. In addition, the upstream terminus of a Navigation Wall, annotated *New Wall*, is depicted a short distance to the east (Item 21). This structure delineates the southern side of the channel and bounds the northern limit of Tooker Marsh, leading into Allen's Marsh. The wall was commissioned by the Cork Corporation in 1760 and was designed to limit the silting-up of the main channel, allowing for greater shipping capacity along the main channel. The structure was later used as a retaining-wall for river dredging works undertaken in the mind-1800s. The wall extended several kilometres to the east, much of this structure now forming a The Marina promenade.

In contrast, little development is observed for the areas to the west of the city. The only significant changes being the in-filling of a waterway that used to flow through Hammonds Marsh (now Henry Street) and the construction of the brewery complex (established by the River Lee Porter Company) at the intersection of the Mardyke Parade and Prospect Row (Items 22-23). Abbey Mill, located at the western end of the North Mall, is now annotated '*Linen Hall*' and several weir structures are indicated for the upstream sections of both channels. A bridge, previously annotated Alderman Reily's Bridge, is still depicted crossing the tributary to the south of the mill site, although it is no longer labelled as such (Item 24).

Holt's map of 1832 is the first map to record Great Georges Street (now renamed Washington Street), which was newly constructed between the Grand Parade and the '*Western Entrance*' (now the Western Road) (Item 25). Other significant changes to the streetscape are also depicted for the first time; the city's remaining inner-quays having been reclaimed to form new thoroughfares within the city (Items 26-29): Newham's Quay being reclaimed to form Corn Market Street; the site of the original Lavitt's Quay reclaimed to form Nelson Place, later renamed Emmett Place; the site of Cold Harbour and Nelson's Quays reclaimed to form Warren's Pace, later renamed Custom House Street; and Lawton's Quay, forming the north side of Morrison's Island, being reclaimed and subsumed into the South Mall (Plate 1).

The reclamation of land along the downstream sections of the north and south channels is also evident. The North Channel, downstream of St. Patrick's Bridge, is now defined by two new quays structures forming St. Patricks Quay and Penrose Quay on the waterways northern side (Item 30) (Plate 2); Merchant's Quay and Lapp's Island providing opposing quayside structures to the south. This development sees the removal of the city's original docklands (Coats Docks), an area established in eighteenth-century for the maintenance and repair of sailing vessel's trading with the city. Holt's map now shows a new, although smaller, dockyard at downstream location, close to the intersection of Water Road with the Glanmire Road.

To the south of the city, the map shows the newly established corn exchange (annotated '*Corn Market*') on lands that once formed Allan's Marsh (Item 31). A new quayside was included as part of this development, named '*Union Island'* (later Union Quay), running along the southern side of the channel (opposite Morrison's Quay). The upstream limit of a new Navigation Wall, constructed to improve access for shipping as it approached the city, is also shown on this map. The structure's upstream terminus is depicted a short distance to the east of the aforementioned corn exchange, at the present-day location of Albert Quay East.

A new bridge, '*Anglesea Bridge*' (built 1830), crosses the South Channel, providing access between the corn exchange and the Lapp's Island (Item 32). The bridge is positioned at the eastern terminus of Union Island [Quay] to the south, leading onto Warren's Place to the north. In addition, a new custom's house is shown at the tip of Lapp's Island (Item 33). Wandersford Bridge is now labelled '*Clarkes Bridge'* and a new quayside (annotated '*Wandersford Quay*') is shown occupying reclaimed land from Clarke's Marsh to the west (Item 34). A short distance upstream of Wandersford Quay, a weir structure is also marked (labelled '*Weirs*').

A new building is shown at the site of Abbey Mill, west of the North Mall (Item 35). It is now annotated as a '*Distillery*' and depicted as a large east-west orientated building with several associated out-buildings. A bridge (Alderman Reily's Bridge) crossing an adjacent tributary of the North Channel is still indicated, although it is not referenced on the map. To the south a building, previously annotated as a '*Brewery*' on Baeuford's map, is shown in greater detail, although it is no longer labelled as such.

An area of intertidal marsh located to the west of this building is now shown as drained land with a semi-circular channel running towards the brewery site; likely forming a millrace at this location (Item 36).

The OS First Edition (1841) and *25-inch Edition (1889-1900)* Maps have been divided into four map areas for ease of discussion (Figures 12-19): **Area 1** depicting the River Lee at Ballincollig; **Area 2** comprising the upstream section of the North and South Channels (the city's western suburbs); **Area 3** comprising the mid-section of the North and South channels (the city's West Ward); and **Area 4** comprising the downstream section of the North and South Channels (the city's Centre Wards).

Map Area 1 (Figures 12-13): the OS maps are the first to provide a detailed view of the upstream river assessment area, located adjacent to the townlands of Coolyduff and Lackenshoneen at Ballincollig. The lands to the south of the river are occupied by the *Royal Gunpowder Mills*, established in 1794 by Charles Henry and later purchased by the Board of Ordnance. The OS First Edition map clearly depicts this large scale industrial complex, comprising water powered mills, an associated millrace, magazine and stores, cooperage, saw-mill, workshops, and artillery barracks (Item 37). In contrast, the lands on the northern side of waterway remain undeveloped. A roadway is shown, following the present-day course of the R618, behind which the land has been largely sub-divided into a series of pasture fields, although a small wooded area is also shown. The strip of land to the south of the roadway forms part of the river flood plain and was most likely used for rough-pasture. A house plot is located *c.* 500m upstream of the study area and constitutes the only dwelling property in the vicinity at this time.

The course of the river remains unchanged on the later OS 25-inch map, forming a broad meander to the north. The gunpowder mills are well represented with the layout and extent of the complex remaining largely unchanged from that depicted on the earlier mapping. Minor additions are limited the insertion of two tramways, running between the powder magazines and dusting house, and an extension to the refinery building.

A small rectangular building, forming a dwelling house and property boundary, is now situated on the north bank of the river; roughly mid-point along the river assessment area (Item 38). In addition, a narrow inlet is shown extending northwest from the waterway at a point *c.* 250m downstream. Continuing another 200m downstream, a structure (*c.* 20m in length) is shown protruding into the river channel and is annotated '*Breakwater*'.

Map Area 2 (Figures 14-15): examination of the OS mapping relating to the river as it flows through Cork City commences at a point upstream of Wellington Bridge (present day Thomas Davis Bridge); where the river diverges to form the north and south channels. The first edition map depicts the semi-rural landscape that comprised the western suburbs of the city at that time. Residential properties, mainly detached in nature, populate the northern side of the North Channel; built at locations along

Sundays Well Road, Shankhill Road, and Wellington Terrace Road (Plate 3). Large garden plots and formal gardens are also shown. The land to the south of the channel remains largely undeveloped. Six large fields, stretching between Wellington Bridge and a formal garden belonging to Mardyke House, comprise a floodplain between the two river channels. A ferry crossing in depicted, labelled '*Ferry'*, at a point immediately upstream of Ferry Walk, where Daly Bridge now spans the river (Item 39).

Three bridges are shown on the First Edition Map and include: Wellington Bridge (built *c.*1830, now renamed Thomas Davis Bridge) which crosses the North Channel, George the IV Bridge (built 1820, now renamed O'Neill Crowley Bridge), and Gaol Bridge (built 1835), both of which cross the Southern Channel (Items 40-41). Wellington Bridge and George the IV Bridge are depicted as structures that have two in-water piers, while Gaol Bridge is shown as a single-ached structure. A large gaol is situated on south side of Gaol Bridge, annotated '*County Gaol*'; the bridge proving access from the gaol to the newly constructed Western Road (Plate 4). Notwithstanding the insertion of these bridges, the two river channels remain largely unaffected by the westward encroachment of the city during the nineteenth-century. In contrast, a tangible reminder of the industrialisation process that was underway is highlighted by the presence of the city waterworks, located on the northern bank of the River Lee, *c.* 280m upstream of Wellington Bridge (Item 43). A number of topographic factors were responsible for the siting of the waterworks at this location, including: its position a short distance upstream of the tidal-reach of the river, the presence of a weir upstream, and its proximity to an adjacent hillside where pumped water could be stored. The facility was founded in 1762 by the Cork Pipe Water Company, an endeavour that established the city's first waterworks. The Frist Edition Map depicts a '*Water Engine'* with two large rectangular reservoirs located behind (north), annotated '*Reservoir*' and '*Old Reservoir*'. A large weir, labelled '*Cascade*', crosses the River Lee a short distance to the west (upstream), providing a head-of-water for the facility's water-powered pumps (Item 44). A large '*Salmon Weir*' is also shown, transecting the entrance to the North Channel (Item 45). The adjacent flood plains to the south of the river comprise a large '*Osiery'* bed, where willow was coppiced to produce withies for use in basketry, the construction of fish-traps, etc. (Item 46).

The later OS 25-inch map depicts a number of changes to this area, most notably the construction of the '*Cork & Muskerry Light Railway*', opened in 1887 (Item 47). This railway-line is shown running westward along the south side of the Western Road, where it crosses the South Channel via George the IV Bridge and continues its journey towards Carrigohane and Blarney. In addition, three foot-bridges have been constructed across on the South Channel, at positions upstream of Gaol Bridge (Items 49-50). The first crosses from the grounds of Brookfield House, the second from the grounds of the Convent of the '*Sisters of good Succour'* (now Bon Secours Hospital), and the third from '*Lapp's Asylum'* (now the School of Pharmacy, UCC).

A series of improvements to the city's waterworks are also shown with a new '*Engine House'* added to a location on the river's edge (built 1859), an in-river wall (tailrace) that extends *c.* 200m eastward

from that structure, and a large reservoir (labelled '*Lower Reservoir*') located on the hillside above Shankhill Road (completed in 1860) (Items 51-53). These developments are the result of the *Bridges, Waterworks and Improvements Act of 1856*, which enabled acquisition of the facility by the Cork Corporation. Shortly after, the corporation initiated wide scale upgrades to the city's water infrastructure. A new hospital, attached to the District Lunatic Asylum which opened in 1852, is also located a short distance to the west of the aforementioned reservoir. However, in the most part, the western suburbs remain similar in layout to that depicted on the First Edition Map; new housing being restricted to terraced houses along of the Western Road, to the south, and Sunday Wells Road to the North.

Map Area 3 (Figures 16-17): this area depicts the upstream sections of both channels on their approach to the western limit of the city. The OS Frist Edition Map of this area shows an increasing use/ adaption of the river by manufacturing industries, including Milling, Brewing, Distilling, and Tanning.

A single bridge is shown crossing the North Channel, annotated North Gate Bridge. This structure was replaced in 1864 and again in 1961 by the present-day structure (Griffith Bridge). A number of substantial millraces are also indicated for the North Channel, channelling river-flow towards their corresponding mill sites. Two millraces are shown leading off the North Channel. The longest of these runs through the area originally known as Reily's Marsh, located on the northern side of the channel (Item 54). The millrace measures *c.* 650m in length and powers a '*Malt Mill*' attached to an adjacent distillery (Item 55). The distillery complex forms an expanded version of that shown on Holt's earlier map of 1832. In addition, a small bridge (unnamed on the map) is shown a short distance downstream of the mill site, at the millrace's confluence with North Channel. This structure is located in a similar position that of the bridge shown on Rocque's 1759 map, annotated '*Alderman Reily's Bridge'*. A weir structure is located a short distance upstream of the millrace entrance point, although it is not labelled as such (Item 56). Another millrace is located on the south side the channel (Item 57). This structure forms a broad curve that travels northeast to con-join with the river channel at the site of a large mill complex, annotated '*Flour Mill'*. This mill was established in 1797, rebuilt by the Beamish and Crawford in 1831, and later incorporated into the adjacent Beamish and Crawford Brewery in the late 1800s. A weir structure, annotated '*Salmon Weir*', is shown crossing the main channel at a point immediately downstream of the millrace entrance (Item 58). A number of small buildings are shown on land adjacent to the weir's northern terminus, annotated '*North Fishery*' Item 59).

Two millraces are also depicted along for the South Channel. The upstream millrace is located adjacent to '*Gill Abbey Mill'*, to the west of the County Gaol (Item 60). A small weir, channelling river-flow towards the millrace, is shown linking together a series of small in-river islands that are positioned upstream of this location (Item 61). The entrance to a second weir is located *c.* 350m downstream, flowing westward and then northward to create an island of land adjacent to the Western

Road (Item 62). This waterway appears to facilitate a brewery complex and adjoining tannery, structures situated close to the present-day Crawford School of Art and Design. A small bridge annotated '*Timber Bridge*' crosses the millrace midpoint along its extent, providing access to the aforementioned island area. A large weir, annotated '*Gill Abbey Weir'* is located immediately downstream of millrace entrance point, running roughly east-west across the main channel of the river (Item 63). A 'Salmon Weir' is also shown immediately downstream of the millrace, crossing the channel a short distance upstream of Wandersford Quay (Item 64).

A number of the city's quays are shown, including: Wises Quay, North Mall, Newsom's Quay, Bachelor's Quay on the North Channel (upstream of the North Gate Bridge); Lancaster Quay (off Great Georges Street); and Wandersford Quay and Crosse's Green Quay (both near Clarke's Bridge) on the South Channel.

The OS 25-inch map shows increased house building activity, particularly along the Western Road. It also shows the addition of bridge infrastructure to both the north and south channels. St. Vincent's bridge (built 1875) is now shown crossing the North Channel between Bachelors Quay and the North Mall (Item 65). Unnamed bridges cross the South Channel at four locations, the first near the site of Gill Abbey Mill (site of present day Donavan's Bridge), the second *c.* 60m upstream of Gill Abbey Weir (Inniscarrig), and the third downstream at Lancaster Quay (Items 66-68). The fourth bridge, accommodating a tramway, crosses the south channel at '*Inniscarrig House'*, close to the present-day location of Inniscarrig Terrace (Item 69). This tramline terminates *c.*120m to the west at a tram station, located adjacent to Lancaster Quay; the aforementioned new bridge at this location facilitating traffic to/from the station.

Other significant developments along the South Channel include the establishment of a '*Mill*' and '*Malthouse*' on Wanderford Quay, a 'Flour *Mill*' and '*Slip*' downstream of Crosse's Quay, and a '*Timber Yard*' upstream of Wandersford Quay (Items 70-71). A foundry is also depicted, the '*Hive Iron works'*, located off Hanover Street and upstream of Clarke's Bridge (Item 72). The iron works was founded in *c.* 1800 and began operations at the Hanover Street location in 1828. The foundry specialised in the production of steam engines, including marine steam engines, and reached its peak production in the mid-1800s. It also produced metal-work for turbines and waterwheels, along with architectural iron-work. In addition, a number of iron-mooring posts, located along a number of the city's downstream quaysides, were also produced by this foundry. A waterside apartment complex and adjoining Social Welfare Office now occupy the foundry site.

To the north, development is most notable at the site of the North Mall distillery, where a new '*Bond Stores*' and cooperage have been built on the eastern side of Reily's Marsh (Item 73). In addition, Lee Mills is shown to have expanded slightly, incorporating a new Malthouse and associated footbridge that crosses the adjacent millrace. Also, the two aforementioned weir structures, located near the millrace entrance-points for the above industrial sites, are now shown as substantial masonry

structures, one which appears to include a configuration designed to assist the migration of fish upriver (Items 74-75). These weirs appear to have been enhanced, forming more substantial from those depicted on the First Edition Map. The construction of larger weirs at these locations would also account for the greater depiction of the intertidal foreshore at river positions adjacent to Lee Mills and the North Mall Distillery; a resulting decrease in water-flow allowing a larger tidal difference to be observed at these locations.

Map Area 4 (Figures 18-19): this area depicts the north and south channels as they flow past the Centre, North Centre, and South Centre Wards to a point immediately downstream of the Customs House (Lapp's Island). The OS First Edition Map shows a riverside environment that is largely similar to that observed for present-day; many of the quayside structures remaining unaffected by modern intervention. Perhaps the most notable contrast between this mapping and the present day environment is the twentieth-century development of the city's bridge infrastructure; a series of subsequent bridges now spanning the north and south channels.

St. Patrick's Bridge remains the sole crossing-point on the North Channel for the map area depicted (Item 76). While today four additional bridges, of twentieth-century or later construction, cross the waterway at locations upstream and downstream of St. Patricks Bridge: Shandon footbridge (built 2004) and Christy Ring Bridge (built 1987) on the upstream side; and Brian Boru Bridge (built 1911) and Michael Collin's Bridge (built 1984) on the downstream side (Plate 15).

The northern side of the channel is delineated by four large quayside structures, two upstream of St. Patrick's Bridge and two downstream; Pope's Quay/ Camden Quay and St. Patrick's Quay/ Penrose Quay, respectively. To the south, the channel is delineated by Kyrl's Quay, Coal Quay, and Lavitt's Quay on the upstream side of St. Patrick's Bridge, with Merchants Quay and Anderson's Quay on the downstream side.

Three bridges are depicted for the South Channel and include South Gate Bridge, Parliament Bridge, and Anglesea Bridge (Items 77-79). Today, four bridge additions are present within this map-area and include: the Nano Nagle footbridge (built 1985), Parnell Bridge (1971), Clontarf Bridge (built 1911), and Eamon De Velera Bridge (built 1984).

The north side of the South Channel is delineated by three quays, Charlotte Quay (now Father Matthew Quay), Morrison's Quay, and Lapp's Quay, while the south side is delineated by five quay structures: Frenches Quay, Sullivan's Quay, George's Quay, Union Quay, and Albert Quay. Vitoria Quay (now Kennedy Quay), built downstream of Albert Quay, was a latter addition (built in the late 1880s) and is shown on the OS 25-inch mapping. The lands behind Albert Quay, encompassing the Corn Exchange, appear further developed and a '*Gas Works*' and '*Lime Works*' are also depicted at that location; the former works being established by the General Gas Company in 1826 (Item 79).

The OS 25-inch map of this area depicts significant development to the city's transport infrastructure with the addition of a city-centre tramline which opened in 1898. The tramway is shown running from Albert Quay, across Parnell Bridge, and along the South Mall (Item 80). This line is linked via Robert Street to a tramline travelling northward from St. Patrick's Street, crossing St. Patricks Bridge to travel either eastward along King Street (now McCurtain Street) or westward along Coburg Street (Plate 5). The South Mall tramline is also linked to the Grand Parade and Georges Street (now Washington Street) via Marlborough Street and St. Patrick's Street. A large Railway Terminus is located immediately west of the Corn Market, behind Albert Quay (Item 81). The station accommodates the aforementioned tramway and the Cork, Blackrock and Passage Railway, which opened in 1850. An '*Electric Power Station*' is also shown as part of the station complex and most likely powered the tramway system.

Notable developments depicted along the North Channel include the '*City Saw Mills*' (established in the late 1700s), located off Kyrl's Street, and new shipping businesses on Penrose Quay, including the Clyde Shipping Company and Cork Steam Packet Company (Items 82-84) (Plate 6). The latter company commissioned and operated of the *SS Sirius,* a vessel credited with the fastest, powered crossing of the Atlantic Ocean in 1838. A ferry service, operating between Anderson's Quay and Penrose Quay is also shown.

Developments along the South Channel include the addition of timber yards, the '*Cork Porter Brewery'* (Item 85), the '*Vulcan Iron Works'* on Union Quay (Item 86), and '*Marina Mills*' (incorporating Furlong's Mill) on Victoria Quay, the present day site of Kennedy Quay.

However, one the most notable developments on the South Channel is the replacement of Anglesea Bridge with Parnell Bridge; a three-span swing-bridge commissioned by the Cork Corporation and completed in 1882 (Item 87). This bridge was later replaced in 1971 by the existing structure, also named Parnell Bridge.

The 25-inch map also depicts two jetties protruding into the river, from the northern side of the channel (Morrison's Quay/ Lapp's Quay), on the upstream and downstream sides of Parnell Bridge. These structures measure *c.* 20m in length and are both annotated '*Landing Stage'*.

A final cartographic feature of note is the inclusion of '*Mooring Posts*' on the 25-inch map; a series of dots representing mooring positions being indicated along St. Patricks Quay, Penrose Quay, Merchants Quay, Anderson's Quay, Union Quay, Lapp's Quay, and Albert Quay. A number of these moorings still survive today, positioned along Penrose Quay, Lapp's quay, and Albert Quay.

3.4 Conclusion

The River Lee has played a defining role in the development of Cork City from its medieval origins, as a settlement occupying the north and south islands of the river estuary, through to its emergence as

an industrialised conurbation in the nineteenth-century. The wealth of cartographic information available provides useful insight into that development, charting the city's topography over time. In addition, it is clear from the study of these sources, that the distinct river topography present, forming two divergent channels around the city-centre, has greatly influenced the present-day character of the city.

The establishment of the city's many quayside areas from the seventeenth-century emphasises the river's importance to maritime trade. Reclamation of marshland areas allowed the city-centre to expand on its east and west sides and provided additional lands for the emerging suburbs located to the north and south. Continued bridge building from the mid-1700s corresponded with the growth of these outlying suburbs; the provision of bridge infrastructure to connect with new areas of settlement proving vital to the city's advancement. The increased industrialisation of the nineteenth-century is represented by the establishment of public utilities within the city, the presence of intensified manufacturing (mills, distilleries, breweries, foundries, timber yards, etc.), and a developing city-wide transport infrastructure. However, increased manufacturing was not solely confined to Cork City, and the presence of a large industrial complex (Royal Gunpowder Mills) at Ballincollig typifies the spread of this industrial activity.

4.0 SURVEY METHODOLOGY

The survey was designed to provide a thorough baseline study of the archaeological risk for the river areas under assessment. Visual inspection of the River Lee was conducted across the riverbed and attendant bankside/ quayside areas associated with the proposed drainage scheme. Inspection included field-walking of the river's intertidal areas and underwater survey of its subtidal channels.

The assessment encompassed a 500m stretch of the River Lee near Ballincollig (Collyduff /Lackenshoneen townlands) and substantial portions of the North and South Channels as they flow through the centre of Cork City. The upstream (Ballincollig) survey area commenced at NGR: 158644E, 715997N 250m and terminated at NGR: 159326E, 715444N. The downstream (Cork City) survey area commenced at NGR: 164920E, 714295N, 350m upstream from where the river diverges to form the North and South Channels. The survey progressed downstream to include first the North Channel, later followed by the South Channel. It terminated at NGR: 168386E, 719426N, downstream of the Port of Cork offices, where the two channels re-conjoin.

On-site assessment comprised the systematic visual inspection of the in-water extent of the proposed drainage scheme. The archaeological assessment sought to record riverbed and bankside/ quayside topography, assess the potential of riverbed deposits to retain archaeological material, and identify any features/structures of archaeological or historic significance that are present. In addition, targeted metal-detection was employed to help assess the riverbed and highlight any metallic concentrations present within those deposits.

A Leica Total Station EDM and Topcon DGPS unit facilitated the gathering of survey data and the position-fixing any features encountered. A Fisher *Aquanaut* 1280U and Tesoro *Compardre* metal detectors were used for the Magnetometer survey. However, reliable metal-detection survey was limited to areas upstream of the city centre, due to the level of in-water metallic debris for the downstream sections.

The survey team comprised of underwater archaeologists, a diving engineer, and a certified surveyor. The dive operations were carried out to HSA/HSE standard using surface supplied equipment, supported with suitable boat cover (licensed workboat and Skipper supplied by Cork Harbour Boats) and mobile/ VHF communications to the Port Operations Centre, in accordance with the Safety in Industry (Diving Operations) Regulations 1981, SI 422.

4.1 Terminology

When referring to the degree of compaction observed for the riverbed deposits under inspection, the terms loose, medium, and hard are relative and do not relate to the measured properties of these deposits. When referring to sediment grain size, the Wentworth scale was adopted, as detailed in Table 1.

Size (mm)	Grade
>256	Boulder
>64	Cobble
>4	Pebble
>2	Granule (gravel)
>1	Very coarse sand
>1/2	Coarse sand
>1/4	Medium sand
>1/8	Fine sand
>1/16	Very fine sand
>1/32	Coarse silt
>1/64	Medium silt
>1/128	Fine silt
>1/256	Very fine silt
<1/256	Clay

Table 1: Sediment grain size categories as applied to riverbed deposits discussed in the report.

5.0 ARCHAEOLOGICAL ASSESSMENT

5.1 River Topography

The sections of the River Lee under assessment flow through semi-rural and urban environments. As previously discussed in Section 3.0, the River Lee has been subject to successive adaptation since the eighteenth- and nineteenth-centuries; most notably with the establishment of the city's quays along the North and South Channels. Field survey confirmed that riverbank areas located upstream of the city have also been subject to development in the nineteenth/twentieth centuries, with the

insertion of river-walling, flood embankments, and artificially raised banksides. Moreover, much of the riverbank under assessment at Ballincollig comprises made-ground, being artificially raised with modern dumped material and rock-armour. A description of the riverbed from selected areas along the waterway is provided in Section 5.3 of this report. In addition, a description of features identified for intertidal foreshore at the site Lee Mills is presented in Sections 5.2.4-5 of this report.

5.2 Visual Survey and Assessment

A total of fifty-six features of historic significance were encountered as part the assessment. These include: twenty-one bridge sites (**F001-F021**), twenty-three quay structures (**F022-F045**) and four associated timber wharfs (**F033a, F040a, F41a, F045a**), nine weir sites (**F046-F054**), and previously unrecorded features on the intertidal foreshore at Lee Mills (**F055-F057**). Identified features are discussed according to site type in the following sections of this report; Sections 5.2.1-5.2.4. In addition, the bridge and quay sites are also catalogued in Appendix 1-2 of this report.

5.2.1 Bridge Sites

Twenty-one bridge sites of eighteenth- to early twentieth-century construction are located within the assessment area (**F01-F021**, Figures 20-22). Twelve of these sites are listed in the National Inventory of Architectural Heritage (NIAH), while nine are included in the Record of Protected Structures (RPS) for Cork City, and one is a Recorded Monument; South Gate Bridge (RMP CO074-034012). A catalogue of these sites, detailing their locational details and legislative status, is tabulated in Appendix 1. The following section provides a general discussion on each structure, presenting each site in chorological order of construction.

F001-F002, North Gate Bridge/ South Gate Bridge: as noted previously (Section 3.1), the earliest maps of Cork City depict two fortified timber bridges which provided access to the original walled-island settlement; the North Gate and South Gate Bridges. Given the use of timber for their construction, these structures required frequent repair and/or replacement throughout their lifespan. The *Council Books of the Corporation of Cork* provides frequent mention of the poor condition of these bridges and documents their many repairs, including the replacement of the North Gate Bridge with new timber structures on two occasions following flood-damage in 1630 and 1639. Masonry structures were eventually built at these locations in the early part of eighteenth-century (*c.* 1713), as depicted on John Roques Map of 1759 (Plates 7-8). The North Gate Bridge was replaced by a single-arched structure in 1864 and a modern bridge, Griffith Bridge, in 1961 (**F001**) (Plate 9). Griffith Bridge measures 29m in length x 20m in width. A photograph of North Gate Bridge, taken in early the eighteenth-century, still survives and shows an elegant single-arched bridge crossing the river at that location (Plate 10). The remnants of this bridge are still visible today, located beneath the north and south termini of Griffith Bridge (Plates 11-12). An extract from Lewis's Topographic Dictionary of 1837 describes North Gate Bridge as follows:

> North [Gate] bridge, over the same branch, was built of stone early in the last century, at the expense of the corporation, on the site of an ancient wooden bridge, which, with another of the same kind at the southern extremity of the main street, formed for ages the only accessible communication between the town and country: it was thoroughly repaired and widened by the corporation in 1831, when two foot-paths of cast iron were formed, and it now opens a ready communication between the North Main-street, the butter markets, and the populous districts of Shandon.[4]

The oldest bridge to survive into the present day is the South Gate Bridge, which comprises elements of the original masonry structure (**F002**). It was completed *c.* 1713 and subsequently extended on its downstream side in 1824 (Plate 13-14). The original structure is thought to have been approximately 15ft wide, with two narrow in-river piers (4ft 5-inch) and arches composed of wedge-shaped *voussoirs*. The central arch spanned 26ft with a three-centred intrados, the 21ft and 23ft side-arches also being of three-centred design.[5] The South Gate Bridge is also briefly mentioned in Lewis's dictionary, describing it as follows:

> South bridge, built also by the corporation….., on the site of the ancient wooden bridge, is a neat structure of three segmental arches of hewn limestone, and has been widened at their expense by the addition of two foot-paths.[6]

The upstream side of South Gate Bridge forms a triple-span limestone bridge with arch-rings that are of elliptical design. It is composed of rubble-stone walls with limestone coping, ashlar buttresses, and ashlar *voussoirs*. Triangular cutwaters extend almost the full height of the bridge (Plate 15). In contrast, the downstream side differs markedly in style and is composed of neatly-cut, sting-coursed, limestone masonry. The central arch is elliptical in form, while the two adjoining arches are of segmental design. Triangular cutwaters extend into the haunch area, terminating in line with second lowest arch-stone in the arch-ring. South Gate Bridge measures 19.8m in length x 10.6m in width.

A wide arched-culvert (**F002a**) is located beneath South Gate Bridge, built into the bridges north abutment wall (Plate 16). The culvert measures 7.20m in width and 1.35 in height. The arch is segmental in form and comprises fifty neat-cut arch-stones (limestone) measuring 480mm in length x 25mm in width. The culvert has been blocked-off using limestone masonry, leaving a keyhole drain at a point a little off centre to the archway. It is likely that this arched-culvert is contemporary to the original bridge build; the culvert being later adapted as part of the bridge widening endeavour undertaken in the 1824.

F003, Parliament Bridge: the original Parliament Bridge, built sometime in the 1760s, was the next bridge to be built within the city (as depicted on Roques 1773 map). It was located on the South Channel and provided access between Sullivan's Quay and Charlotte Quay (now Father Matthew Quay). The bridge was replaced in 1806, following flood damage sustained in 1804. The replacement

[4] Samuel Lewis, *A Topographical Dictionary of Ireland*, 1837.
[5] O'Keeffe, P.J. & Simmington, T. *Irish Stone Bridges*, p.225, 1991.
[6] Samuel Lewis, *A Topographical Dictionary of Ireland*, 1837.

bridge still stands today and forms an elegant, single-ached, bridge composed of neat-cut limestone masonry, with cut-stone balustrade, fine *voussoirs,* and *modillion* cornices (Plates 17-18). Timber shuttering is evident on the in-river sides of the bridge's north pier (Plate 19). This comprises close-set vertical timbers with horizontal shutters, behind which the pier's foundations have been laid (comprising bonded rubble-stone and mortar). A laid-stone apron, which originally covered these foundations, remains partially intact; its southernmost extent having become eroded. A series of substantial timber piles protrude from the foundations and are likely to be associated with the previous eighteenth-century bridge at this location. Parliament Bridge measures 29m in length x 13m in width. The bridge was refurbished in the 1990s and some of the masonry was replaced using concrete in 1922.

F004, Clarke's Bridge: annotated Wandersford Bridge on Beauford's map of 1801, this bridge is the oldest surviving bridge structure to remain close in its original form (**F014**). The structure is located on the South Channel and provides access from Wandersford Quay to Hanover Street, via Wandersford Street. The bridge was designed by Thomas Holt and completed in 1776. At that time it was reputed to have the longest spanning (68ft) arch in the country. The bridge-arch is constructed of rough-cut limestone and the arch-ring is segmental in form (Plates 20-21). Narrow arch-stones alternate in paired lengths for decorative effect while neat-cut limestone has been used for keystones and springing stones on both sides of the bridge (Plates 22-23). The arch-walls and bridge façades are composed of local red sandstone. Thin cut limestone has been used for the coping. Small springing arches are located either side of the bridge on its south side, these appear to be later additions designed to widen the approach to the bridge on that side (Plates 24-25). Clarke's Bridge measures 22m in length x 7.8m in width.

F005, Alderman Reily's Bridge: this structure, built *c.*1770 and depicted Roques Map of 1773, also retains much of its original build (Plate 26). The bridge is located on the North Channel, at the terminus of the tailrace for the North Mall Distillery (built 1779). The bridge provided access from Wise's Quay on the north to reclaimed land, Reily's Marsh, on the south. The structure measures 16m in length x 6.6m in width and comprises two segmental archways (measuring 4.5m in width), with ashlar *voussoirs* and limestone masonry forming the arch-rings. Thirty-two arch stones from the arch-ring, measuring 450mm in length x 200mm in width x 250mm in depth. Rubble-stone has been used to construct the spandrel and parapet areas, while limestone masonry has been sued for the arch-walls (Plate 27). A triangular shaped cutwater (brick-built) is located on the upstream side of the bridge, while a rounded cutwater is present on the downstream side (Plates 28-29).

F006, St. Patrick's Bridge: this bridge crosses the North Channel between St. Patrick's Street and Bridge Street, at the intersection between Lavitt's Quay/Merchants Quay to the south and Camden Quay/St. Patrick's Quay to the north. The foundations of St. Patrick's Bridge were first laid in 1788. However, before construction of the bridge was completed, the partially built structure was swept away by severe floods (January 1789). The bridge was subsequently re-built an opened later that

year in September 1789 (Plate 30). The bridge was again damaged by flood waters in 1853 and also required subsequent replacement (Plate 31). A new bridge, designed by Sir John Benson, was constructed in 1861; as depicted on the OS First Edition Map (Plate 32). The structure measures 66m in length x 18.5m in width and comprises three elliptical archways with carved archivolts (Plates 33-35). Effigies that include St. Patrick, St. Bridget, Neptune, and three sea goddess adorn the keystones of each arch-ring (Plate 36). Pilasters rise from the cutwater, crossing the haunch area, and triangular shaped cut-waters are located on the upstream and downstream sides of the bridge. The structure has a carved limestone balustrade with four cast-iron lamp standards and paired lanterns set along parapet walls. The bridge's foundations lie approximately 4.5m below the low-water mark and are supported on piers formed of reinforced concrete.

F007, O'Neill Crowley Bridge: this structure, originally named George the IV Bridge, crosses the South Channel at appoint *c.* 200km downstream from its starting point. The bridge was built in 1820 to provide access from the Western Road/ Vitoria Cross Road onto Wilton Road. It measures 27m in length x 15.9m in width and comprises a three-arched bridge of limestone construction (Plates 37-38). The arch-rings are segmental in form and composed of neatly cut arch-stones; 23 stones per arch. Large, semi-circular, cutwaters are located on both the upstream and downstream sides of the structure (Plate 39). The *intrados* (arch-ceiling) also comprises neat-cut limestone masonry (Plate 40). A tramline for the '*Cork & Muskerry Light Railway*', opened in 1887, is depicted crossing George IV Bridge on the OS 25-inch map of 1899. The bridge was renamed in 1911.

F008, Parnell Bridge: stands on the site of two former bridge structures, named Anglesea Bridge. The original structure was built on the South Channel in 1830 to provide access from Anglesea Road/Corn Exchange to the south and Warren Place to the north (Plates 41-42). An extract from Lewis Topographic Dictionary provides a description of the bridge, shortly after it was completed:

> Anglesey bridge, erected in 1830 by Sir Thomas Deane, from a design by Mr. Griffiths, is a very handsome structure of hewn limestone, with parapets of cast iron; and consists of two elliptic arches 44 feet in span, with a rise of eleven feet, having between them a waterway of 32 feet crossed by two parallel drawbridges of cast iron, which are raised to admit vessels above it.[7]

By the late 1800s, increased traffic levels on the bridge required its replacement, its foundations having become unsafe. Anglesea Bridge was replaced, in 1882, by a steel lattice girder structure of swing-bridge design (Plate 43). The swing bridge, renamed Parnell Bridge, was designed by T. Claxon Fiddler (London) to allow greater shipping access to the South Channel; the bridge comprising a swinging central-span with two fixed ends (Plates 44). A journal extract from 1884 provides a detailed description of the newly built bridge shortly after its construction:

[7] Samuel Lewis, *A Topographical Dictionary of Ireland*, 1837.

> two abutments and two intermediate piers, each consisting of a pair of cast-iron cylinders or columns, as shown by the dotted circles upon the general plan. The central opening is that which serves for the passage of vessels. The swing bridge extends over two openings, from the north abutment to the southern pier, its centre of revolution being situated over the centre of the northern span, and revolves upon a turntable, which is carried upon a lower platform or frame of girders extending across the northern span of the bridge. The southern opening is spanned by an ordinary pair of lattice girders in line with the girders and superstructure of the swing bridge.[8]

The remains of this phase of bridge construction are evident below the modern Parnell Bridge. A semi-circular section of bridge abutment, composed of neat-cut limestone masonry, is located on the south side of the bridge (Plate 45); an extended abutment once formed the pivot-point of the swing-bridge. A set of masonry steps are inset into the southern quayside, on the upstream side of the bridge and immediately downstream of Union Quay (Plate 46). These steps formed part of the original Parnell Bridge, providing access to the river and the southern bridge abutment. Bridge remains are also evident on the north side of the channel with nine courses of neat-cut limestone (measuring a uniform 1m in length x 0.50m in width) forming the northern bridge abutment (Plate 47). The swing bridge was removed and replaced by the existing three-span Parnell Bridge in 1971, a pre-cast mass concrete structure supported by two in-water piers (Plate 48). The current Parnell Bridge measures 47m in length x 25.6m in width.

F009, Thomas Davis Bridge: this bridge, formerly named Wellington Bridge, is located on the North Channel, spanning the river between the Western Road and Sunday's Well Road (Plate 49). Lewis's Topographic dictionary describes the structure as follows:

> Wellington Bridge, at the western extremity of the city, near the termination of the Mardyke, and close to the division of the main channel of the Lee, is a noble structure of hewn limestone, erected by Messrs. Pain, from a design by Richard Griffiths, Esq.: it consists of a centre arch of 50 feet and two side arches each of 45 feet span, with solid parapets, the piers of the arches sunk in caissons; and opens a fine communication with the new western road, near George the Fourth's bridge.[9]

The bridge was built *c.* 1830 and is depicted a short time later on the OS Frist Edition Map of 1843. It was constructed of dressed limestone and comprises three archways. The arch-rings are segmental in form, composed of 42 arch-stones with ashlar *voussoirs*. Triangular cutwaters are present on both the upstream and downstream side of the structure. The bridge measures 50m in length x 9.28m in width.

F010, Gaol Bridge: this structure spans the South Channel near the north-west entrance to University College Cork. The bridge was designed Marc Isambard Brunel, farther of Isambard Kingdom Brunel, in 1835 It was constructed to connect the County Gaol with the recently constructed

[8] Scientific American Supplement, No. 446, 1884, www.archiseek.com.
[9] Samuel Lewis, *A Topographical Dictionary of Ireland*, 1837.

Western Road. The bridge measures 17m in length x 9.28m in width and is composed of a single segmental arch, with margined channelled ashlar (limestone) *voussoirs*. The bridge façade is constructed of neat-cut limestone rising to a parapet with segmental coping and tooled bands (Plates 50-51). Two large retaining walls extend at a 95-degree angle from either side of the structure's soutrn terminus. The western (upstream) wall measures 45m in length and is set-back from the waterway. The eastern (downstream) wall measures 36m in length and delineates the waterway at that location (Plate 52). Both structures are contemporary with the bridge build and are composed of neatly-cut, rock-faced, limestone masonry of uniform size and shape; measuring 1.5m in length x 0.70m in width (Plate 53). Modern consolidation of the walls foundation elements is evident, a concrete toe extending the full length of the retaining wall.

F011, Footbridge (site of): the remains of a footbridge that once the South channel between Bishops Mill and Gill Abbey is located *c.*200m downstream from O'Neill Crowley Bridge; as clearly indicated on the OS 25-inch (1899) mapping of the area. Its date is unknown but cartographic evidence suggests a post-1843 construction date. Today this section of channel is bounded by the UCC campus and a number of modern footbridges are located a short distance upstream and downstream of feature. The remains of a bridge abutment are located on the south side of the river at NGR: 165688E, 712176N (Plates 54-55); comprising of two courses of rock-faced ashlar (measuring 4.5m in length x 1.4m in width). The north side of the channel is composed of slabs of dumped concrete and rock-armour; no sign of bridge's northern abutment being visible (Plate 56). Three timber piles protrude from the riverbed, near the centre of the channel (Plate 57). The timber piles are in line with the original crossing location/adjacent abutment and are thought to be the remnants of the bridge's supporting sub-structure. The piles are square in profile, measuring 0.30m x 0.30m, and are upstanding from the riverbed between 0.90m and 1m.

F012-F013, Unnamed Footbridges: two steel lattice footbridges span the South Channel, providing access between UCC buildings to the south and student halls of residence to the north. These bridges are depicted on the OS 25-inch Map, crossing the channel within the grounds of the Convent of the Sisters of Good Succour and Lapp's Asylum. These bridges lie 36m apart and are of similar construction; both spanning the waterway on a set of iron-girders (Plates 58-59). Iron lattice-work forms the superstructure, with modern steel railings superimposed to form the bridge sides. The upstream structure measures 23m in length x 3.9m in width and the downstream 27m in length x 3.2m in width. Masonry retaining walls delineate the channel at this location and provide anchor-points for the bridge structures (Plates 60-61). While the construction date of these bridges is unclear, cartographic evidence, coupled with construction method, suggests a late nineteenth-century build date.

F014, Unnamed Bridge (site of): a narrow bridge is depicted on the OS 25-Inch Map, crossing the South channels at a point *c.* 60m upstream of Gill Abbey Weir. No in-water remains of this bridge were encountered, although the remains of a possible bridge abutment are located on the north side

of the channel, NGR: 166479E, 714959E; incorporated into a modern house developed at that location (Plate 62). Cartographic evidence suggests a structure was built at this location post-1843.

F015, St. Vincent's Bridge: this bridge crosses the North Channel between Bachelors quay and the North Mall (Plates 63-64). It was built in 1878 and funded under the 1875 Cork Improvement Act. The bridge is supported by two sets of tubular pillars/caissons, reinforced with iron cross-beams, and filled with concrete. Two parallel wrought iron lattice girders are attached to the caissons and are tied into the adjacent quay structures. Wrought iron pillars also extend from the outer edge of the caissons to provide reinforcement to the bridge's superstructure (Plate 65). The deck consists of a concrete walkway supported on braced cross-beams that extend between the parallel girders. Cast floral tie-plates have been used on the bridge exterior elevations. The bridge measures 41m in length x 3.8m in width.

F016, Railway Bridge (site of): a railway bridge built to accommodate the Cork and Muskerry Light Railway is depicted on the OC 25-inch map, crossing the South Channel between to the present-day location of Inniscarrig Terrace and the River Lee Hotel. Two bridge abutments remain and two circular steel piles, designed to support the structures mid-point, are visible in-river. The eastern abutment is constructed using red brick with rock-faced ashlar forming the corner stones (Plate 66). Limestone masonry has also been used as coping along the abutments north and south sides. The structure measures 2m in height x 3m in length and is located at NGR: 166621E, 7157444N. A section of the narrow gauge track can be seen extending, *c.* 0.30m, from the abutment, fastened upon a large railway sleeper. The tubular steel bridge supports are located roughly mid-point across the waterway (Plates 67). These measure 0.80 in diameter, are upstanding 1.8m from the riverbed, and are positioned 2m apart. The west abutment is formed by a retaining wall that is set back 1.8m from the channel. The base of the wall is composed of concrete, with the upper parts built up using redbrick (Plate 68). The bridge was constructed to provide access to and from the railway station that occupied a position adjacent to Lancaster quay, *c.* 200m downstream. The railway was completed in 1887, giving a late nineteenth-century date to the remaining bridge features.

F017, Donavan's Bridge: this bridge crosses the South Channel to link College Road with a nearby housing development. It was built in 1902 and comprises a single-arch road bridge of limestone construction. The arch-ring is segmental with net-cut, uniform, arch-stones and sting-coursed masonry forms the bridge façade and adjoining parapet walls (Plate 69). The bridge measures 22m in length x 9.4m in width. It was designed by the Cork engineering firm W.H. Hill & Son and was constructed by Patrick Murray builders.

F018-F019, Brain Boru Bridge/ Clontarf Bridge: both structures comprise scherzer rolling-lift bascule railways bridges completed in 1911 (Plates 70-71). These bridges, depicted on the OS 25-in Map, linked former West Cork Railway terminus on Albert Quay with the Great Southern and Western terminus to the north of the city. Contarf Bridge crosses the South channel between Lapp's Quay to

the north and Albert Quay to the south. Both bridges comprise composite steel and concrete superstructures supported by six concrete-filled steel caissons. The steel superstructure is made up of braced girders, fastened by series of bolts and rivets, which sits upon elastomeric bearings. Three separate reinforced concrete slabs support the eastern footpath, the carriageway and the western footpath respectively. The steel truss bascule supports rise above the carriageway level in the longitudinal opening between these concrete slabs. Brian Boru Bridge measures 68m in length x 15m in width and had an opening span of 18.9m. Clontraft Bridge measures 60m in length x 15m in width and also had an opening span of 18.9m. The latter bridge was in operational as a lifting bridge up until 1976, after which its counter weights were removed. Both structures now function as fixed road bridges.

F020, Newman's Bridge: provides pedestrian access across the South Channel a short distance upstream of Donavan's Bridge. It comprises a single span concrete bridge, completed in 1916 (Plates 72-73). The abutments are arcaded with parallel square-section pillars rising above deck level. Decorative wrought-iron railings adorn the sides and wrought-iron lamps have been fastened to the pillar tops. The structure measures 22m in length x 6m in width.

F021, Daly Bridge: crosses the North Channel provide between Sunday's Well and the Mardyke (Plate 74). The bridge replaced an old ferry crossing at this location, as depicted on the OS First Edition Map of 1843. Daly's Bridge, known locally as the 'Shaky Bridge', is an 87m-long pedestrian suspension bridge built in 1926. The structure consists of two steel lattice towers, each composed of two columns that are braced together using cross-beams. High-tension steel cable runs between the two towers, through saddles mounted at the top of each column. The bridge sides are composed of steel lattice panels and a timber-deck is mounted on a series of steel cross-beams. Hanging rods run between the cable and the deck. Masonry abutments are set back from the river's edge (Plate 75). These provide an anchor-point for the two towers and additional support of the walkway. Daly Bridge was designed by the Cork City Engineer S.W. Farrington and the steelwork was provided by David Rowell & Company of Westminster.

Conclusion, bridges

The range of historic bridges present is diverse and includes unique structures, such as Daly's Suspension Bridge and Vincent's Footbridge. The oldest surviving bridges include South Gate Bridge (F001), Clarke's Bridge (F004), and Alderman Reily's Bridge (F005), which all date to the eighteenth-century. The remaining bridges date to the nineteenth- and twentieth-century, although these structures have in many instances replaced earlier bridges, built in the eighteenth-century and before. These crossing points should not simply be viewed in terms of the bridges that stand today; consideration needs to be given to the archaeological potential of riverbed deposits to retain structural elements from previous bridges that occupied these often key locations within the city. Three previously unrecorded bridge sites (F11, F014, and F16) have been included in the inventory, along with a number of noteworthy features identified from known bridges, including: the remnants of the second North Gate Bridge (built 1864), located beneath the existing Griffith Bridge; bridge abutments

from Parnell Bridge (built 1882), and the presence of timber shuttering associated with the laying of foundations for Parliament Bridge.

5.2.2 Quayside Structures

Twenty-three quay structures of eighteenth- to nineteenth-century construction are located within the assessment area (**F022-F045**, Figures 20-22). Eleven of these features are located on the North Channel and twelve on the South channel. Ten sites are listed in the National Inventory of Architectural Heritage (NIAH) and mooring bollards located on St. Patrick's Quay, Lapp's Quay, and Albert Quay also feature in the inventory. In addition, an arched-culvert at French's Quay (**F037a**) is included. No sites are listed in the Record of Protected Structures (RPS) for Cork City or the Record of Monuments and Places (RMP). A catalogue of the historic quays present, including their locational details and legislative status, is tabulated in Appendix 2. A summary description, gathered as part of the on-site survey is provided below.

North Channel

F022, Wise's Quay: this nineteenth-century quay structure is located on the north side of the channel, running between the site of the North Mall Distillery and the western end of North Mall Quay (Plates 76-78). The quay measures 39m in length and comprises ten courses of, sting-coursed, rock-faced limestone ashlar. Two block sizes have been used in the construction; 500mm length x 400mm width and 1m length x 400mm width (Plate 79). Each piece of masonry has a 50mm circular hole at its centre; most likely lewis-holes, drilled to lift the masonry into place during construction. The quay has been underpinned by a series of edge-set (rectangular) timber piles, upstanding *c.* 400mm from the riverbed. These piles measure 200mm in length x 150mm in width. A cement render extends from the base of the quay, at a 45-degree angle, to a point near the inner side of the pile-heads. A small rectangular drain is located *c.*28m along the structure and a modern access ladder has been bolted to the quayside, approximately half-way across its length. Cast-iron railings, installed in 1900, run along the top of the quayside. Concrete rubble and collapsed masonry is located along Low Water Mark, *c.*1.5m to the south of the quay wall. A clear transition point between Wise's Quay and the North Mall can be seen, where the differing masonry con-joins (Plate 80).

F023, North Mall: the North Mall extends from Wise's Quay to the west side of Griffith Bridge (site of North Gate Bridge). The North Mall was built *c.* 1830 and comprises thirteen (visible) courses of limestone masonry, measuring between 300mm length x 200mm width and 800mm length x 450mm width (Plate 81). Large coping stones, measuring 1m in length x 400mm in width, form the topmost course. Three rectangular drain features are located along the quay's extent. A line of in-river timber shuttering runs parallel to the quayside, stepped into the channel by approximately 1.2m. Poured mass-concrete has been placed behind this shuttering to consolidate the quay's foundation elements (Plate 82). A flight of masonry access steps, eighteen in total, provide river access at a point 130m along the quay's extent (NGR: 166929E, 721462N) (Plate 83). The access steps are contemporary to the construction of the quayside. Upstream of these steps, the quayside is subject to modern repair;

concrete blocks replacing masonry and poured mas-concrete forming the coping. A modern access ladder has been fastened to the quay wall and a modern drainage pipe protrudes from the quayside at a point *c.*50m upstream of Griffith Bridge. A rectangular drain placed to accommodate run-off from the adjacent roadway is also present (Plate 84). The cast-iron railings present on Wise's Quay continue along the full length of the North Wall.

F024, Bachelor's Quay: the structure forming Bachelors Quay, situated opposite Wise's Quay and the North Mall, extents from St. Vincent's Bridge for a distance of 257m to meet Griffith Bridge (Plate 85-87). Two build-phases can be observed for this structure. The lower part of the quay wall being composed of medium to small, rough-coursed, limestone which rises to a maximum height of approximately 3m (for the first 60m), after which it is only present to a height of *c.*1.5m. Neatly-cut limestone masonry forms the upper courses; ranging between three and eight courses. Much of the quayside dates to the 1820s, however, the aforementioned lower sections are likely to be of eighteenth-century date. Approximately 145m of the quay has undergone consolidation, identical to that observed on the north side of the channel (Plate 88). However, the original timber piles/shuttering elements, used to underpin the quay, are partially visible along the downstream half of the structure (*c.*112m section) (Plate 89). The coping and topmost masonry course has suffered collapse, along a *c.* 20m section, and has been subject to modern repair (NGR: 166826E, 720659N centre-point) (Plate 90). Collapsed masonry is viable at Low Water, lying immediately beneath the repaired section. Modern river-access ladders have been retro-fitted to the quay wall at two locations along its extent.

F025/F026, Farren's Quay and Popes Quay: these quaysides form a continuous structure, built in the early-mid nineteenth-century (Plates 91-92). The quay wall comprises fourteen-courses of string-coursed limestone masonry (including the coping) that range in size from 450mm in length x 450mm in width to 1m in length x 450mm in width (Plate 93). A viewing balcony has been incorporated into the upper part of quay wall, 70m downstream of Griffith Bridge (Plate 94-95). This balcony is also depicted on an early twentieth-century photograph of French's/Pope's Quay; shown as a boxed-off structure, probably of timber construction, rising from the same quayside location (see Plate 91). The existing viewing area has been constructed using cement blocks which rest on three ornate limestone supports. A flight of masonry river-access steps (twenty-one in total) are located at NGR: 167261E, 721693N, a short distance upstream of Shandon Footbridge (Plate 96). A small mooring-ring, with an internal diameter of 150mm, is located on the riverside edge of the tenth-step and is a contemporary feature of the build. Another mooring-ring, of the same dimensions, is located next to a small drain, located *c.* 20m upstream of the access steps (Plate 97). This drain measures 450mm in width x 300mm in height. Two identical drain features can also be found across the quayside's extent, along with six rectangular drains measuring 750mm in height x 550mm in width. In addition, opposing flights of river-access steps are present, situated close the eastern terminus of Pope's Quay; 50m downstream of Shandon Bridge (Plate 98). Both features comprise twenty-steps in total, with a landing area positioned mid-point down each flight; positioned just below the high-water mark. Wrought iron mooring-rings are located on the riverside of each set of steps (Plate 99). Evidence of

repair work in the form of pressure grouting is present and the section of quay wall running between the two access-steps is bulging outward in a number of areas.

F027, Kyrl's Quay: this quay is located on the south side of the channel, opposite Pope's Quay, and runs between Griffith Bridge and Shandon Footbridge. The structure was built in the nineteenth-century and comprises twelve courses of neat-cut limestone masonry; measuring between 1m in length x 400mm in width and 500mm in length x 400mm in width (Plates 100-101). Two flights of masonry river-access steps are incorporated into the quayside at NGR: 167120E, 721674N and NGR: 16717E, 721614N. In addition, an access slip is also present, immediately upstream of Shandon Footbridge, NGR: 167243E, 721325N. The upstream river-access point comprises twenty-one steps and incorporates a lading step, close to the High Water Mark (Plate 102). The downstream access point comprises eighteen-steps and similar landing step, also near the High Water Mark (Plate 103). A small arched-culvert (**F027a**), now blocked-up, is located approximately 30m downstream of the latter river access-point. The culvert is segmental in form, with an arch-ring comprising ten net-cut arch-stones and one larger wedge-shaped keystone. The culvert measures *c.*1.5m in height x 1m in width (Plate 104). The downstream access slip is of similar overall design to the access steps located upstream; the access simply being ramped rather than stepped (Plate 105). Three mooring rings (200mm internal diameter) are located along the extent of the quay wall.

F028, Camden Quay: this nineteenth-century quay measures 300m in length, running between the downstream-end of Pope's Quay and the upstream side of St. Patricks Quay (Plates 106-108). A modern Bridge, Christy Ring Bridge, truncates the structure approximately half-way along its extent. The quay comprises fourteen visible courses of neatly-cut, sting-coursed, limestone masonry (Plate 109). A series of drain features are located along its extent, predominantly situated just below the High Water Mark. A number of drain features are also located higher up the quay wall, *c.* 2m from the top of the structure. Two drain sizes area present, the first measuring 450mm in width x 300mm and the second 750mm in height x 550mm in width (Plate 110). A number of small wrought iron mooring-hoops were also encountered, along with seven modern river-access ladders (Plate 111). The quay wall terminates *c.* 10m upstream of St. Patricks Bridge; the transition point being marked by a pilaster associated with the construction of the aforementioned bridge (Plate 113).

F029/F030, Cole Quay and Lavitt's Quay: these quays from a single nineteenth-century structure that extends along the south side of the North Channel, between Shandon Bridge and St. Patrick's Bridge (Plates 106 and 114-116). The quayside is truncated by Christy Ring Bridge, at a point *c.* 240m downstream of Shandon Bridge. The first *c.* 70m of quay retains its original build, while a *c.*170m section, located between NGR: 167328E, 721027N and NGR:16749E, 720906N, has been be subject to modern reconstruction works (undertaken in 1990s); the topmost courses having been replaced using poured mass-concrete sections (Plate 117). These sections extend above ground-level to from a barrier wall. Downstream of Christy Ring Bridge, the quay wall retains its original build again (Plate 118). The quay is composed of fourteen visible courses of limestone masonry of regular

size and shape; measuring between 900mm in length x 360mm in width and 570mm in length x 360mm in width. A number of mooring rings and a series of drain features are located along the extent of Coal Quay/Lavitt''s Quay (Plates 119-120).

Two sets of opposing river-access steps are located on Coal Quay, immediately downstream of Shandon Bridge. The first comprises two flights, both with sixteenth masonry steps, which lead away from a central landing. Landing-steps (measuring 1.6m x 1.5m) are located at the High Water Mark and the steps terminate at Low Water Mark (Plate 121). An arched-culvert (**F029a**) has been built into the wall, directly between the two flights of steps (Plate 123). The arch is segmental in form and comprises seven arch-stones. The archway measures *c.* 2.5m in height x 2m in width and has been blocked-off using cast concrete blocks. An iron-flap for a storm drain is centred within this blocked-off section of the culvert. A second set of access steps is located 26m downstream (Plate 124). This structure differs in layout to the previous; the flights of steps running towards, rather than away from each other. The two flights comprise sixteen-steps with an additional landing step at the High Water Mark.

F031, St. Patrick's Quay: this quay is delineates the North Channel between St. Patrick Bridge and Michael Collins Bridge. The structure measures *c.* 450m in length and is truncated 247m along its extent by a timber wharf located on the upstream side of Brian Boru Bridge. The section of quayside, running between St. Patrick's Bridge and Brian Boru Bridge, is of nineteenth-century date (Plate 124-125). Downstream of Brian Boru Bridge the quayside is replaced with a modern quay of concrete construction (Plate 126). This modern component of St. Patrick's Quay runs as far as Michael Collin's Bridge, after which it is replaced by Penrose Quay; the latter structure also being formed by a modern concrete quayside, the original build being retained approximately 1m below ground level and 3m north of the existing riverside façade.[10]

The historic section of St. Patrick's Quay comprises ten course of net-cut limestone masonry (Plate 127). The quay's foundations have been underpinned by a continuous line of tight-set timber piles and a series of twenty-four timber fenders (Plate 128). These fenders are stepped-out from the base of the quay wall by *c.* 400mm. From this point the fenders rise at an 80 degree angle to extend the full height of the quay wall. The fenders are composed of Greenheart timber (*Ocotea Rodiaei*), a timber-type commonly used in twentieth-century marine and river works. The insertion of these fenders and the underpinning of the quay wall are likely to be contemporary to the construction of the timber wharf downstream.

A flight of masonry steps is located a short distance downstream of St. Patrick's Bridge (Plate 129). This river-access point comprises twenty-four steps and has a landing step at the High Water Mark. A wrought iron mooring-ring measuring 400mm in dimeter is fastened to the quay wall, immediately

[10] Ove Arup, 1980s.

behind this landing area. Cast iron railings, of early twentieth-century date, adorn the quayside at this lactation. These are subsequently replaced by modern railings a short distance downstream.

A timber wharf (**F031a**) is inset into the quayside on the upstream side of Brian Boru Bridge. The structure measures 63.4m in length x 3.6m in width. Concrete and timber bracing has been used to consolidate St. Patricks Quay, where the quay wall has been impacted to accommodate the insertion of the timber wharf (Plate 130). A series of timber fenders delineate the riverside edge of the structure (Plates 131-132). The fenders are formed of paired timbers that have been bolted together. Horizontal cross-beams run along the base of the fenders, below the Low Water Mark, and provide additional strength. The fenders are fastened to the wharf's deck by two horizontal beams that run the length of the structure, above and below the deck-level. The deck rests upon a series of closely spaced (*c.*1m) timbers that extend from the quay wall. These are also fastened to the aforementioned horizontal timbers. Vertical timbers are located at the quay wall and extend to deck level. Carpenter marks, incised into a number of the structural timbers, were also encountered (Plates 133). As noted for the fenders positioned upstream, the wharf also appears to be constructed of Greenheart timber. The timber wharf is of early twentieth-century construction and is most likely associated with the insertion of Brian Boru Bridge in 1911. Four cast-iron mooring bollards, dating to *c.*1860*,* protrude from the modern pavement adjacent to the timber wharf (Plates 134).

F032, Merchant's Quay: this quay is located on the south side of the channel, opposite St. Patrick's Quay (Plate 135). It extends from the downstream side of St. Patricks Bridge for a distance of 205m where it abuts Anderson's Quay, 186m upstream of Brian Boru Bridge. A large arched-culvert (**F032a**) is located immediately downstream of St. Patrick's Bridge (Plates 136). The culvert measures 5.40m in width and 3.50m in height. The arch-ring is segmental in form and comprises nineteen arch-stones. The original extent of the arch opening has been reduced using cast-concrete blocks, leaving a reduced opening measuring *c.* 1.5m in width x 1m in height. This culvert is a contemporary build to St. Patrick's Bridge, being inset into the bridge's downstream buttress wall. This culvert is likely a discharge point for water-flow from the waterway that once ran the length of St. Patrick's Street; the waterway being culverted and reclaimed in the late 1700s. Downstream of this feature the historic quay wall forming Merchant's Quay slopes gently towards a set of river-access steps (Plate 137). The quayside has been built-up along this section, using modern cement blocks to remove the slope in quayside. Cast-iron mooring bollards can be seen protruding from the top of the original quay, now encapsulated by the modern addition above. The quay wall is composed of neat-cut limestone measuring between 500mm length x 300mm width and 900mm length x 400mm width. The quay's foundations have been underpinned along this section; close-set vertical timber piles being positioned *c.*1.5m from the base of the quay wall (Plate 138). A layer of cement extends from the quay wall to the inner edge of these piles. Three timber fenders are also present, rising vertically from positions immediately in front of the timbers piles used to underpin the quay wall.

A river-access point, now sealed-off from use, is located nearby at NGR: 167710E, 72057N (Plate 139). This access point comprises three flights of steps. The first set of steps leads towards the channel, at which point the structure turns at right angles to run parallel to the quay wall; the second/third flights leading down to the Low Water Mark. Three landing areas are incorporated into the design and provide access to the river at high water, mid-water, and low water. Another set of access steps, of similar design, are located *c.* 40m downstream (Plate 140). From this point the quay wall extends for a further 125m downstream to meet Anderson's Quay. The original quayside forming Merchant's Quay is upstanding to a height of *c.* 3m, above which a modern wall and railings have been inserted (141). A final set of river-access steps is located at the downstream terminus of Merchant's Quay and comprises seventeen masonry steps (Plate 142).

F033, Anderson's Quay: this quay is located on the south side of the channel, opposite to St. Patrick's Quay and Penrose Quay. Anderson's Quay runs from the downstream terminus of Merchant's Quay to a point c. 240m downstream at Michael Collins Bridge. The existing structure is composed of both historic and modern elements. The section running upstream of Brian Boru Bridge has been raised in height using modern concrete sections, as found along sections of the adjoining Merchant's Quay (Plate 143). The quay's foundation have been consolidated using timber piles, inserted parallel to the structure (offset *c.* 1.5m from the wall), behind which concrete has been placed. The quay survives to a greater height on the downstream side of Brian Boru Bridge where it stands to a height of *c.*4m (Plate 144). A recessed iron access-ladder is located along this section of quayside. Modern pre-cast concrete has been placed along the top of the quay, into which steel railings have been inset. A number of timber fenders rise vertically from the base of the quay, attached to the quay wall using two sets of forged iron strap-fastenings (Plate 145). At a point c. 70m downstream of Brian Boru Bridge, the historic elements of the quayside are replaced by a modern poured mass-concrete structure, lined using Larson clutch-piles and timber fenders (Plate 146).

A short length of timber wharf is located immediately downstream of Brian Boru Bridge (**F033a**). This structure measures 10m in length by 6m in width. The structure is most likely of contemporary build date to the adjacent bridge and aforementioned timber wharf on St. Patrick's Quay. The structure comprises a timber deck resting on cross-beams that in turn are attached to an outer beam that runs the full length of the quayside. Three large, vertically set, timber piles support the outer edge of the wharf, with internal cross-bracing timbers also being used to provide additional strength (Plates 147-148). An interesting array of carpenter's marks was observed as part of the inspection, incised into the cross-beam timbers that are located beneath the structure (Plate 149).

South Channel

F034, Lancaster Quay: this quay, located on the north side of the channel, forms the approach to the Western Road and measures 277m in length (Plate 150). The structure dates from the mid to late nineteenth-century; a period during which significant development of the western reaches of the city took place. The structure has been truncated by three bridge structures; St. Finbarre's Bridge and two

unnamed bridges (Plates 151). The quay wall is composed of six, visible, courses of limestone masonry measuring up to 1m in length x 300mm in width (Plate 152). The quay is upstanding to a height of approximately 2m, above which a rubble-stone wall has been constructed (Plate 153).

F035, Wandersford Quay: the original section of Wandersford Quay dates to the early nineteenth-century. It is located on the south side of the channel, running from the northern end of Crosse's Green Quay, on its downstream side, to a point *c.* 150m upstream (Plates 154-155). The structure is truncated by Clarke's Bridge, at a point 19m from its eastern terminus. A modern structure has been built onto the western terminus of Wandersford Quay, extending the quayside as far west as St. Finbarre's Bridge (Plate 156). The original quay measures approximately 2m in height and comprises un-coursed, limestone, masonry that ranges in size and shape; measuring between 500m in length x 350mm in width and 300mm in length x 300mm in width (Plate 157). The original height of the quay has been raised with the placement of the rubble stone wall, running the length of the quayside; this wall likely inserted in the late nineteenth- or early twentieth century (Plate 158). A river-access ladder is has been fastened to the quay wall and a number of twentieth-century service pipes protrude from the base of the structure. Several small drain features are also present along its extent.

F036, Crosse's Green Quay: this nineteenth-century quay structure runs along the south side of the river channel (south-south-east direction) from the western terminus of Wandersford Quay for a distance of *c.* 60m (Plate 159). The lower, original, section of the quayside is formed of un-coursed limestone masonry, while the upper elements of the quay wall comprise a rubble-stone wall; the latter structure being a later addition. A small arched-culvert (**F036a**) is located immediately downstream of the structure's southernmost extent (Plate 160). The culvert measures 3.2m in length x 1.4m in height. Its arch is segmental in form and is composed of thirty-two arch-stones. The culvert has been blocked-off using poured mass-concrete, although a flow of raw-sewage was observed emanating from below this point. No other features of interest were identified along the extent of this quay.

F037, French's Quay: this quay occupies the south side of the channel running between Proby's Quay to the west and South Gate Bridge to the east (Plate 161-162). The quayside comprises two build phases, with an overall structure that measures *c.* 120m in length. The majority of the structure is composed of randomly coursed limestone, with masonry ranging in size from 200m length x 150mm width to 400mm in length x 300mm in width (Plate 163). This part of the structure is thought to date to the mid eighteenth-century. A small rectangular drain feature, measuring 450mm in length x 250mm in width is located along the downstream section of the quayside (Plate 164).

A *c.* 15m section of the quayside, running between NGR: 167222E, 715081 and NGR: 167234E, 715124N, has been subject to nineteenth-century replacement. This section comprises neat-cut, sting-coursed, limestone masonry measuring up to 800mm in length x 400mm in width (Plate 165). Two sections of this later addition are subject to recent collapse, exposing the rubble-core that forms

the main body of the quayside behind. Nineteenth-century repair-work is also evident elsewhere along the extent of French's Quay, localised to sections from the upper part of the quay wall.

An arched-culvert is located towards the western end of French's Quay at NGR: 167180E, 715015N (**F037a**, Plate 166). This culvert facilitates a waterway that formerly ran along Proby's Quay, the waterway having been culverted in the 1800s. The culvert measures 3.6m in width *x c.* 3m in height. The archway is segmental in form and comprises thirty-two arch-stones. The arch-walls, measuring 1.4m in height, are composed of neat-cut limestone masonry with an *intrados* formed of red-brick (Plate 167). A slipway (**F037b**) is located a short distance upstream of this structure. The slipway is of masonry construction and appears to be contemporary with the eighteenth-century build-phase at French's Quay. The slipway measures 10m in length and 2.5m in width (Plates 168-169).

F038, Sullivan's Quay: this structure delineates the south side of the channel between South Gate Bridge and Parliament Bridge (Plates 170-173). Sullivan's Quay is of nineteenth-century construction, comprising large pieces of limestone masonry that are of regular size and shape; the average block size being 900mm in length x 350mm in width. Fourteen string-courses are visible at Low Water. A flight of river-access steps are located at a point *c.* 50m downstream of South Gate Bridge (Plate 174). A modern access-ladder has also been retro-fitted of the quay wall, approximately 10m downstream of the aforementioned bridge structure. The quayside is truncated, roughly half-way along its extent, by Nano Nagle Footbridge (built in 1985). Cut-stone balustrades and cast-iron railings line the quayside.

F039, Unnamed Quay (South Mall): a short section of quayside, measuring *c.* 60m in length, is located on the north side of the channel, opposite the downstream side of Sullivan's Quay. This structure originally provided access to the river from the west end of the South Mall. The structure is currently hidden beneath a boardwalk that protrudes 3.6m from the quay wall (Plate 175). Poured mass-concrete has been used to anchor the boardwalk to the quayside, resulting in the removal of two/three courses of masonry from the structure. The existing quay wall comprises eight courses of limestone masonry measuring between 800mm in length x 450mm in width and 500mm in length x 300mm in width. A flight of river-access steps are located *c.* 40m along its extent. A small arched-culvert (**F039a**) is located at NGR: 167468E, 715769N, close to the downstream terminus of the quayside (Plate 176). The arch is segmental in form and comprises thirteen arch-stones. The culvert has been blocked-off using cast-cement blocks and a storm drain has been inset into the culvert opening.

F040, George's Quay: this quay delineates the south side of the channel between Parliament Bridge and the western end of Union Quay (Plate 177). The structure is of nineteenth-century date and is composed of neatly-cut, string-coursed, limestone masonry; measuring up to 900mm in length x 350mm in width. George's Quay measures *c.* 240m in length and comprises seven-courses of masonry, visible at low water. The original coping has been removed and replaced using sections of

pre-cast concrete. A flight of river-access steps are located 14m downstream of Parliament Bridge (Plate 178). In addition, two wrought iron mooring-rings are located along the quay's extent (Plate 179).

A line of vertically set timber piles, set side-by-side and placed parallel to the quay, have been used to underpin the quay wall. These piles are positioned 500mm from the base of the wall, behind which horizontal shuttering has been inserted. Poured mass-concrete has been laid behind the shuttering to consolidate the quay's foundations. A series of greenheart timber fenders (thirty in total) are spaced at regular intervals along the quayside, running between the downstream side of the aforementioned access-steps and the upstream side of a timber/concrete wharf, which is located 132m downstream (Plates 180). Vertical timbers, which abut the quay wall, have been used to form the inner side of each fender. Additional timbers, attached to the outer side of the fender assemblage, are stepped-out from the quay wall at its base; allowing them to rise at an 80 degree angle to join the top part of the aforementioned inner timber. The timbers are joined using an iron-cap/strap that encases the timber head (Plates 181-182). Iron-ties have also used to fasten the timbers together.

A composite timber and poured mass-concrete wharf (**F040a**) is located *c.* 30m upstream of the quay's terminus (Plate 183). This structure measures 47m in length x 3.8m in width and comprises a concrete-deck, supported on its riverside by sixteen timber piles. These piles are similar in size (300mm x 300mm) and design to those used elsewhere along the quayside. Five timber fenders are also located downstream of the timber wharf (Plate 184). A large horizontal beam also forms part of the assemblage, running along to the top of the quay wall and interlocking with the head of each fender. These horizontal components are no are no longer *in situ* at Georges Quay. However, they can be observed in a number of places along Union Quay (F041), where the quayside has been lined with an identical fender assemblage.

F041, Union Quay: this quay delineates a 200m section of the channel on its south side, running between the southeast terminus of Georges Quay (near Trinity Footbridge) and Parnell Bridge (Plate 185). Morrison's Quay forms an opposing quayside, located on the downstream side of Morrison's Island. The existing structure is thought to date to the early nineteenth-century and comprises ten courses of neatly-cut limestone masonry; measuring between 1m in length x 450mm in width x 600mmin length x 450mm in width (Plate 186). A narrow timber platform or wharf is located immediately downstream of Trinity Footbridge (**F041a**, Plate 187). This structure originally measured 30m in length x 1m in width. However, it is presently in a state of disrepair with a *c.* 10m section from its downstream side having suffered collapsed. The remaining structure is supported along its outer edge by seven timber fenders, spaced 1.35m apart. Equally, the inner side is also supported by vertical timbers that abut the quay wall; iron-straps have been used to fasten these timbers to the wall (Plate 188). Cross-beams link the supporting timbers and provide a sub-structure to which the deck-level planking timbers are fastened (Plate 189). The quay's foundation have been consolidated this

location, mass concrete having been poured behind horizontal timber shuttering that runs the length of the timber wharf (Plate 190).

An ornate, keyhole-shaped, arched culvert/drain (**F041b**) is located towards the downstream extent of the timber wharf, at a point 22m downstream of Trinity Footbridge at NGR: 167774E, 714956N (Plate 191). The culvert measures 1.45m in height, 1m in width at the base of the ach-ring, and 400mm at its base. The arch-ring is segmental in form, comprising fifteen arch-stones which measure a uniform length of 400mm, with width varying between 70mm to 240mm (Plate 192). Large interlocking ashlar blocks surrounding the culvert feature. The culvert *intrados* and adjoining walls have been rendered using cement and the feature has been block-off using concrete blocks (*c.*1.6m within the structure).

A flight of river-access steps (now disused) are located *c.* 8m downstream of the culvert (Plate 193). Twelve masonry steps are visible, leading directly to the Low Water Mark. Immediately downstream of the access-steps, the quayside extends 1.6m into channel to form a new northern limit to the quay wall. This new limit delineates the channel until reaching another set of river-access steps at Parnell Bridge. The entire length of the quay wall has been underpinned using vertically-set timber piles measuring 300mm x 330mm. The piles are closely spaced, with a gap of 6mm to 10mm between each timber, and are stepped out approximately 500mm from the base of the Quay wall (Plate 194). Concrete has been poured behind these piles to consolidate the quay's foundations. A total of six-hundred and sixty of these timbers have been used as part of the consolidation measures. In addition, a series of seventy-six timber fenders, of identical composition to that observed along George's Quay, adorn the quay frontage (Plates 195-196). A total of twelve drain features are located along Union Quay, with three drain sizes were encountered: 500mm x 500mm, 700mm height x 500m width, and 600mm height x 500mm width (Plate 197). Four large wrought iron mooring-rings are also present and measure 500mm in internal diameter (Plate 198).

A flight of river-access steps, comprising twenty-four masonry steps, is located at the downstream terminus of Union Quay, NGR: 167912E, 717122N (Plate 199). The quayside has been truncated at this point by the insertion of the modern Parnell Bridge, built in the 1971. Seven electricity cables protrude from the quay wall and cross the south-channel at point 12m upstream of Parnell Bridge.

F041/F042, Father Matthew Quay (formerly Charlotte Quay) and Morrison's Quay: these quays from one continuous structure of early nineteenth-century date that delineate the north side of the channel, surrounding Morrison's Island (Plate 200). The quay measures 520m in length and has been constructed of neatly-cut, string-coursed, limestone masonry; a total of ten-courses being visible at Low Water. The masonry is fairly regular in size and shape, measuring between 700mm in length x 450mm in with and 1m in length x 450mm in width (Plate 201). The entire structure has been subject to consolidation work along it foundations. Two types of consolidation works are present. The first comprising a series of close-set vertical timber piles, behind which concrete has been poured (Plate 202); this being identical in type to that observed for the opposing George's Quay/Union Quay. The

second type comprises vertical timbers that are set flush to the quay wall, extending to a height of *c.*1.4m and spaced 200mm-300m apart; the spaces between these timbers having been in-filled with a rough-mix concrete (Plate 203).

A series of greenheart timber fenders, numbering one-hundred in total, have been placed at regular intervals along approximately 90% the quayside structure; the fenders only being absent from a small *c.* 50m section of Father Matthew Quay. The fenders found along Morrison's Island conform in design/fabric to that observed elsewhere along the South Channel quays (Plates 205-206). A flight of masonry river-access steps are located approximately mid-point along Father Matthew Quay and two others are located on Morrison's Quay; placed mid-point along the quay and at its downstream terminus (Plates 208-209). These river-access points are all of similar design, each flight comprising eighteen masonry steps with a larger landing-step located mid-way (High Water Mark) down the structure. The bottom steps all terminate a short distance above the Low Water Mark. A series of rectangular drain features, forty-two in total, are present along the structures extent, located along the base of quay wall (below the High Water Mark). These features are uniform in size and shape and measure 600m in height x 400m in width (Plate 207). An arched-culvert (**F042a**) is located *c.*180m along Morrison's Quay (Plate 208). This structure has been subject to modern repair using concrete blockwork and cement render. Little remains of the arch-ring, although it is likely to have been of similar design to the culvert encountered on Union Quay (F041b).

F043, Lapp's Quay: this nineteenth-century structure extends along the north side of the channel, running between Parnell Bridge and Eamon De Valera Bridge. It is truncated mid-way along its extent by Clontarf Bridge. The structure is composed of neatly-cut, string-coursed, limestone masonry measuring up to 1m in length x 450mm in width. A series of timber fenders are positioned along the quayside on the upstream of Clontarf Bridge (Plate 209); these being identical to those observed elsewhere along the south channel. Two mooring posts and three cast-iron mooring bollards are located along Lapp's Quay. The mooring bollards are embossed with their makers mark: '*R. Perrott & Sons, Cork, 1887.* These bollards were produced by the Hive Foundry, once located on Hanover Street, which has been responsible of much of the nineteenth-century ironwork to be found throughout city (Plates 210-211). Downstream of Clontarf Bridge, a large boardwalk measuring 80m+ in length x 6m in width has been inserted (Plate 212).

F045, Terrance MacSweeney Quay/ Albert Quay: this quay structure is located on the south side of the channel, extending between Parnell Bridge and Eamon De Valera Bridge. The quay is constructed of neatly-cut, string-coursed, limestone masonry measuring between 1.5m in length x 500m in width and 600mm in length x 500m in width (Plate 213). Eight masonry courses are visible at Low Water. The quay wall has been underpinned the same method observed for Union Quay, located upstream of Parnell Bridge. The quay was constructed in the mid to late nineteenth-century and the quayside retains three of its original cast-iron mooring bollards, located along its downstream side

(Plate 214). As observed for Lapp's Quay, these were manufactured by '*R. Perrott & Sons, Cork'* of the Hive Foundry, which operated from its Hanover Street location in the nineteenth-century.

A timber wharf (**F045a**) adjoins the downstream half of the structure, between Clontarf Bridge and Eamon De Valera Bridge. This structure is likely to be associated with the construction of Clontarf Bridge in 1911 and mimics a similar structure located on the upstream side of Brian Boru Bridge (on the North Channel). The structure measures 87m in length x 8m in width. The sub-structure is constructed of greenheart timber with concrete being used to cover the deck-level. A series of paired, vertical, timbers support the outer side of the structure. Timber beams run between the outer, vertical, timbers and the quayside wall; each beam being tied-into the masonry of the quay wall (Plates 215-217). Cross-bracing has also been used to provide additional support. Deck timbers run longitudinally across the top of the wharf structure, providing a surface upon which the concrete has been laid. Upstream of the wharf, timber fenders run parallel to the quay wall. These are of similar design and dimensions to those observed elsewhere along the channel (Plate 218).

Conclusion, Quays

Quays form an integral part of any maritime-based city. Not all of Cork's quays are listed in the NIAH or have existing protected status. The present study adds further sites to the record that add to the baseline data sets being sought.

5.2.3 Weirs

Nine weir sites are located within the assessment area and are tabulated in Table 3 below. The majority of sites have their origins in the nineteenth-century, as depicted on the OS First Edition (1841) and 25-inch Edition (189-1900) maps. However, all of the weir sites have been subject to modern improvement work and/or replacement.

Sites **F046-F047** form large weir structures that cross the River Lee, upstream from where the river diverges to form the North and South Channels (Plates 219-220). A series of clutch-plies have been placed along the upstream side of weir site **F046** and a poured mas-concrete fish-pass has been inserted. Modern intervention is also evident at weir site **F047**, concrete having been used to re-face sections of the weir. Site **F048** comprises an in-river wall/tailrace constructed as part of the improvements to the city's waterworks at that location, built sometime in 1859 (Plate 221). Sites **F049** and **F050** are located along the upstream section of the North Channel, as it flows through Mardyke Park. Weir **F049** remains almost fully intact and includes a masonry (limestone) fish-pass; although this structure has suffered partial collapse (Plates 222-223). Another weir site (**F050**) is located approximately 200m downstream. This structure is no longer intact, material from the structure being evident in-river, along with rubble-stone located on the adjacent riverbanks (Plate 224).

Gill Abbey Weir (**F051**) is located on the South Channel, *c.* 150m downstream of Donavan's Bridge (Plate 225). The weir remains intact at its original location, although the structure has been subject to

modern improvement and concrete has been used to re-face the weir. Weir site (**F052**), also located on the South Channel (30m downstream of St. Finbarre's Bridge), has been replaced by a modern concrete structure; built upon the foundations of the original historic structure at that location (Plate 227). Another modern weir (**F053**) is also located a sort distance upstream of South Gate Bridge and comprises a poured mass-concrete structure (Plate 227). The final weir site (**F054**) comprises a large, u-shaped, structure located on the upstream side of Parliament Bridge (Plate 228). This site has also been subject to modern remedial works and has been repaired/consolidated using poured mass-concrete.

Feature No.	National Grid Reference	Site Type/ Name	Date [cartographic]	Status	Plate/ Figure Reference
F046	164916E, 714265N	Weir and fish-pass [unnamed]	pre-1841	----	Plate 219 Figure 20
F047	165122E, 714140N	Salmon Weir [unnamed]	pre-1841	----	Plate 220 Figure 20
F048	165115E, 714650N	In-river walling/tailrace	1859	----	Plate 221 Figure 20
F049	166143E, 717752N	Weir [unnamed]	pre-1841	----	Plates 222-223 Figure 21
F050	166566E, 718099N	Salmon Weir [unnamed]	pre-1801	----	Plate 224 Figure 21
F051	166572E, 715064N	Gill Abbey Weir	pre-1841	----	Plate 225 Figure 21
F052	166900E, 71678331	Salmon Weir [unnamed]	pre-1841	----	Plate 226 Figure 21
F053	167250E, 715294N	Weir [unnamed]	Modern	----	Plate 227 Figure 21
F054	167495E, 715603N	Weir [unnamed]	pre-1841	----	Plate 228 Figure 22

Table 3: Weir sites located within the river assessment areas.

5.2.4 Intertidal Foreshore at Lee Mills

A large timber structure (**F055**) was encountered on the intertidal foreshore adjacent to the former site of Lee Mills (Figure 23, Figures 23-24). The structure is composed of eleven sections of greenheart timber that have been fastened together to form a horizontal platform. In addition, the remains of a timber jetty/walkway (**F056a-F056b**) are located a short distance to the west of the platform structure. Both structures are positioned at the Low Water Mark and are fully exposed during spring-low tides. Four archways (**F057**), now blocked-up, are located along the riverside wall of Lee Mills, three of which are located directly opposite the timber structures. Feature F050 is thought to be part of a possible barge landing area/platform, designed to allow a river barge or similar vessel to safely bottom-out at this location; access to the foreshore and platform area being provided by one of the adjacent archways. These intertidal features are discussed separately below and are also tabulated in Table 4.

Feature No.	National Grid Reference	Site Type/ Name	Construction Date	Status	Plate/ Figure Reference
F055	166757E, 718809	Timber Structure; possible landing platform	1800s	----	Plates 229-236 Figures 21, 23-24
F056a **F056b**	166738E, 718718N 166730E, 718681N	Two sections of a possible timber jetty	1800s	----	Plates 237-239 Figures 21, 23-24
F057 **Arch No. 1** **Arch No. 2** **Arch No. 3** **Arch No. 4**	 166791E, 718930N 166752E, 718748N 1667381E, 71868N 166730E, 718644N	Four archways located along the riverside wall of Lee Mills.	1800s	----	Plates 240-243 Figures 21, 23-24

Table 4: New features identified for the inter-tidal foreshore at Lee Mills.

F055, Barge Landing Platform: this structure measures 21.3m in length x 5.44m in width and is positioned adjacent to Arch No. 2 (**F057**). The structure comprises three underlying lengths of timber (T1-T6) that run east-west, parallel to Lee Mills, and five overlying timbers (T7-T11) that run north-south, at right-angles to underlying timbers (Plates 229-230). The overlying timbers measure 5.44m in length x 220mm in width x 220mm in depth (Plates 231-232). The underlying timbers measure between 10m and 11m in length x 220mm in width x 220mm in depth. These timbers have been scarfed-joined (1m scarf-length) to form the longer lengths (21.3m) required to run the full extent of the structure (Plates 233-234). Timbers T1-T2, located on the riverside of the structure, remain fully exposed along their combined length. However, Timber T4 remains partially buried and timber T6 fully buried within the in the foreshore. Timber T9 has suffered damage at a point 3.5m along its length. Forged, dome-headed, iron-pins (300mm diameter shaft/ *c.* 500mm head) have been used to fasten the overlying/underlying timbers together (Plates 235-236). These fastening-pins also appear to have been used to secure the overall structure the riverbed. Analysis of the fastening locations suggests three of the original overlying timbers are missing from the structure; one at the downstream terminus and two in the gap between Timbers T7 and T8.

F056a, F056b: two horizontal timbers and associated vertical piles are located a short distance upstream (west) of the landing structure; located at a distance of 8m and 17m respectively (Plate 237). **F050a** comprises a horizontal timber that runs east-west along the foreshore, parallel to Arch No. 3, and a vertical pile positioned on the timber's outer (north) side. The horizontal timber measures 2.48m in visible length (its western end remaining buried) and 150mm in width (Plate 238). The timber pile measures 70mm in diameter and is upstanding 60mm from the foreshore. **F050b** is located 7.2m further to the west, lying in line with the horizontal timber from F056a. The timber measures 2.1m in visible length, its western terminus remaining buried, and 150mm in width (Plate 239). Three equidistantly spaced vertically-set timbers are located along the line of the horizontal timber. Two of these abut the timbers outer edge; one 400mm along its length and the other 1.8m. The first measures 150mm x 140mm and is upstanding 50mm from the foreshore. The second is rectangular in section, measuring 70mm x 30mm and remains buried (10mm depth). The third timber is located 1.4m to the east and measures 80mm x 40mm and also remains buried (15mm depth). The two

timber assemblages are thought to form part of one continuous structure. Features **F056a**/**F056b** are likely to have once formed part of an east-west orientated jetty or walkway, located adjacent to Archway Nos. 3-4.

F057, Arch Nos. 1-4: these archways have been inset into the masonry wall that comprises the riverside extent of Lee Mills. The archways are likely date to the nineteenth-century, at a time when Lee Mills was still in operation. Arch No. 1 most likely served as a culvert, while the exact function of other arches remains unclear. However, it is probable that at least one of these archways was designed to provide access to the river and adjacent foreshore area. Arch Nos. 3-4 are particularly well-built, having been constructed using good quality limestone throughout. Today, the archways are no longer in use, all four having been sealed using rubble-stone (Arch. No. 1), concrete blocks (Arch. No. 2), and red-brick with an overlying cement render (Arch Nos. 3-4). The varying use of materials to seal these structures suggests they were blocked-off at different times and as separate endeavours.

Arch No.1 is located close the intersection between the north side of Lee Mills and the river-walling/quay that runs along Grenville place (Plate 240). The arch measures 2.95m in width and 1.7m in height. It is segmental in form and comprises thirty visible arch-stones. The arch-stones are composed of roughly shaped limestone measuring 240mm in width at top, 150mm in width at bottom, and 600m in length.

Arch No. 2 is situated 36.6m to the west, adjacent to timber structure F056a. This arch measures 5.27m in width, 3.35m in height, and comprises of twenty-two, neat-cut, arch-stones; measuring 320mm in width at top, 310mm at the bottom, and 550mm in length (Plate 241). The arch-ring is segmental in form.

Arch No. 3 is located 10m to the west (downstream) and measures 3m in width x 2.65m in height (Plate 242). The arch-ring is also segmental in form and composed of good quality limestone with a total of seventeen arch-stone visible. These measure 300mm in width at top, 240mm at bottom, and 440mm in length.

Arch No. 4 is located 4m downstream of Arch No. 3. It measures 4.42m in length x 3.27m in height and comprises twenty-four arch-stones composed of neat-cut limestone; measuring 307mm in width at top, 290mm at bottom, and 490mm in length (Plate 243). The arch-ring is segmental in form.

The intertidal foreshore that surrounds these sites has acted as a catchment area for portable objects and waterborne sediments, forming a deposition area that extends across a c.60m area of the foreshore. An intensive visual survey, coupled with metal-detection, recovered a series of historic items from the upper layers of the deposits present; highlighting the good holding-content present and the potential for deeper deposits to retain archaeological material (Plates 244-245). A list of the small finds retrieved from the intertidal survey at Lee Mills is included in Section 5.4.

5.3 Sub-tidal Channel

An underwater assessment was carried out along a 500m section of the River Lee and the sub-tidal sections of the North at South Channels at selected locations; undertaken using SSDE to HSE/HSA standards (Plates 246-247) No archaeologically or historically significant material, structures, or deposits were encountered as part of this endeavour. A summary description of the riverbed deposits observed as part of the underwater survey is provided below.

River Lee, Ballincollig: the riverbed is composed of rounded cobbles (<60mm) and pebbles (<30mm) along this stretch of the waterway (Plate 248). These deposits overlie pockets of coarse gravel (depth of 50mm). Occasional boulders are present (400m-500m size range) and sections of bedrock are frequently exposed on the riverbed (Plate 249). The central channel is remarkably clean, any portable objects having been washed further downstream to suitable collection points. In contrast, a considerable amount of modern material is located adjacent to the riverbank ,on the north side of the channel, where house-plots back onto the river (Plate 250). Building rubble has been frequently dumped along this side of the river to provide a form of rock-armour protection and prevent erosion of the riverbank. Some of this materiel has been washed into the north side of the flow-channel (during flood waters) and comprises concrete rubble blocks, breeze blocks, car tyres, scaffolding sections, miscellaneous steel objects, an engine block, and a washing machine drum, etc. Riverbed deposition was observed along the easternmost extent of the survey area, where river pebbles and gravels have accumulated to a depth of *c.* 300mm. Frequent modern debris is located within the deposit matrix and comprises fragments of water-eroded pottery, fishing weights, and other small objects.

Given the compact, shallow, nature of the riverbed deposit encountered, coupled with the high water-velocity present during flood-water events, the archaeological holding content for this stretch of the river can be considered extremely low.

North Channel: underwater survey of the sub-tidal channel extended from a point 50m upstream St. Vincent's Bridge, opposite Lee Mills, to a point *c.* 1.5km downstream at Michael Collins Bridge. Upstream of St. Vincent's Bridge, the riverbed in compact in nature, comprising >400mm boulders and >70mm cobbles (Plate 251). A number of large boulders measuring up to 1.5m length x 1m width were also noted. Occasional tree-branch martial was present and a large pile of masonry was encountered close to river-wall at Grenville Place, where a *c.*15 section of the wall has collapsed and later been replaced. Travelling beneath St. Vincent's Bridge the central-channel becomes more pronounced, the sides of the channel sloping at a *c.* 40 degree angle. The riverbed is now composed of rounded pebbles and small cobbles overlying gravel (<2mm) and coarse sand (Plate 252). A hand-penetration depth of 500mm was observed at this point. Approaching Griffith Bridge the channel edge becomes less defined and slopes at between 10 and 20-degrees. The riverbed is composed of cobbles with occasional boulders that overlie a coarse gravel sub-stratum. Under Griffith Bridge rock-armour is present surrounding the bridge piers. No indication of the foundation elements from earlier

bridge structures at this location was present. Continuing downstream, along Kyrl's Quay and Pope's Quay, the sides of the channel slope at a 30-degree angle and the riverbed becomes finer in nature; now comprising rounded pebbles and coarse gravel with occasional cobbles (Plate 253). A hand-penetration depth of 80mm was observed along this stretch of the riverbed. The character of the riverbed remains unchanged as far as Brian Boru Bridge, with a riverbed composed of coarse gravel and rounded pebbles (Plate 254). Frequent pottery fragments (modern) were noted, along with miscellaneous metallic debris. All observed material was small in nature, any larger objects likely to have been removed during flood-water events. Hand-pentation depths of between 50mm and 100m were achieved along this section of the riverbed. Downstream of Michael Collins Bridge the riverbed changes in composition, the river gravels/cobbles being replaced with a soft silty-clay with 600mm of penetration (Plate 255). In general the North Channel appears to retain a natural character and the riverbed deposits present can be considered to have a medium to good holding-content.

South Channel: the underwater survey of the sub-tidal channel was undertaken along four sections of the South Channel; the location of the proposed flow-control structure; St. Finbarre's Bridge to the Parliament Bridge; Parliament Bridge to Parnell Bridge; and Clontarf Bridge to a point 200m along Albert Quay East.

A 50m section of riverbed surrounding the location of the proposed flow-control structure was visually assessed; an area located close the south channel's starting point. Water depth at this location was shallow (500mm max.) and negated the need for dive survey; a waded/ snorkel survey of the area being undertaken. The riverbed is composed of rounded- sub-rounded pebbles (<30mm) and occasional cobbles (<65mm) (Plate256). This forms a compact deposit, measuring *c.*300mm in depth that overlies a substratum of course sand and gravel. The riverbed retains its natural character and can be considered to have a medium holding-content. Very little modern debris was encountered on the riverbed along this section of the channel.

The riverbed along the upstream survey area is composed of rounded to sub-rounded cobbles, ranging in size from 50mm x 40mm to 70mm x 60mm, and rounded pebbles; forming a compact deposit that ranges in depth of between 80mm and 100m (Plates 257-258). A hand-penetration depth of 40mm was achieved in places, where the underlying river gravel was exposed. As observed for the North Channel, little surface debris was encountered. The riverbed appears to retain is natural character and it is likely that any archaeological material, structures, or features would lie buried at depth within riverbed sub-stratum.

The riverbed located between Parliament Bridge and Parnell Bridge is less compact in nature and predominantly composed of small pebbles (<40mm) with frequent cobbles (<70mm) also present; only occasional boulders, measuring up to 300mm in length x 200m in width being noted (Plate 259). The aforementioned deposits overlie a sub-stratum of gravel (<2mm) and coarse sand. This sub-stratum is frequently exposed and a hand-pentation depth of 300mm can be achieved for these areas

(Plate 260). This section of the riverbed retains its natural character and has a good holding-content, particularly for those riverbed areas adjacent to George's Quay and the upstream side of Union Quay.

The riverbed downstream of Clontarf Bridge slopes at a *c.* 20-degree angle from the base of the two opposing quays. It is composed of a silty-clay with a penetration depth of 800mm+. Moving downstream, underneath Eamon De Valera Bridge, the slope increases its angle to *c.* 30 degrees. The central channel is composed of soft silty-clay with a hand-penetration depth of 600mm. Alongside Albert Quay East the channel slopes from the clutch-piles that delineate the quayside at a 70-degree angle. This area appears to have been dredged or subject to frequent prop-wash from cargo vessels using the quayside. Moving out into the channel, *c.*15m, the riverbed rises by approximately 1.5m (45-degree angle). The riverbed along this downstream section of the South channel is composed of a dark-grey silty-clay with a penetration depth of over 1m.

In general, the riverbed between Clontarf Bridge and Albert Quay East remains flat and featureless and largely sterile of surface debris. A good holding-content can be ascribed for this area, the silty-clay providing an ideal environment of the retention and preservation of archaeological material. However, much of this riverbed area is also likely to have been subject to modern dredging, an activity that would greatly reduce the archaeological potential of the riverbed deposits present. Underwater visibly for this downstream section of South Channel was poor, ranging between 0-300mm. As such, no useful underwater photography was achieved.

5.4 Metal-detection Survey and Small Finds

Metal-detection survey was attempted at a number of other locations, however, the background metallic signatures present negated meaningful survey. As such, metal-detection use was restricted to a section the intertidal foreshore adjacent to Lee Mills, on the North Channel, which also underwent an intensive visual survey (Plate 261). As previously discussed, this intertidal area has formed a catchment area for waterborne sediments and portable objects lost/discarded into the waterway. A high target ratio of 3-4 hits per m² was encountered. Metal-detection of the surface layers revealed a mix of modern metallic debris and older material dating to the early twentieth-century. Modern material included frequent coins, spoons, lead-fishing weights, re-bar, mobile phones, etc. (Plates 262-264). Older material of historic interest included three rifle bullets and a military or constabulary dress-button (Plates 265-266). Small finds form the visual survey include two honing stones, of a type still produced in the 1950s, a selection of clay pipe bowl and stem fragments of late nineteen- to early twentieth-century date, and ceramic fragments (glazed red earthenware) of a type produce from the seventeenth-century onward (Plates (267-269). An additional find of interest was recovered from the riverbed a short distance downstream of Mardyke Footbridge. This find constitutes a silver band from the wooden base of a trophy/presentation cup (Plates 270-271). A total of nine names are listed on the cup, starting with '1942 C.J. Daly' and ending with '1956 W.J. Dwyer'. The find is believed to be associated with the Sunday Wells Boat and Tennis Club, located a short distance upstream; the wooden base of the cub having been discarded into the waterway sometime after 1956.

6.0 PROPOSED IMPACTS[11]

The impact categories used have regard to those set out in the 'Guidelines on the information to be contained in Environmental Impact Statements', 2002, EPA, 'Advice notes on Current Practice (in preparation of Environmental Impact Statements), 2003, EPA, and Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes, National Roads Authority.

In-river works associated with proposed drainage scheme are minimal, much of the proposed flood defence work being undertaken at street level or set back from the river channel in the form of flood defence walls/ embankments. In addition, no dredging of the waterway is proposed as part of the drainage scheme. The proposed impacts and mitigation proposals for each of the features identified as part of the UAIA are tabulated in Table 5. A number of the features will be subject to impacts, of varying degree, by the proposed scheme; these are also discussed below according to site type.

Bridges: six bridge structures will be impacted by the proposed drainage scheme. However, in the most part, interventions are limited in nature and restricted to the upper elements of each of the bridge structures. Only one bridge structure (**F005**; Alderman Reily's Bridge) is subject to a more significant, moderate, impact and requires additional mitigation prior to the flood defences works commencing.

Quays: the majority of the impacts associated with the proposed flood defence work to the city's quays are limited to street-level interventions. The level of impact and proposed mitigation for these street-level interventions has been undertaken separately by John Cronin and Associates. Proposed interventions to the lower components of each quay structure constitute, in the main part, localised maintenance and repair of the quay-façade and the insertion of micro-piles along their foundations. This intervention work does not have a significant impact on the existing structures, and can be considered to have a slight positive impact.

Direct in-river impacts, in the form of sheet-pile walls, are restricted to two sections along the South Channel. These works will impact Crosse's Green Quay (**F036**/**F036a**) and an unnamed quay (**F039**) located off the Grand Parade/South Mall (upstream of Parliament Bridge). These quays will be buried behind the new in-river extent created by the insertion of these sheet-piles walls. In addition, a large weir structure (**F054**), located on the upstream side of Parliament Bridge, will be impacted by sheet-pilling along its northern side.

The most significant potential impact to features identified from the UAIA is along the intertidal foreshore at Lee Mills; two previously unrecorded timber structures (**F055 and F056**) being situated at that location. It is proposed to insert of a new sheet pile wall along the south side of the sub-tidal

[11] This section does not purport to relate to precise engineering details but is rather an attempt to understand the nature of the impact on the potential archaeological environment, based on the supplied data.

channel, roughly along the Low Water Mark. It is also understood that the area of foreshore to south of this wall will be subject to reclamation. As a result these structures will be directly impacted by the proposed reclamation works. In addition, a series of four archways (F057), built into the riverside façade of Lee Mills will also be buried as a result of these works.

7.0 MITIGATION

Archaeological monitoring is required for all of the proposed direct defence interventions located along the city's bridge and quayside areas. This will allow these works to be suitably monitored and any additional recoding of each structure to be undertaken. In addition, a measured archaeological survey of one bridge structure and three quay structures: **F036**/**F036a** (Crosses's Green Quay and culvert), **F039** (unnamed quay), **F045**/**F045a** (Albert Quay and timber wharf), and **F057** (riverside wall of Lee Mills) should be carried out pre-construction. Timber structures **F055** and **F056**, located on the intertidal foreshore at Lee Mills, are also subject pre-construction mitigation. These structures are to be removed under archaeological supervision or subject to an engineering strategy to allow their preservation *in situ*; without sustaining any damage from the insertion of the adjacent sheet pile wall or the associated reclamation work.

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
F001	Griffith Bridge [site of North Gate Bridges]	Installation of new bridge parapets.	No impact to historic bridge structure	No further mitigation required	None
F002	South Gate Bridge	----	No Impact	----	None
F003	Parliament Bridge	In-channel sheet pile wall and boardwalk to be constructed in-channel between Grand Parade and Parliament Bridge	Possible indirect impact to setting of Parliament Bridge; slight/moderate	Monitoring of interventions within vicinity of Parliament Bridge.	Permanent indirect impact to setting of Parliament Bridge; slight/moderate
F004	Clarke's Bridge	Flood wall with random rubble limestone cladding extending eastward from Clarke's Bridge.	Slight indirect impact	Monitoring of proposed interventions in vicinity of Clarke's Bridge.	Permanent Slight indirect impact
F005	Alderman Reily's Bridge	Proposed penstock to be placed on upstream face of the existing bridge. Remedial works to the existing bridge (as required) to ensure that the masonry arches have capacity for potential uplift.	Direct Impact: moderate	• Full measured archaeological survey of bridge structure prior to interventions taking place. • Monitoring of interventions in vicinity of Alderman Reily's Bridge.	Permanent moderate negative direct impact to Alderman O'Reilly Bridge.
F006	St. Patricks Bridge [site of earlier bridge]	----	No Impact	----	None
F007	O'Neill Crowley Bridge [Georg IV Bridge]	----	No Impact	----	None
F008	Parnell Bridge [site of Anglesea Bridges]	----	No Impact	----	None
F009	Thomas Davis Bridge [Wellington Bridge]	----	No Impact	----	None
F010	Gaol Bridge	----	No Impact	----	None
F011	Unnamed footbridge [site of]	----	No Impact	----	None
F012	Unnamed footbridge	----	No Impact	----	None
F013	Unnamed footbridge	----	No Impact	----	None
F014	Unnamed footbridge [site of]	----	No Impact	----	None
F015	St. Vincent's Bridge	----	No Impact	----	None
F016	Unnamed bridge [site	----	No Impact	----	None

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
	of tramway crossing]				
F017	Donovan's Bridge	----	No Impact	----	None
F018	Brian Boru Bridge	Steel flood defence parapet to be constructed along bridge footpaths. Parapet to tie in with existing bridge steelwork. Steel flood gates to be created at footpaths on both banks	Direct Negative Impact; slight/moderate	Monitoring of interventions in vicinity of Brian Boru Bridge.	Permanent slight direct negative impact
F019	Clontarf Bridge	Four proposed demountable pedestrian access gates. Existing bridge structure to incorporate steel flood defence upstand c.0.5m high between road and footpath. Flood wall to tie into high ground on bridge.	Direct Negative Impact; slight.	Monitoring of interventions in vicinity of Clontarf Bridge.	Permanent slight direct negative impact
F020	Newman's Footbridge	----	No Impact	----	None
F021	Daly's Bridge	Ramping of Ferry Walk to south of bridge and glass flood barrier proposed nearby. No impact to Bridge.	Indirect Negative Impact to setting; slight Neutral impact to bridge.	Monitoring of required interventions in vicinity of Daly's Bridge.	Indirect Negative Impact to setting; slight
F022	Wise's Quay	The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact.	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F023	North Mall	The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact.	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F024	Bachelors Quay	The existing river wall and foundation zones are to be grouted. Possible additional strengthening works may include the incorporation of micro-piles. The face of the existing wall is to be cleaned and	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact. Removal of the parapet wall	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		repointed and the stonework repaired where necessary. The existing stone parapet along Bachelor's Quay and is to be removed, salvaged and replaced by a parapet wall cut limestone cladding typically 1.2m above existing ground level.	will result in a neutral impact.		
F025	Farrens Quay	Existing stone parapet to be maintained at existing level with repairs. The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F026	Pope's Quay	Existing stone parapet to be maintained at existing level with repairs. The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F027	Kyrl's Quay	The existing stone parapet is to be removed, salvaged and replaced by new parapet wall with cut limestone cladding. The existing access steps are to be maintained and extended to flood defence with new reinforced	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		concrete steps.			
F027a	Culvert	----	No Impact	----	None
F028	Camden Quay	Existing stone parapet is to be maintained as part of the flood defence system and repaired where required The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F029	Cole Quay	Similar intervention as described for Pope's Quay. The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F029a	Culvert	----	No Impact	----	None
F030	Lavitt's Quay [part of former Seven Haven's Quay]	Similar intervention as described for Pope's Quay (east) apart from section of Lavitt's Quay to west of Christy Ring Bridge where existing reinforced concrete parapet is to be demolished and replaced with a new reinforced concrete parapet wall The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		necessary.			
F031	St. Patrick's Quay	Existing concrete kerb and railing are to be demolished and replaced with a new concrete flood defence parapet typically 0.7m above existing ground levels. Guard railing is to be installed on the proposed parapet (0.5m of railing) The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F031a	Culvert	----	No impact	----	None
F032	Merchants Quay	Existing concrete kerb and railing are to be demolished and replaced with a new reinforced concrete flood defence parapet typically 0.7m above existing ground levels. Guard railing is to be installed on the proposed parapet (0.5m of railing).	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F032a	Culvert	----	No Impact	----	None
F033	Anderson Quay	Existing concrete kerb and railing are to be demolished and replaced with a new reinforced concrete flood defence parapet typically 0.7m above existing ground levels. Guard railing is to be installed on the proposed parapet (0.5m of railing). The existing river wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		necessary.			
F033	Timber Wharf	----	No Impact	----	None
F034	Lancaster Quay	The existing river wall and foundation zones are to be gravity and pressure grouted. Existing open railings to be replaced with reinforced concrete flood defence wall to tie into adjacent existing walls.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F035	Wandersford Quay	Proposed wall to be constructed on the west side of the existing boundary wall 1.2m above existing ground levels. Proposed parapet is to be clad with salvaged stone. Flood wall with random rubble limestone cladding extending eastward from Clarke's Bridge. Internal joints to be sealed and all internal outfalls to be fitted with non-return valves. Possible additional strengthening works may include the incorporation of micro-piles. A new mass concrete backing wall is to be provided. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to quay walls
F036	Crosse's Green Quay	Proposed sheet pile wall with limestone random rubble cladding to be constructed along river edge	Direct Negative Impact; slight.	Monitoring of interventions along Crosse's Green Quay.	Permanent Direct Negative Impact; slight
F036a	Culvert	Proposed sheet pile wall with limestone random rubble cladding to be constructed along river edge.	Indirect Negative Impact; moderate	• Full measured archaeological survey of culvert structure prior to interventions taking place.	• Permanent Indirect Negative Impact; moderate

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
				• Monitoring of interventions within vicinity of culvert.	
F037	French's Quay	Existing parapet extends over flood defence and is to be maintained	No Impact	----	None
F037a	Arched-Culvert	Existing culvert in Proby's Quay/French's Quay to be pressurised during a flood event. Repairs to the existing culvert and work to internal joints to be carried out where necessary	The maintenance and repair of the existing culvert will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to masonry
F038	Sullivan's Quay	The existing quay wall and foundation zones are to be grouted. Possible additional strengthening works may include the incorporation of micro-piles. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing culvert will result in a Slight Positive Impact	No further in-water mitigation required.	Repair of the existing culvert will result in a Permanent Slight Positive Impact
F039	Unnamed Quay, off the South Mall	Proposed sheet pile wall to be constructed in channel to 3.00mOD. Section of existing boardwalk to be removed to connect defence wall to quay. Pedestrian access ramp to be incorporated on dry side of sheet pile wall, connecting Grand Parade quay to Parliament Bridge. Steel plates to be fitted along west side of ramp.	Direct Negative Impact; moderate	• Full measured archaeological survey of quay structure prior to interventions taking place. • Monitoring of proposed interventions.	Permanent Direct Negative Impact; moderate
F039a	Culvert	----	No Impact	----	None
F040	George's Quay	A concrete parapet to be constructed typically 1.2m above existing ground levels.	Direct Negative Impact; moderate	No further in-water mitigation required.	Permanent Direct Negative Impact; moderate
F041a	Timber Wharf	----	No Impact	----	None
F041	Union Quay	A concrete parapet to be constructed typically 1.2m above	The maintenance and repair of the existing quay wall will result	No further in-water	Permanent slight direct positive impact by

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		existing ground levels Possible additional strengthening works may include the incorporation of micro-piles. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	in a Slight Positive Impact.	mitigation required.	appropriate repairs to quay wall
F041a	Timber Wharf	----	No Impact	----	None
F041b	Culvert	----	No Impact	----	None
F042	Father Matthey Quay	Proposed public realm works at Morrison's Island. Works to be progressed under the Planning and Development Act.	----	Morrison's Island is subject to separate UAIA report.	-----
F043	Morrison's Quay	Proposed public realm works at Morrison's Island. Works to be progressed under the Planning and Development Act.	----	Morrison's Island is subject to separate UAIA report.	-----
F043a	Culvert	----	----	----	-----
F044	Lapp's Quay	The existing quay wall and foundation zones are to be grouted. The granular soil backing zone is to be grouted. The face of the existing wall is to be cleaned and repointed and the stonework repaired where necessary.	The maintenance and repair of the existing quay wall will result in a Slight Positive Impact	No further in-water mitigation required.	Permanent slight direct positive impact by appropriate repairs to wall
F045	Terrance MacSweeney Quay/ Albert Quay	*Terrance MacSweeney*: proposed reinforced concrete flood defence parapet to flood defence level (typically 0.8m above existing ground levels). Guard railing is to be installed on the proposed parapet to 1.2m above existing ground level (0.4m of railing). *Albert Quay:* reconstruction works to be undertaken along entire quay	Direct Negative Impact	• Full measured archaeological survey of quayside along Albert Quay West. • Monitoring of proposed interventions.	Permanent Direct Negative Impact

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		length, existing wharf to be demolished. Proposed sheet pile wall to be constructed on riverside of existing quay typically 0.9m above existing ground levels.			
F045a	Timber Wharf at Albert Quay	Existing wharf to be demolished and reconstruction works to be undertaken along entire quay length. Proposed sheet pile wall to be constructed on riverside of existing quay to flood defence level of 3.40mOD, typically 0.6m above existing ground levels. 0.6m of railing to be fitted on top of parapet to1.2m above proposed ground levels. Parapet ties into high ground at each end. All drainage outfalls to be fitted with non-return valves.	Direct Negative Impact	• Full measured archaeological survey of wharf structure prior to its removal. • Monitoring of proposed removal and retaining of the timber and iron components from that structure.	Permanent direct negative impact
F046	Weir and fish-pass [unnamed]	----	No Impact	----	None
F047	Salmon Weir [unnamed]	----	No Impact	----	None
F048	In-river walling/tailrace	----	No Impact	----	None
F049	Weir [unnamed]	----	No Impact	----	None
F050	Salmon Weir [unnamed]	----	No Impact	----	None
F051	Gill Abbey Weir	----	No Impact	----	None
F052	Salmon Weir [unnamed]	----	No Impact	----	None
F053	Weir [unnamed]	----	Direct Impact	----	None
F054	Weir [unnamed]	Proposed sheet pile wall to be constructed in channel to 3.00mOD. Section of existing boardwalk to be removed to connect defence wall to quay. Pedestrian access ramp to be incorporated on dry side of sheet	Potential slight direct impact to weir from insertion of sheet pile wall	• Monitoring of proposed works surrounding the weir structure. • Recoding of weir structure as part of monitoring process.	Potential permanent slight direct impact to weir from insertion of sheet pile wall

Feature No.	Feature Name/Type	Proposed works	Potential Impacts	Archaeological Mitigation	Residual Impacts
		pile wall, connecting Grand Parade quay to Parliament Bridge. Steel plates to be fitted along west side of ramp.			
F055	Timber structure at Lee Mills; landing platform	Proposed sheet pile flood defence wall to be constructed in channel to flood defence level of 4.70mOD, typically 1.5m above existing ground levels. Flood wall to tie into proposed flood defence embankment at western end. All drainage outfalls to be fitted with non-return valves.	Direct Negative Impact	• Removal of structure under archaeological supervision. • Additional recording of any below surface remains. • Timbers to be retained and re-located to suitable location in consultation with the DAHRRG.	Permanent Direct Negative Impact
F056	Timber structure at Lee Mills; possible jetty timbers	Proposed sheet pile flood defence wall to be constructed in channel to flood defence level of 4.70mOD, typically 1.5m above existing ground levels. Flood wall to tie into proposed flood defence embankment at western end. All drainage outfalls to be fitted with non-return valves.	Direct Negative Impact	• Removal of structure under archaeological supervision. • Additional recording of any below surface remains. • Timbers to be retained and re-located to suitable location in consultation with the DAHRRG.	Permanent Direct Negative Impact
F057	Arched-culverts; Lee Mills	Proposed sheet pile flood defence wall to be constructed in channel to flood defence level of 4.70mOD, typically 1.5m above existing ground levels. Flood wall to tie into proposed flood defence embankment at western end. All drainage outfalls to be fitted with non-return valves.	Indirect Negative Impact; slight	Full measured survey of riverside facade of Lee Mill, focused on the recoding of the four arched-culverts.	Permanent Indirect Negative Impact; slight

Table 5: Proposed impacts and mitigation for identified in-river features from the UAIA.

8.0 RECOMMENDATIONS

8.1 Pre-construction Measures

It is recommended that detailed archaeological surveys of the structures comprising Alderman Reily's Bridge (**F005**), Crosse's Green Quay (**F036**), and the façade of the riverside wall at Lee Mills (**F057**) be carried out in advance of construction works commencing. This survey is to include the production of detailed plans, cross-sections, and elevations so as to constitute a full and proper record of each structure. It is also recommend that a specific migration strategy for timber structures **F055** and **F056** be agreed and implemented well in advance of construction works commenting at Lee Mills.

8.2 Construction Phase Measures

ARCHAEOLOGICAL MONITORING. Archaeological monitoring in accordance with the terms of Section 5 of the National Monuments Act (2004 Amendment) is recommended during riverbed and bankside disturbances associated with the proposed flood relief scheme. These measures will ensure that any sub-surface remains of archaeological or historic value are dealt with in an appropriate archaeological manner.

RETAINING AN ARCHAEOLOGIST/S. An archaeologist should be retained for the duration of the relevant works. The archaeologist should be familiar with and experienced in river/estuarine environments.

THE TIME SCALE for the construction phase should be made available to the archaeologist, with information on where and when ground disturbances and dredging will take place.

SUFFICIENT NOTICE. It is essential for the developer to give sufficient notice to the archaeologist/s in advance of the construction works commencing. This will allow for prompt arrival on site to monitor the ground disturbances. As often happens, intervals may occur during the construction phase. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.

DISCOVERY OF ARCHAEOLOGICAL MATERIAL. In the event of archaeological features or material being uncovered during the construction phase, it is crucial that any machine work cease in the immediate area to allow the archaeologist/s to inspect any such material.

ARCHAEOLOGICAL MATERIAL. Once the presence of archaeologically significant material is established, full archaeological recording of such material is recommended. If it is not possible for the construction works to avoid the material, full excavation would be recommended. The extent and duration of excavation would be a matter for discussion between the client and the statutory authorities.

ARCHAEOLOGICAL TEAM. It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This would be complimented in the event of a full excavation.

SECURE SITE OFFICES and facilities should be provided on or near those sites where excavation is required.

FENCING of any such areas would be necessary once discovered and during excavation.

ADEQUATE FUNDS to cover excavation, post-excavation analysis, and any testing or conservation work required should be made available.

MACHINERY TRAFFIC during construction must be restricted as to avoid any of the selected sites and their environs.

SPOIL should not be dumped on any of the selected sites or their environs.

PLEASE NOTE: All of the above recommendations are based on the information supplied for the River Lee (Cork City) Drainage Scheme. Should any alteration occur, further assessment maybe required.

PLEASE NOTE: Recommendations are subject to the approval of The Department of the Arts, Heritage, Gaeltacht, Reginal and Rural Affairs and of the National Museum of Ireland.

9.0 ACKNOWLEDGEMENTS

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APPENDIX 1: Catalogue of Historic Bridge Sites located within the assessment area [Features F001-F021].

Feature No.	Bridge Name	Date	Status	National Grid Reference	Location	Plate/ Figure Reference
F001	Griffith Bridge [site of North Gate Bridges]	1961 [1864, 1700s]	----	167037E, 721708N	North Channel	Plates 7, 9, 10-11 Figure 21
F002	South Gate Bridge	1713, extended 1824	NIAH 20515065 RPS 328 RMP CO074-034012	167269E, 715395N	South Channel	Plates 8, 13-16 Figure 21
F003	Parliament Bridge	1806, 1760s	NIAH 20515061 RPS 270	167525E, 715554N	South Channel	Plates 17-19 Figure 22
F004	Clarke's Bridge	1776	NIAH 20503247 RPS 026	167078E 716588N	South Channel	Plates 20-25 Figure 21
F005	Alderman Reily's Bridge	*c.*1770	NIAH 20500786 RPS 814	166741E, 720452N	North Channel	Plates 26-29 Figure 21
F006	St. Patricks Bridge [site of earlier bridge]	1861 [1789]	NIAH 20513133 RPS [no ref.]	167673E, 720909N	North Channel	Plates 30-36 Figure 22
F007	O'Neill Crowley Bridge [Georg IV Bridge]	1820	----	165434E, 712590N	North Channel	Plates 37-40 Figure 20
F008	Parnell Bridge [site of Anglesea Bridges]	1971, 1882, 1830s	----	167922E, 717469N		Plates 41-48 Figure 22
F009	Thomas Davis Bridge [Wellington Bridge]	*c.*1830	NIAH 20865053 RPS [no ref.]	165296E, 714915N	North Channel	Plate 49 Figure 20
F010	Gaol Bridge	1835	NIAH 20866133 RPS 698	160031E, 713361N	South Channel	Plates 50-53 Figure 20
F011	Unnamed footbridge [site of]	post 1841	----	165676E, 712273N	South Channel	Plates 54-57 Figure 20
F012	Unnamed footbridge	post 1841	----	165812E, 712641N	South Channel	Plates 58 & 560 Figure 20
F013	Unnamed footbridge	post 1841	----	165849E, 712839N	South Channel	Plates 59 & 61 Figure 20

Feature No.	Bridge Name	Date	Status	National Grid Reference	Location	Plate/ Figure Reference
F014	Unnamed footbridge [site of]	post 1841	----	166479E, 714959E	South Channel	Plate 62 Figure 20
F015	St. Vincent's Bridge	1875	NIAH 20500785	166783E, 720670N	North Channel	Plates 63-65 Figure 21
F016	Unnamed bridge [site of tramway crossing]	*c.* 1887	----	166058E, 715742N	South Channel	Plates 66-67 Figure 21
F017	Donovan's Bridge	1902	NIAH 20503318	166398E, 714957N	South Channel	Plate 69 Figure 21
F018	Brian Boru Bridge	1912	NIAH 20506355 RPS [no ref.]	167994E, 720405N	North Channel	Plate 70 Figure 22
F019	Clontarf Bridge	1912	NIAH 20508001 RPS [no ref.]	166958E, 718000N	South Channel	Plate 71 Figure 22
F020	Newman's Footbridge	1916	NIAH 20866155	166371E, 715080N	South Channel	Plates 72-73 Figure 21
F021	Daly Bridge	1927	NIAH 20866038 RPS 722	165686E, 716547N	North Channel	Plates 74-75 Figure 20

APPENDIX 2: Catalogue of Historic Quays located within the assessment area [Features F022-F047].

Feature No.	Quay Name	Construction Date	Status	National Grid Reference	Location	Plate/ Figure Reference
F022	Wise's Quay	1800s	----	166747E, 72074N- 166798E, 72095N	North Channel	Plates 76-80 Figure 21
F023	North Mall	*c.*1830	NIAH 2050035 & 2050016	166798E, 72095N- 167023E, 721807N	North Channel	Plates 81-84 Figure 21
F024	Bachelors Quay	*c.*1820, built upon earlier [1700s] quayside	NAH 2050036	166799E, 720480N- 167029E, 721488N	North Channel	Plates 84-90 Figure 21
F025	Farrens Quay	1801-1832, built at	----	167047E, 721920N-	North Channel	Plates 91-95

Feature No.	Quay Name	Construction Date	Status	National Grid Reference	Location	Plate/ Figure Reference
		location of earlier [1700s] quayside		167120E, 722058N		Figure 21
F026	Pope's Quay	1801-1832, built upon earlier [1700s] quayside	NIAH 20512164	167120E, 722058N-167361E, 721451N	North Channel	Plates 96-99 Figure 21
F027 (F027a)	Kyrl's Quay (Culvert)	1801-1840, built upon earlier [1700s] quayside	NIAH 20513140	167053E, 721583N-167262E, 721213N	North Channel	Plates 100-105 Figure 21
F028	Camden Quay	1831-1841	NIAH 20513132	167361E,721434N-167666E, 721292N	North Channel	Plates 106-113 Figure 22
F029 (F29a)	Cole Quay (Culvert)	1770-1840	----	167262E, 721123N-167262E, 721213N	North Channel	Plates 106, 114-120 Figure 21
F030	Lavitt's Quay [part of former Seven Haven's Quay]	1801-1832, built upon earlier [1700s] quayside	NIAH 20513139	167327E, 720998N-167658E, 720618N	North Channel	Plates 106, 114-120 Figure 22
F031 (F031a)	St. Patrick's Quay (Timber Wharf)	1801-1832	NIAH 20512612	167789E, 721261N-168078E, 720515N	North Channel	Plates 121-134 Figure 22
F032 (F032a)	Merchants Quay (Culvert)	1801-1832, built upon earlier [1700s] quayside	----	167679E, 720598N-167880E, 720252N	North Channel	Plates 135-142 Figure 22
F033 (F033a)	Anderson Quay (Timber Wharf)	1860-1880, and modern sections	----	167880E, 720252N-168118E, 719843N	North Channel	Plates 143-149 Figure 22
F034	Lancaster Quay	1860-1880	----	166596E, 715885N-166850E, 716980N	South Channel	Plates 151-153 Figure 21
F035	Wandersford Quay	1801-1843	----	166954E, 716435N-167113E, 716403N	South Channel	Plates 154-158 Figure 21
F036 (F036a)	Crosse's Green Quay (Culvert)	1801-1843	----	167113E, 716403N-167119E, 715789N	South Channel	Plates 159-160 Figure 21

Feature No.	Quay Name	Construction Date	Status	National Grid Reference	Location	Plate/ Figure Reference
F037 **(F037a)** **(F037b)**	French's Quay (Culvert) (Slipway)	*c.* 1750	NIAH 20503317 [culvert] 20503316 [slipway]	167156E, 715179N- 167266E, 715227N	South Channel	Plates 161-169 Figure 21
F038	Sullivan's Quay	*c.* 1840	----	167283E, 715323N- 167511E, 715410N	South Channel	Plates 170-174 Figures 21
F039 **(F039a)**	Unnamed Quay, off the South Mall (Culvert)	1800s		164070E, 715782N- 1674630E, 7157800N	South Channel	Plates 175-176 Figure 22
F040 **(F40a)**	George's Quay (Timber Wharf)	1800-1840	----	167527E, 715378N- 167918E, 717127N	South Channel	Plates 177-184 Figure 22
F041 **(F041a)** **(F041b)**	Union Quay (Timber Wharf) (Culvert)	1750-1840	----	167754E, 714665N- 167918E, 717127N	South Channel	Plates 185-199 Figure 22
F042	Father Matthey Quay	1750-1840	----	167533E, 716856N- 167733E, 714930N	South Channel	Plates 200-208 Figure 22
F043 **(F043a)**	Morrison's Quay (Culvert)	1750-1840	----	167733E, 714830N- 167895E, 717587N	South Channel	Plates 200-208 Figure 22
F044	Lapp's Quay	1800-1840	NIAH 20506388 [moorings]	167924E, 717779N- 168014E, 718229N	South Channel	Plates 209-212 Figure 22
F045 **(F045a)**	Terrance MacSweeney Quay/ Albert Quay (Timber Wharf)	*c.* 1860	NIAH 20506390-91 & 20508002 [moorings]	167952E, 717342N- 168132E, 71812N	South Channel	Plates 213-217 Figure 22